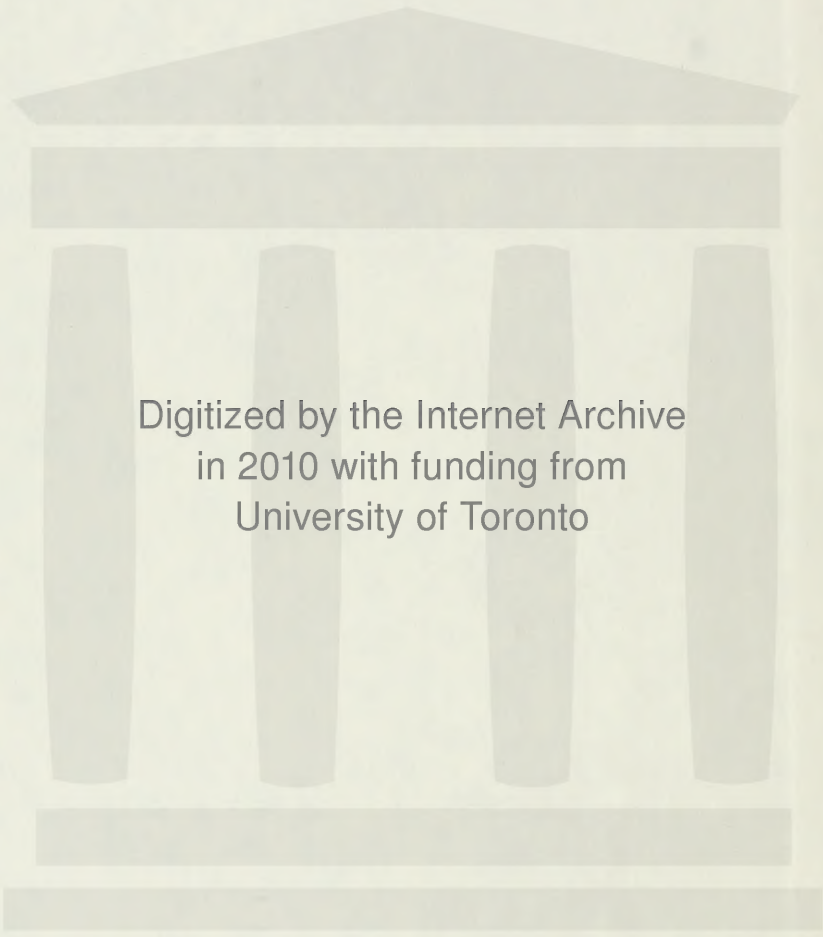

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INDEX.

NOTE.—The figures in parentheses have reference to the pages in Supplements.

A

Advances in the Science of Water Purification, 861, 889
Advantages of Land Over Artificial Schemes, 162, 206
Advertisement Hoardings, Control of, 885, 897
Aerial Nuisance from Sewage Works, 43, 79
Age Limits for Appointments, 314, 356
A Generous Proposal, 619
Alkaline Waters of the London Basin, 130, 132
Alton, Municipal Work in, 599, 621
American Road Stone Tests, 799
An Anomaly, 155
An Exceptional Opportunity, 513

Annual Reports:—
Belper, 243
Bristol, 220
Calcutta, 839
Cape Town, 640
Fifeshire, 78
Godalming, 635
Johannesburg, 287, 301
Kent, 303
Krugersdorp, 138
Leeds, 281
London, City of, 243
Mid-Lothian, 367
Newcastle-upon-Tyne, 95, 113
Northamptonshire, 73
Sheffield, 653
Tiverton, 879
Warwickshire, 236, 341
Wiltshire, 271, 286
Worcestershire, 879

Antrim Roads, 360
Appointments Vacant:—36, 90, 123, 151, 194, 224, 251, 282, 307, 339, 372, 406, 440, 480, 517, 553, 593, 624, 656, 690, 725, 763, 803, 850, 882, 911
Arbitration Clause, Effect of Recent Decisions upon the, 776, 809
Arbitration Clause, Suggested New Form of, 623
Architects, Officials as, 662, 668
Architects, Tendering by, 887
Architectural Competitions, 668
A Regal Scavenger, 147
Armagh, Road Maintenance in, 289
Artificial Surf Baths, 237
Artistic Treatment of Ferro-Concrete, 388
Asphalt, Macadam, 95, 108

Assistants' and Students' Section:—
Administration, 426
Bending Moments, 394
Books, 22, 301
Building Construction, 611, 749
Cantilever, 504
Cast-iron Stanchion, 464
Concrete Beam, 270
Conversion of Macadamised Road, 464
Deflection of Beams, 174
Design for Highway Bridge, 540
Design of Struts, 868
Floor Construction, 210
Foundations, 898
Hospitals, 75
Hydraulics, 644, 678, 788
Hydrostatics, 868
Leak in Drain Pipes, 142
Masonry Arch, 358
Mechanics, 116, 142, 611, 831
Notes on Reinforced Concrete, 174
Paving, 579
Refuse Disposal, 210
Road Making, 358, 394, 898
Roof Design, 142, 678
Sewage Disposal, 578
Street Gulley, 788
Strength of Materials, 710, 831
Strength of Shafting, 242
Surface Water Drainage, 425
Surveying, 22, 300, 644
Traverse Surveying, 328
Wood Paving, 242, 711

Association of Cleansing Superintendents, 137
Association of Consulting Engineers, 199, 219
Association of Kent Surveyors, 139, 439

Association of Managers of Sewage Disposal Works:—
Annual Dinner, 889
Annual Summer Meeting at Wolverhampton, 79
Barnsley Meeting, 514
London Meeting, 863
Salford Meeting, 348

Attacks on Surveyors, 2, 99
Australian Federal Capital, Laying out of, 184
A Well-earned Holiday, 397
Aylesbury, Municipal Work at, 280

B

Bacteria, 129, 134, 183
Baltimore's Municipal Motors, 655
Barnsley, Sewage Disposal at, 514
Barrow-in-Furness New Central Fire Station, 856
Bath Cattle Market, 789
Bath Council and the City Surveyor, 379
Baths, Artificial Surf, 237
Baths, Stourbridge, 52
Batley Incident, A, 3
Bayard Cars, 880
Beckenham, Street Corner Mirror at, 299
Belgrade, Wood Paving in, 562
Benz Cars, 642
Birmingham Municipal Undertakings, 496
Birmingham, Sewage Disposal at, 693
Birmingham, Some Notes on, 114
Birmingham Tramway Car Experiment, 385
Bituminous Materials, 257, 299, 612, 637, 694, 712, 747, 789, 833, 869, 899
Blackpool Cleansing Department, 213
Blackpool Sewer Outfall Extensions, 182, 207
Bolton Municipal Ice Making Plant, (4)
"Bonecourt" Surface Combustion System, 503
Bournemouth Street Lighting, 32
Brick Manufacture, Fletton, 86
Bricks from Clinker, 277
Bridge Construction, Reinforced Concrete and, 446
Bridges for Motor Vehicles, 862
Bridging the Mersey, 865
Bridlington and some of its Municipal Works and Undertakings, 4
Bridlington Waterworks, 44
Bristol, Municipal Engineering Work in, 220
British Association at Dundee, 377, 383, 384
British Fire Prevention Committee, (8), 719
British Practice in Sewage Disposal, 343, 353
Buenos Ayres, Large Reservoir for, 141
Building By-laws, Modernising of, 523, 536, 585
Building By-laws, Modification of Model, 258, 265
Building, L.C.C. School of, 395
Building Line Dispute, 855, 893
Building with 2in. Walls, Permanent, 752
Bushey, Herts, Contour Survey of, 772, 899
Buxton's Thermal Springs, 138
By-laws in Rural Districts, 258, 265

C

Calcutta Improvement Trust, 811, 839
Calendar Competition, 155
California, State Highway System for, 869
Call to Arms, 791
"Camarco" on the Bath Road, 709
Canada, Municipal Engineers in, 599
Canada, Municipal Work in, 84, 352
Cape Town Municipal Work, 604
"Carpeting" Principle in Road Construction, 426
Celluloid and Petrol Dangers, 424
Cement Lining for Steel Pipes, 829
Cesspool Emptying, 427, 867
Cheap Heat and Power, 503
Cheltenham, Geology of, 121
Chichester, Sanitary Administration at, 395
Chimneys, Down Draughts in, 675
Chiswick, New School at, 421
Chlorination of Water at Cleveland, Ohio, 389
Chlorine or Hypochlorites? 411, 438
Christmas Gift Problem, Solving the, 879
Civic Government by Commission, 108
Clarification of Sewage, 249
Clitheroe, Municipal Progress in, 171
Coal Washing Water, Pollution of Streams by, 209
Colonel Crompton and Calumny, 410
Colonel Crompton, Functions of, 558, 592
Combined Drainage: Metropolitan Committee's Proposals, 431
Commission, Government by, 486
Compulsory Open Windows, 69
Concrete and Moisture, 629
Concrete, Electrolysis of, 487, 502
Concrete Foundations for Roads and Streets, 630
Concrete in Road Construction, 149
Concrete Institute: Presidential Address, 694, 704
Concrete, Making of, 705
Concrete Paving: Expansion Joints, 8, 32
Concrete Under Water, Methods of Depositing, 28
Concrete Waterproof, 629, 640
Condition of Roads in Ireland, 259
Construction of Isolation Hospitals, 342, 349
Construction, Rapid Methods of, 597
Continental Municipal Engineers' Visit, 575, 614
Continental Visits, 792
Contour Survey of Bushey, Herts, 772, 899
Contractors' Retention Money, 199
Conversion of Old Sewers into New, 225
Copper Sulphate in Purifying Water Supplies, Use of, 30

Correspondence:—
Age Limits for Appointments, 356
Bacteria, 183
Bituminous Materials, 299, 612, 712, 747, 789, 833, 869, 899
Breaking Tests of Concrete Slabs for Road Bridge Floors, 245
Call to Arms, 791
Continental Visits, 792
Contour Survey of Bushey, Herts, 899
Crompton Pavement, 462, 505, 539, 577, 714
Essentials for a Garden City, 274
Facilities for Professional Education, 357
Fire Protection in London, 747, 790
Garden Cities and Town Planning, 357
Hinckley Waterworks, 133
Institute of Sanitary Engineers: Election of Council, 834, 870, 900
Institution of Municipal and County Engineers, 326
Institution of Municipal and County Engineers' Town Planning Competition, 713
Institutions of Municipal Engineers, 674
Intercepting Traps in House Drains, 356, 505, 712, 747, 791, 834, 870, 900

Correspondence (*continued*) :—
Is the Road Board a Failure? 420, 462
Manchester Appointment, 748, 791
Mixing Cement with "Bitumen," 612, 645, 675, 713
Modern Road Construction, 713
Molesworth's Formula for Masonry Dams, 183
Municipal Engineers and the Petrol Tax, 714
Non-Slipping Whinstone, 506, 539, 577, 612
Overtime in Municipal Engineers' Offices, 327
Private Street Works Act, 1892: Public Footpath with Added Strip, 675
Road Gritting, 613
Sewage Distribution at Ilkeston, 539, 613
Sewage Distributors, 20
Sewer Ventilation, 390, 462
"Southern England: Coast and Countryside," 576
Standardisation of Road Materials, 20
Steam Haulage, 834
Symon's Meteorological Magazine, 20
Thetford Proposed Workmen's Dwellings, 357
Town Planning: The Preliminary Survey, 420
Town Planning: Whose Work? 462, 538, 576, 612
Two Appointments, 613
United States Gallon, 357
What is a Garden City? 645, 674, 748, 792, 834
Work of Road Surveyors, 19
Correspondents Please Note, 752
Cost of Repaving Works, 775
Counsel's Opinion on Alleged Damage to Tarred Roads, 307
Country House Sewage Purification, 335
County Surveyors and Motor-cars, 887
Creosoted Wood Paving, 415, 461
Cromer, Refuse Destruction at, 288
Crompton Pavement, 462, 505, 539, 577, 714
Croydon and Motor Omnibuses, 211
Croydon, New Open Space at, 173
Crystal Palace Old Students' Society, 689
Crystal Palace School of Engineering, 173, 903

D

Dangerous Tramway Poles, 95
Darra Mair, Death of Dr. L. W., 672
Deep Excavations, Dangers of, 73
Delhi, 175
Derwent Valley Water Dispute, 653
Derwent Waterworks, Completion of, 269
Design of Masonry Dams, 93, 100, 632
Developing and Conserving Water Supply for Municipal and Domestic Purposes, 695, 721
Development of Swansea, 314
Devon Appointment, 858
Disinfectants, Antiseptics, and Deodorants, 33
Dissemination of Weather Forecasts, 141
Diss New Water Supply, 359
District Surveyors' Fees, 881, 887
Donegal Appointment, A, 734
Drainage and Foundations, Road, 887, 907
Drain Blocked by Tree Roots, 347
Dumfries, Sanitary Progress in, 3
Dundee's New Central Reading Rooms, (5)
Dungarvan Council and its Surveyor, 378
Dusseldorf City Planning Exhibition, 437, 461

E

Eachus, The late Mr. Eedes, 543
East Cowes, Reinforced Concrete Reservoir at, (8)
Education, Facilities for Professional, 357, 390
Education of Highway Engineers, 558, 560
Effect of Intercepting Traps in House Drainage, 826
Effect of Recent Decisions upon the Abitration Clause, 776, 809
Effect of Sunlight on Bacteria, 135
Electricity from Refuse, 360
Electric Traction in Scotland, 133
Electrolysis of Concrete, 487, 502
Electrolytic Disinfectant, 286
Enforcing Building By-laws at Doncaster, 243
Engineer and the Community, 384
Engineer as Arbitrator, 776, 809
Engineering, Philosophy of, 377, 384
Engineers, Training of, 855
English Bridge, Shrewsbury, 839
Essex Field Club, 132
Essex, The Housing Problem in, 392
Essex, Water Supply in, 392
European Countries, Road Materials in Some, 600
Exmouth's New Waterworks, 205
Expenses of Road Congress Delegates: L.G.B. Statement, 36
Experiments on the Weathering of Portland Stone, 380
Extraordinary Traffic, 2

F

Facilities for Professional Education, 357, 390
Factors Affecting Cost of Road Maintenance, 198, 208, 225
Ferro-Concrete, Artistic Treatment of, 388
Ferro-Concrete Sludge Pumping-Pontoon, 269
Filing Plans, 487
Fire Protection in London, 747, 790
Fire Station at Barrow-in-Furness, New Central, 856
Fleet Sewerage Scheme, 85
Fletton Brick Manufacture, 86
Flood Havoc in Norfolk, 327
France, Dust Prevention in, 122
French Road System, 886, 895
Functions of Colonel Crompton, 558, 592

G

Gas and Water Mains, Removal of, 446
Gas Liquor, Pollution of Streams by, 199, 201
Gasworks, Stourbridge, 87
Germany, Tar and Cement Pavements in, 415
Godalming, Municipal Work, at 635
Gold Coast, Water Supply on the, 359
Good Roads Movement in Canada, 352
Government by Commission, 486
Grays, Municipal Works of, 416
Grimsby Borough Engineer and the Intercepting Trap, 397
Group Names of Rocks, 770
Guildford's Old Cottages, 173
Gyratory Traffic Regulations, 43

H

Hackney Branch Libraries, (8)
Heavy Motor Traffic: Hornsey Test Case, 552, 801
Hemlocks Dam, 620
Henley Wiring System, 848
Hereford New Secondary School, 429
Herefordshire Roads, 197, 200, 225
Highway Bridge, Design for a, 540
Highway Bridges and Culverts, 379, 386
Highway Engineering Education, 558, 560
Hinckley Waterworks, 133
Horbury Sewage Works, 360
Horse Shoes and the Road Crust, 597
Hours of Roadmen, 32

Housing and Town Planning :—
Address by Lord Crewe, 211
America, 155
Birmingham, 213
Birmingham Scheme, 608
Blunders of the Past, (7)
Calcutta, 811, 839
Doncaster, 735, 750
Dusseldorf City Planning Exhibition, 437, 461

Housing and Town Planning (*continued*) :—
Essentials of a Garden City, 274, 314
Essex, 392
Finchley, 758
Garden Cities and Town Planning, 357
Hale Competition, 602
Housing Arbitrations: Local Government Board Order, 352
Huddersfield, 33
Influence of Town Planning upon the Public Health, 547, 588
Insanitary Rural Cottages, 663
Institution of Municipal and County Engineers Competition, 703, 713
Ireland, 635, 663
Laying Out of New Towns and Cities, 184
Liverpool, 21
Modern Town Planning, (7)
Mr. John Burns and Housing, 199
Municipal Engineers and Town Planning, 19
Necessity of Preliminary Surveys, 383, 420
New Type of Dwelling, 785
Paris, 69
Prestwich Scheme, 427
Progress in Town Planning, 227, 228, (6)
Questions in Parliament, 761
Rural Housing, 599, 601, 770, 774
St. Paul's, 846
Scotland, (8)
Scottish L.G.B. Memorandum, 647
Seaham Harbour, 897
Self-contained Cottages *v.* Block Dwellings, 268, 315
Sheffield, 190
South Fife Development, (6)
South Yorkshire Coalfield, 735, 750
Spalding Scheme, 655
Stafford, 782
Stafford Corporation and the Housing Act, 446
Summer School of Town Planning, 133, 831
Thetford Workmen's Dwellings, 294, 357
Tiverton, 663
Town Planning and the Municipal Engineer, 447
Town Planning from an Engineering Aspect, 486, 488
Town Planning Schemes, 277, 717
Town Planning: Whose Work? 462, 538, 576, 612
Uruguay, 748
What is a Garden City? 645, 674, 748, 792, 834
Working Class Housing, 787, 878
Workmen's Cottages, 437, 455, 647, 787
Yeovil, 774
Huddersfield Town Planning, 33

I

Ice Making Plant at Bolton, New Municipal, (4)
Ilkeston Sewage Disposal Works, 448
Ilkeston Tramways and Electricity Supply, 477
Ilkeston Water Supply, 474
Improvements in Sanitation, 160
Indian Students and Municipal Engineering, 217, 287
India, Survey of, 735, 746
Influence of Town Planning upon the Public Health, 547, 588
Insects and Disease, 259, 279
Instalment Payments for Road Construction, 402

Institute of Sanitary Engineers:—
Birmingham Meeting, 114
Election of Officers, 834, 896, 900
London Meeting, 700
New President, 886
Institution of Civil Engineers, 175, 505, 636

Institution of Municipal and County Engineers:—
Advertisement Hoardings, 885, 897
Annual Dinner, 104
Annual Meeting (London and Aylesbury), 41, 58, 95, 96, 134, 184, 202, 233, 260, 289, 323
Annual Report, 58, 96
A Retrospect, 42, 68
Bridlington Meeting, 4, 44

Institution of Municipal and County Engineers *(continued)* :—
Circular to Surveyors, 703
Council Meetings, 123, 404, 605, 875
District Committees, 64, 131, 323, 326
East Midland District, 703
Examinations, 65
Grays Meeting, 410, 416
Ilkeston Meeting, 471, 511
London Meeting, 814
Metropolitan District Meeting, 751, 876
North-Eastern District, 876
Orphan Fund, 41, 66
Presidential Address of Mr. R. J. Thomas, 64
South Eastern District, 624, 824
Stourbridge Meeting, 50
Town Planning Competition, 703, 713
West Midland District, 775, 823
Wrexham Meeting, 564, 620

Institution of Municipal Engineers:—
Annual District Meetings, 251
Annual Meeting in London, 523, 524, 585
Annual Report and Balance Sheet, 525
Council Meetings, 35, 193, 439, 656, 802, 894
Election of Council, 531
Godmanchester Meeting, 590
Joint Eastern and North-Eastern District Meeting, 86
Joint Southern and South-Eastern District Meeting, 776
Joint Western and South-Western District Meeting, 877
Joint Yorkshire and Northern District Meeting, 591
Keswick Meeting, 106
Mutual Defence Fund, 843, 877
Northern District Meeting, 460
North-Western District Meetings, 160, 479, 762, 846
Presentation, 525
Presidential Address of Mr. Frank Latham, 527
Southern District, 878

Institution of Water Engineers :—
Cheltenham Meeting, 29, 121
London Meeting, 859, 889
Visit to Cardiff Reservoir Works, 431
Water Regulations Committee's Report, 121
Intercepting Traps in House Drains, 313, 316, 356, 390, 397, 505, 522, 533, 586, 661, 669, 693, 696, 712, 736, 741, 747, 826, 834, 870, 900
Interlocking Reinforced Slabs and Piles, 149
International Testing Association, 486
Irish and Scottish Roads, 287, 292
Isis Portland Cement Works, 169
Isolation Hospitals, Construction of, 342, 349
Is the Road Board a Failure? 389, 420, 463

J

"Jerry" Building, Surveyors and, 383
Johannesburg, A Year's Work in, 287, 301
Johannesburg, Public Health in, 259, 264
Jones, Retirement of Colonel, 771
Junior Institution of Engineers, 123

K

Keswick and its Municipal Undertakings, 106
Krugersdorp, Municipal Work in, 138

L

Lady and the Lamp, 269
Land v. Artificial Sewage Treatment, 162
Lavatories, Bridlington, 11

Law Notes:—
Contract with Local Authority: Absence of Seal.—*Hource* v. *Kingsbury Urban District Council*, 212.
Drainage Works: Obstruction of Access to Shop: Claim for Compensation: Public Health Act, 1875, sec. 308.—*Lingke* v. *Christchurch Corporation*, 362
Highway: Dedication: Right of Access. *Tottenham Urban District Council* v. *Rowley*, 839

Law Queries:—
Alterations of Area: Main Roads, 429
Alterations to Buildings, 429
Auctions on Private Land, 646
Breaking up Streets: Restoration, 77
By-Laws: Air Space, 177, 391
By-Laws: Air Space: Paving, 143
By-Laws: Cesspool, 901
By-Laws: Exemption: Height of Rooms, 574
By-Laws: New Street, 362
By-Laws: Opening in External Wall, 676
By-Laws: Picture Theatre, 574
By-Laws: School Premises: Plans Approved by Board of Education, 143
By-Laws: Thickness of Walls: "Topmost Story," 213
Cesspool Construction, 575
Combined Drain, 676, 901
Combined Drainage, 362, 428
Connections to New Sewers: Cellar Under Street, 575
Conversion of Workshop into a Cinematograph Exhibition, 901
Extension of Cesspool, 143
Extraordinary Traffic, 428
Highway Repair: Damage to Water Main, 574
Highway: Tunnelling under Carriageway, 429
Highway Walls, 428
House Drainage, 830
Housing and Town Planning Act, 1909: Inspection of District, 901
Housing and Town Planning Act, 1909: Section 17, sub-sec. (1), 77
Housing and Town Planning, &c., Act, 1909, 76, 77
Injury to Gas and Water Mains, 77
Laying-out a New Street, 176, 392
Lighting of Private Streets in Rural Districts, 391
National Insurance Act, 1911, 143
National Insurance Act, 1911: Unemployment, 77
New Street, 575
Paving of Yards, 77, 392
Private Street Works, 574, 830
Private Street Works Act, 1892: Objections to Final Apportionments: Disputed Ownership, 646
Private Street Works Act, 1892: "Owner," 77
Private Street Works Act, 1892: The Benefit Principle, 212
Private Street Works: Encroachments on Highway: Laying-out a New Street, 391
Private Street Works: Re-sewering, 429
Private Street Works: Sewer, 77
Private Street Works: Work Already Done by Owners: Apportionment, 176
Public Health (Buildings in Streets) Act, 1888, 76, 831, 901
Rain Water from Roof, 753
Rain Water Pipes, 575, 831
Refuse Removal: "House Refuse," 676
Right of Way, 362
Roadside Waste, 76
Rural District Surveyor: Extra Remuneration: Percentage, 143
Sewage Disposal Works: Flooding of Sludge Pits, 753
Street Obstructions, 76
Street Widening, 831
Surface-water Drains, 753
Surface-water Sewer: Powers of Local Authority, 76
Surveyor to Urban District Council: Duties: "Whole Time:" Private Street Works, 212
Telegraph Poles on Highways, 362
Town Planning, 676
Traction Engine, 676
Urban District Councillor: Resignation, 676
Water Rate, 428
Water Stand Post, 575
Water Supply, 76, 753
Water Supply: "Proper Supply," 830
Water Supply: Service Pipes, 753
Law, Sanitary Progress and the, 155
Laying out of New Towns and Cities, 184
Leadgate Surveyor, An Attack on the, 2
Leeds, Sewage Disposal at, 281
Leeds, Street Lighting in, 796
Leigh-on-Sea, New Council Offices and Fire Station, (1)
Lewes, Sewerage and Sewage Disposal at, 500
Light and Power from Lignite, 887
"Lightning" File, 909
Lithofalt Block Paving, 758
Llanelly, Lawn Tennis Courts at, 573
Loan Indebtedness, Reduction of, 673
Loans, Local Government Board Inspector on, 686
Loan without Sanction, 379
Local Authorities and Motor-bus Traffic, 436
Local Government Board and Isolation Hospitals, 342, 349
Local Government Board and Proposed Municipal Golf Course, 69
Local Government Board and Reinforced Concrete, (7)
Local Government Board and West Hartlepool, 557
Local Government Board Auditor and Repaving Works, 775

Local Government Board Inquiries:—
Abersychan, 23; Alfreton, 23, 214, 273; Ashby Woulds, 715; Ashton-in-Makerfield, 177; Bacup, 430; Balby, 70; Balderton, 396; Ballymoney, 144; Barnard Castle, 244; Barrow, 144; Basford, 715; Bath, 302, 679; Batley, 506; Belfast, 579, 615; Bentley, 396; Berwick, 579; Bettws-y-Coed, 330; Bexhill, 214; Birkenhead, 302; Birmingham, 506, 792; Blackburn, 792; Blyth, 430; Boston, 273; Bourne, 430; Bournemouth, 177; Bradford, 363, 902; Bray, 70; Bridlington, 273, 542; Bristol, 430; Burgess Hill, 579; Brynmawr, 396; Cambridge, 244; Cambridgeshire, 273; Cannock, 363; Cardiff, 615, 872; Chadderton, 679; Chatham, 430; Chelmsford, 70, 466; Cheltenham, 330; Chester-le-Street, 542, 615; Chorley, 177; Cleckheaton, 754; Clones, 177; Colchester, 273; Colne, 430, 902; Coventry, 302, 396, 506; Crediton, 23; Croydon, 302; Dawlish, 23; Derby, 506; Desborough, 872; Devonport, 792; Dewsbury, 506, 902; Doncaster, 302, 579, 615; Downpatrick, 902; Driffield, 615; Dublin, 754, 872; Dudley, 542; East and West Molesey, 244; East Grinstead, 792; East Ham, 835, 902; East Riding, 244; Exeter, 177; Exmouth, 648; Falmouth, 23; Featherstone, 177; Feltham, 330; Forehoe, 542; Friern Barnet, 872; Frinton, 466; Fylde Water Board, 273; Godalming, 214; Goole, 679; Gosport, 430; Guildford, 396; Harrogate, 430, 902; Hastings, 330; Hay, 430; Hazel Grove, 715; Headington, 330; Hertfordshire, 615; Hornsey, 542; Harwich, 615; Huddersfield, 117; Hull, 466; Hyde, 615; Ilford, 178; Ilkeston, 615; Ipswich, 178; Keighley, 615; Kenilworth, 144; Kingstown, 302; Kirbymoorside, 615; Kirkby-in-Ashfield, 23; Leeds, 23; Leek, 330; Lees, 615; Leiston, 902; Leyton, 466; Littleborough, 902; Ludlow, 178; Lytham, 679; Maesteg, 615; Maldens and Coombe, 507, 615; Mallow, 363; Manchester, 330, 648; Mansfield, 244; Merthyr, 902; Mexborough and Swinton Gas Board, 507; Mid-Lothian, 872; Morley, 679; Neath, 543; Newark, 396; New Forest, 466; Newport (Mon.), 396; Newquay, 715; Newtownards, 580; North Bromsgrove, 872; Nottingham, 396, 792; Oakengates, 679; Ossett, 715; Paignton, 144; Pembroke (co. Dublin), 792, 902; Penistone, 715; Penzance, 23; Petersfield, 244; Plymouth, 117; Plympton, 615; Pontefract, 715; Poole, 872; Portslade, 903; Portsmouth, 648, 902; Preston, 903; Prudhoe, 648; Ramsbottom, 649; Ramsgate, 144, 580; Rawtenstall, 23; Repton, 273; Rhyl, 144; Rhymney, 178; Rochdale, 543; Rotherham, 178, 715; Runcorn, 835; Saddleworth, 273; St. Anne's-on-the-Sea, 754; St. Helens, 214; St Ives, 214; Salford, 363; Saltburn, 543; Sandgate, 835; Scarborough, 178; Scarborough and Scalby, 715; Shanklin, 144; Sheffield, 23, 580; Shoreham, 214; Shrewsbury, 363; Smethwick, 430; Somerset, Axbridge,

Local Government Board Inquiries *(continued)*:—
and Weston-super-Mare, 793; Southampton, 70; Southgate, 679; Southport, 330, 649; South Shields, 23; Southwick, 793; Stalybridge, 430; Stamford, 466; Stockport, 302, 649, 835; Stoke-on-Trent, 649, 715; Stone, 363; Stourport, 903; Strabane, 396; Stretford, 396; Sunderland, 23, 178; Sutton-in-Ashfield, 793; Swansea, 446; Tiverton, 396; Totnes, 680; Tottenham, 23; Twickenham, 615; Uckfield, 754; Ulverston, 649; Wallsend, 616; Walton-le-Dale, 872; Warrington, 273; Waterloo-with-Seaforth, 70; Wednesbury, 117, 431; Wellingborough, 649; West Ham, 303; Westhoughton, 835; West Ward, 872; Whitby, 580; Wimbledon, 903; Wincanton, 616; Winchester, 24; Wirral, 903; Wokingham, 616; Woolwich, 616; Worcester, 903; Yeovil, 466; Yiewsley, 466; York, 431, 793; Youghal, 754
London Basin, Alkaline Waters of the, 130, 132
London County Council—A New Enterprise! 411
London County Council Engineership, 573, 598, 639
London County Council Finances, 242
London County Council School of Building, 395
London Improvement, Proposed, 258
London, New Court House for, 115
London School Building Scheme, 34
London Tramways, 175
London Water Supply: Dr. Houston's Annual Report, 769
Lord Crewe on Town Planning, 211
Lower Thames Valley District Surveyors' Association, 538, 655, 829
Lye Building Line Dispute, 855, 893

M

Madras Municipal Engineership, 782
Madras Streets, Terrors of the, 359
Madras Water Supply, 226, 228, 315
Maintenance Clause, The, 811
Manchester and its Refuse "Tips," 343
Manchester Appointment, 487, 512, 748, 791
Manchester, Cleansing Work in, 137, 532
Manchester, Sewage Disposal at, 427
Manchester Sewerage, 759, 785
Marylebone: Medical Officer's Report, 2
Masonry Dams, Design and Construction of, 93, 100, 632
Mechanical Haulage, 735, 745
Meetings, 39, 93, 127, 254, 312, 376, 443, 483, 520, 556, 596, 627, 659, 728, 766, 805, 884
Meldrum Bros., Ltd., 613
Mersey and Irwell Joint Committee's Annual Report, 198, 223
Mersey, Bridging the, 855
Metal Lathing for Plaster Work, 16
Methods of Differentiating Soils for Sewage Purification, 93, 109
Mid-Lothian Roads, 367

Minutes of Proceedings:
A Batley Accident, 3
Accommodation Subways, 599
A Critic on Municipal Trading, 447
A Dangerous Turning and an Important Improvement, 94
A Donegal Appointment, 734
Aerial Nuisance from Sewage Works, 43
Age Limits for Appointments, 314
Alkaline Waters of the London Basin, 130
A Loan Without Sanction, 379
A Marylebone Report, 2
American Opinions on Road Foundations and Drainage, 887
An Anomaly, 155
An Interesting Calendar Competition, 155
Asphalt Macadam, 95
A Thin Carpet Layer of Bitumen and Sand, 94
Attack on the Leadgate Surveyor, 2
A Year's Work in Johannesburg, 287
Bacteria, 129
Bath Council and the City Surveyor, 379
Berlin Congress, 154
Birmingham Sewage Disposal, 636
Bituminous Road Materials in the United States, 694
British Practice in Sewage Disposal, 343
Building Line Dispute, 855
By-laws in Rural Districts, 258
Capital Expenditure and Road Maintenance, 769
Chlorine Method of Water Sterilisation, 854
Chlorine or Hypochlorites, 441
Cleaning of Water Mains, 485
Colonel Crompton and Calumny, 410
Colonel Jones's Retirement, 771
Concrete and Moisture, 629
Concrete Foundations for Roads and Streets, 630
Concrete Institute, 559, 694
Concrete Paving: Expansion Joints, 3
Condition of Roads in Ireland, 259
Consulting Engineers, 199
Contractors' Retention Money, 199
Control of Advertisements, 885
Conversion of Old Sewers into New, 225
Cornish Roads: Important Proposals, 734
County Surveyors and Motor Cars, 887
Dangerous Tramway Poles, 95
Design and Masonry Dams, 93
Development of Swansea, 314
District Surveyors' Fees, 187
Drainage of Isolation Hospitals, 342
Dungarvan Council and its Surveyor, 378
"Dwellings" or Homes, 315
Education of Highway Engineers, 558
Electrolysis of Concrete, 487
Electrolytic Disinfectant, 286
Engineer as Arbitrator, 809
Engineers and Town Planning, 486
Ex-Pupils and Assistants Advertisements, 855
Extraordinary Traffic, 2
Factors Affecting Cost of Road Maintenance, 198
Fair Play? 735
Filing Plans, 487
Functions of Colonel Crompton, 558
Garden Cities and Garden Suburbs 314
Government by Commission, 486
Grays, 410
Group Names of Rocks: Their Significance in Highway Work, 770
Gyratory Traffic Regulations, 43
Herefordshire Roads, 197
Horse Shoes and the Road Crust, 597
Housing and By-laws, 227
Housing in Ireland, 663
Importance of Culverts and Small Highway Bridges, 379
Indian Students, 287
Insanitary Rural Cottages, 663
Insects and Disease, 259
Institution of Civil Engineers, 631
Institution of Municipal and County Engineers, 41, 94, 131, 378, 695, 855
Institution of Municipal Engineers, 523
Institute of Sanitary Engineers, 886
Intercepting Traps in House Drains, 313, 522, 661, 693
International Road Congress Traders' Committee, 811
International Testing Association, 487
Irish and Scottish Roads, 287
Local Government Board and Isolation Hospitals, 342
Local Government Board and West Hartlepool, 557
L.C.C.—A New Enterprise! 411
London County Council Engineership, 598
London Water: Dr. Houston's Report, 769
Madras Water Supply, 226, 315
Maintenance Clause, 811
Manchester and its Refuse "Tips," 343
Manchester Appointment, 487, 663
Mersey and Irwell Joint Committee's Report, 198
Methods of Differentiating Soils for Sewage Purification, 93
Modernising Building By-Laws, 523
Money Wasted on the Roads: Who is to Blame? 661
Motor 'Buses and Road Maintenance, 411, 522
Motor v. Team Haulage, 735
Mr. John Burns and Housing, 199
Municipal Engineers in Canada, 599
Municipal Waterworks Association, 598
Municipal Work at Alton, 599
Newcastle City Engineer's Report, 95
Newport Pagnell: A Report, 811
New York Sewage Disposal, 1, 557
Notes from Recent Annual Reports, 341
Officials as Architects, 662
Ottawa River Survey, 286
Overtime, 315
Percolating Filters, 598
Persecution: The Cause, 411
Philosophy of Engineering, 377
Pitting of Steel Pipes, 854
Points from Road Board's Report, 285
Pollution of Streams, 199
Prevention of Smoke, 154
Proposed London Improvements, 258
Protection of Roads from Drifting Sand, 315
Public Health Congresses, 131
Public Health in Johannesburg, 259
Public Health of Staffordshire, 810
Quantity Surveyors and Reinforced Concrete, 771
Rapid Methods of Construction, 597
Reinforced Concrete and Bridge Construction, 446
Reinforced Concrete Tests, 771
Removal of Gas and Water Mains, 446
Rivers Pollution, 734
Road Board and the Metropolis, 810
Road Crust as an Arch, 130
Road Reform, 225
Royal Commission on Sewage Disposal; Eighth Report, 733
Royal Commission on Sewage Disposal, 885
R.I.B.A. Registration and Education, 631
Rubber and Leather as Measuring the Value of a Road-crust, 409
Rural and Urban Housing, 770
Rural Housing, 599
Sanitary Progress and the Law, 155
Sanitary Progress in Dumfries, 3
Sanitation at Oakengates, 559
Sanitation in Small Urban Districts, 227
Seizing the Opportunity, 410
Sewage Disposal at the Sanitary Congress, 153
Sewage Disposal by Oxidation Methods, 485
Sewage Disposal in South Africa, 558
Sewage Disposal in the United States, 445
Sewerage of Sydney, 663
Sludge Disposal, 771
Some Aspects of the French Highway System, 886
Specifications for Carriageways, 257
Stafford Corporation and the Housing Act, 446
Staffordshire Roads, 42
Standardisation, 197
State Highway System for California, 809
Sterilisation of Sewage Effluents, 411
Sterilisation of Water by Chlorine Gas, 378
Sub-Street Pipe Lines, 886
Superannuation, 447, 523
Survey of India, 735
Surveyors and their Roads, 1
Surveyors' Institution, 663
Tanks—and Other Matters, 853
Tarred Roads and the Weather, 341
Tendering by Architects, 887
The Motor 'Bus, 695
"The Surveyor" Special Issues, 631
Tiverton Road Surveyor's "Reprimand," 131
Town Planning and the Municipal Engineer, 447
Town Planning Competition, 695
Town Planning in America, 155
Town Planning in Calcutta, 811
Town Planning in the South Yorkshire Coalfields, 735
Town Planning Progress, 227
Traction Engines v. Roads, 3
Traders and the Road Congress and Exhibition, 631
Training of Engineers, 855
Training of Sanitary Engineers, 630
Treatment of Soft Wood Paving Blocks, 559
True Co-operation: the Penzance Policy, 523
Ultra-Violet Rays, 313
Utilisation of Road Sweepings, 154
Ventilation of Sewers, 409
Waste of Water, 95
Waterproof Concrete, 629
Water Purification, 42
Water Supply in the United States, 695
Why Tar Particularly? 662

Minutes of Proceedings *(continued)*:
Wiltshire Roads, 257, 286
Wrexham Meeting, 559
Yeadon's Municipal Bazaar, 259
Modernising of Building By-laws, 523, 536, 585
Modern Road, The, 383
Modern Survey Work, 723
Modern Traffic Conditions, 236
Modification of Model Building By-laws, 258, 265
Money Wasted on the Roads, 661
Motor 'Bus *v.* Tramcars, 467
Motor Cars, County Surveyors and, 887
Motor Cars for Fire Brigade Superintendents, 147
Motor Fire Engine for Norwich, 78
Motors, Self-Starters for, 849
Motor Traffic, Growth of, 20
Motor Vacuum Street Cleaner, 866
Motor Vehicles, Special Bridges for, 862
Motor *v.* Team Haulage, 735, 745
Motor Wagons for Johannesburg, 148
Motor Weighbridge, 750
Municipal Competitions Open, 36, 90, 124, 151, 194, 224, 252, 283, 308, 339, 373, 406, 440, 481, 517, 553, 593, 624, 657, 691, 726, 763, 803, 850, 882, 911
Municipal Contracts Open, 36, 90, 124, 151, 194, 224, 252, 283, 308, 339, 373, 407, 441, 481, 518, 554, 594, 625, 657, 691, 726, 763, 803, 850, 882, 912
Muncipal Engineering, Architecture and Town Planning, 150
Municipal Engineering, Indian Students and, 217
Municipal Engineers and Petrol-tax, 714
Municipal Engineers and Town Planning, 19
Municipal Engineers' Duties, 66, 161
Municipal Engineers in Canada, 599
Municipal Golf-course, L.G.B. and Proposed, 69
Municipal Ice Making Plant at Bolton, (4)
Municipal Progress in Clitheroe, 171
Municipal Services, Cost of, 711
Municipal Trading, A Critic on, 447
Municipal Tramways Association: Annual Conference, 424
Municipal Waterworks Association: First Annual Meeting, 598, 603
Municipal Work in Canada, 84, 352
Municipal Work in Krugersdorp, 138

Municipal Work in Progress and Projected:—
Administration:—
Bishops Stortford, 25; Bradford, 617; Camberley, 275; Derby, 468; Gwyrfai, 248; Hackney, 118; Kent, 332; Lakeard, 332; Maldens and Coombe, 118; Mytholmroyd, 332; Oldham, 836; Pressall, 364; Tutbury, 468; Watford, 118; Whitby, 304.

Buildings:—
Abercarn, 364; Aberdeen, 179, 836; Airdrie, 578; Aldershot, 468; Altrincham, 544; Ammanford, 145; Anglesey, 581; Antrim, 118; Arbroath, 275, 873; Ardrossan, 581; Ardsley, 681; Ashton-under-Lyne, 364; Auckland, 794; Ayr, 398, 581; Bacup, 246; Banffshire, 468; Bangor, 617; Barnsley, 364, 432, 873, 836; Barnstaple, 650; Barrow, 650; Barry, 544; Basingstoke, 581; Bath, 617; Belfast, 179, 364, 398, 508, 873; Beverley, 71; Bexhill, 873; Birmingham, 71, 145, 215, 432, 755; Bishop Auckland, 398; Bishop Stortford, 544; Blackburn, 246; Blackpool, 398, 432, 794, 717; Blandford, 332; Blyth, 179, 398; Bolsover, 398; Bolton, 508; Boston, 179, 544; Bourne, 346, 364; Bournemouth, 544; Bradford, 145, 544, 581, 836; Braintree, 794; Brighouse, 204, 650; Broadstairs, 145; Bristol, 179, 398; Brixham, 118, 544; Bromley, 717; Bucks, 794; Builth Wells, 364, 836; Burgess Hill, 215; Campbeltown, 581; Camberwell, 145; Cambridge, 544, 794; Cambs, 145; Cardiff, 215, 364, 432, 468, 508, 544, 617, 750; Carlton, 617; Chelmsford, 215, 246, 304, 508, 650; Chelsea, 215; Cheltenham, 215; Chesham, 246; Cheshire, 508, 750; Chester, 468; Chester-le-Street, 432; Clacton-on-Sea, 650; Cleethorpes, 508; Clevedon, 581; Coalville, 544, 681; Congleton, 332; Cork, 179; Cornwall, 275, 304, 717; Coventry, 25, 71, 432, 508; Cromer, 581; Croydon, 650; Carnoustie, 836; Dartford, 246; Dartmouth, 717; Darwen, 617; Daventry, 304; Deal, 650; Denbigh, 468; Deptford, 617; Derbyshire, 581; Devon, 468, 873; Devonport, 145, 179, 873; Diss, 508; Dorking, 432; Dorset, 617; Downham, 432; Dumbarton, 275, 398; Dumbartonshire, 25, 71; Dundee, 71, 581; Durham, 179, 364, 650, 681, 717; Easington, 544; East Cowes, 681; East Grinstead, 145; East Ham, 508; East Molesey, 681; East Riding, 179, 246, 617; East Suffolk, 179; Edinburgh, 432, 503, 794; Ellesmere, 650; Ellesmere Port, 544; Erith, 468; Erpingham, 364; Essex, 71, 179, 364, 794; Failsworth, 275; Festiniog, 617; Finchley, 468; Flintshire, 508; Folkestone, 544; Frome, 71; Gainsborough, 332; Glamorganshire, 836; Glasgow, 25, 315, 617, 873; Glossop, 25; Goole, 332, 717; Greenock, 71, 145; Greenwich, 145; Grimsby, 432, 873; Hackney, 25, 508; Haddingtonshire, 246; Halstead, 398; Hamilton, 394; Hampton, 544; Harrogate, 544, 794; Hartlepool, 246; Hatfield, 332; Helensburgh, 508; Helston, 215; Hendon, 71; Hereford, 246, 398; Herne Bay, 364; Holland, 145; Holywell, 398; Horncastle, 275; Hornsea, 836; Houghton, 275; Hove, 246; Hungerford, 398; Hunstanton, 873; Ilford, 71, 581; Ilkeston, 794; Ipswich, 508; Johnstone, 750; Keighley, 145, 332, 617; Kingston, 432; Kingstown, 275; Kirby Moorside, 25; Kirkcaldy, 398; Kirkham, 68; Lambeth, 836; Lanarkshire, 873; Lancashire, 680; Lancaster, 544; Leeds, 179; Leek, 118; Leyton, 179; Lichfield, 71; Lincoln, 873; Lindsey, 68, 246; Littlehampton, 275, 836; Liverpool, 25; Llandrindod Wells, 179; Llandudno, 750; Llandyssul, 118; Llanelly, 873; Londonderry, 304; Lostwithiel, 118; Louth, 275, 364, 544; Lowestoft, 681; Ludlow, 332; Lurgan, 71, 681; Luton, 179, 468; Lymm, 650; Lynn, 544, 717; Machynlleth, 275, 904; Maldens and Coombe, 118, 398, 873; Mallow, 398; Marylebone, 904; Masham, 215; Matlock, 617; Middlesex, 650, 794, 836; Mold, 544; Monaghan, 544; Monmouthshire, 118; Montrose, 145, 794; Motherwell, 836; Newcastle-upon-Tyne, 118, 508, 581, 755; Newhaven, 680; Newport, 304, 364, 904; Newton Abbot, 468; Newton-in-Makerfield, 581; Norfolk, 508; Northallerton, 246; Northampton, 246, 650; Northwich, 364, 873; Norwich, 145, 332, 717; Notts, 215, 650; Nuneaton, 179; Oldham, 275; Paddington, 398, 617; Penistone, 145; Penzance, 544; Peterhead, 717; Plymouth, 468, 617; Pontefract, 246, 275, 650; Poole, 71, 364; Ramsgate, 873; Rathdown, 836; Renfrewshire, 904; Retford, 304; Rhyl, 332, 364, 750; Rochdale, 544; Rochester, 508; Rotherham, 650; Rowley, 717; Roxburgh, 617; St. Helens, 398; St. Pancras, 215; Salford, 246; Sandwich, 717; Scarborough, 246, 468; Selby, 25; Sheffield, 398, 650; Shrewsbury, 755; Southampton, 836; Southport, 246; South Shields, 544; Spalding, 25, 71; Staffordshire, 71, 544, 755; Stockport, 246; Sunderland, 275, 717; Surrey, 717; Sutton Coldfield, 544; Sutton-in-Ashfield, 873; Swansea, 755; Teignmouth, 364; Thingoe, 275; Thornaby-on-Tees, 398; Torquay, 544, 398, 794; Truro, 508; Uckfield, 836; Uxbridge, 836; Wallasey, 118, 145, 246; Wandsworth, 25, 145, 215, 432; Warrington, 275, 617; Wednesbury, 215; Wellingborough, 681; Wellington, 398; West Hartlepool, 275, 836; Weston-super-Mare, 873; West Riding, 179, 544; Weymouth, 836; Whitby, 432; Whitley and Monkseaton, 275; Willesden, 246; Wilts, 794; Winchester, 118; Wolverhampton, 215; Woolwich, 71; Wood Green, 398, 544, 717; Worcester, 432, 508; Wycombe, 581; Yarmouth, 118, 275, 544

Housing and Town Planning:—
Aberystwyth, 794; Acton, 794; Altrincham, 364; Ampthill, 794; Ashbourne, 717; Atherstone, 873; Banbury, 717; Barrow, 650; Battle, 448, 717; Billericay, 617; Birkenhead, 794; Birmingham, 179; Blackburn, 364;

Municipal Work in Progress and Projected *(continued)*:—
Housing and Town Planning *(continued)*:
Blaydon-on-Tyne, 398; Bognor, 246; Boston, 332, 617; Bourne, 275; Bradford, 145, 617; Branston, 468; Bridlington, 118, 145; Buckfastleigh, 794; Bungay, 836; Burnley, 145, 468; Caister, 904; Cambridge, 717, 794; Carnarvon, 755, 794; Chelmsford, 25, 332, 681; Chester, 404; Chesterfield, 304; Chester-le-Street, 717; Clitheroe, 904; Coleraine, 717; Coventry, 755; Criccieth, 681; Cardiff, 215; Denbigh, 904; Doncaster, 304; Dublin, 275; Dumfries, 717; Dundee, 755; Eastry, 246; Edinburgh, 179, 794; Ellesmere Port, 304, 581; Evesham, 398; Falmouth, 364, 717, 904; Farnham, 836; Fife, 246; Forehoe, 246; Glasgow, 275, 717, 755; Gosport, 432; Greenock, 398; Gwyrfai, 904; Hailsham, 755; Harrow, 794; Hemel Hempstead, 755; Hendon, 836; Honiton, 681, 755; Hyde, 581; Leeds, 650; Liverpool, 468; Llanelly, 581; Leek, 364; Lyme Regis, 275; Lurgan, 145, 364; Manchester, 508; Merthyr, 275; Merthyr Tydfil, 755; Merton, 71; Midhurst, 755; Milngavie, 873; Mitford and Launditch, 508; Moira, 581; Morpeth, 275, 364, 398; Nantyglo and Blaina, 304; Neath, 544; Newcastle-on-Tyne, 581; Newry, 304; Newquay, 118, 836; Northampton, 836; Northwich, 544; Okehampton, 681; Paignton, 717; Pebworth, 755; Pembroke, 432, 681, 794; Penzance, 717; Peterborough, 873; Pollokshaws, 364; Portadown, 432; Prestatyn, 544; Rhondda, 179; Rhymney, 544; Richmond, 246, 873; Ripon, 145; Rosyth, 179; Ruislip-Northwood, 179; St. Austell, 332, 794; St. Germans, 681; Selby, 432, 717; Shrewsbury, 179, 364; Sidmouth, 364; Skibbereen, 398; Southmolton, 873; Southwick, 508, 681; Spalding, 275, 617; Stafford, 836, 904; Steyning West, 304; Stockport, 246; Stratford-on-Avon, 118; Swaffham, 364, 617; Swansea, 544, 650; Tilbury, 468, 581; Tiverton, 581; Tullamore, 77; Twickenham, 118, 617; Valley, 145; Wallasey, 581; Walthamstow, 864; Wanstead, 873; Wednesfield, 304; Whitehaven, 398; Winchester, 304; Wirral, 581, 617; York, 581; Ystradgynlais, 681

Parks and Open Spaces:—
Ashington, 246; Bath, 25; Birmingham, 148, 794; Brighton, 650; Brixham, 398; Broadstairs, 246; Bushey, 432; Campbeltown, 179; Cardiff, 215; Dawlish, 508; Derby, 215; Droylsden, 873; Eastbourne, 717; Eccles, 215; Edinburgh, 179, 398, 904; Ellesmere, 468; Ellesmere Port, 581; Evesham, 332; Felixstowe, 364; Glasgow, 468, 581; Halifax, 332; Hartlepool, 246; Hove, 755, 836; Ilkley, 581; Irlam, 398; Kingston, 581; Kirkley, 304; Lincoln, 794; Littlehampton, 508; Liverpool, 755; Llandudno, 332, 364; Llanelly, 432; Manchester, 794, 873; Margate, 215; Newcastle-upon-Tyne, 118, 650; Oldham, 468, 904; Oswaldtwistle, 398; Paignton, 794; Partick, 275; Plymouth, 681; Rutherglen, 364; Smethwick, 146; Southampton, 432; Southport, 275, 398; Sunderland, 508, 873; Swindon, 681; Tamworth, 468; Wallasey, 25; Whitby, 71; Withernsea, 332, 836; Yarmouth, 332

Refuse Collection and Disposal:—
Bangor, 544; Bath, 148; Cardiff, 904; Clacton, 276; Cleethorpes, 508; Colwyn Bay, 364, 398; Finsbury, 794; Gateshead, 836; Gosforth, 873; Guildford, 468; Hackney, 276; Horsham, 650, 681; Hunstanton, 904; Lambeth, 148; Largs, 795; Leith, 71; Lincoln, 681; Lowestoft, 118, 179; Maldens and Coombe, 118; Margate, 398; Melton Mowbray, 148; Merthyr, 148; Middlesbrough, 25, 755; Newport, 795; Oakham, 432; Pontypool, 72, 468; Ramsbottom, 71; Saddleworth, 836; Shoreditch, 365; Stockton, 215; Swansea, 398, 650; Taunton, 617; Tiverton, 118; Tutbury, 904; Wednesbury, 71

Roads and Materials:
Aberdeen, 146, 215, 276, 304, 332, 508, 617, 904; Aberdeenshire, 795; Aber-

Municipal Work in Progress and Projected *(continued)*:—

Roads and Materials *(continued)*:—

gele, 617; Alnwick, 468; Antrim, 246; Argyll, 179; Ashburton, 681; Aylesbury, 873; Ayrshire, 304; Bagshot, 399; Ballymoney, 581; Banff, 71; Banffshire, 468; Barnsley, 246, 276, 873; Barnstaple, 146; Barry, 276; Bath, 146, 873; Belfast, 755; Belford, 717; Bermondsey, 681; Berwickshire, 25, 904; Bexhill, 25; Bingley, 755; Birmingham, 755, 873; Blackpool, 617, 874; Bodmin, 756, 904; Bognor, 304; Bolton, 304, 332; Bootle, 179; Bourne, 904; Bowland, 717; Brandon and Byshottles, 365; Brentford, 365, 468; Brighouse, 246; Bristol, 179, 544, 681, 836; Broadstairs, 118, 399; Bromley, 717; Burton-on-Trent, 795; Bushey, 118; Caerphilly, 874; Camberwell, 25, 146, 468, 795; Camborne, 246, 276; Cannock, 246, 804; Cardiff, 215, 904; Carmarthenshire, 508; Carnarvonshire, 681; Castlereagh, 617; Chelmsford, 26, 215, 508; Cheltenham, 215, 332, 399; Cheriton, 681; Cheshire, 756; Chesterfield, 276; Chester-le-Street, 399, 904; Chichester, 399, 874; Chislehurst, 469; Chorley, 246; Clydebank, 365; Colne, 508; Conway, 874; Cork, 276, 836; Coventry, 469; Crompton, 581; Croydon, 118, 179, 617, 650, 874; Darlington, 432; Dawlish, 246, 544; Deptford, 617; Derby, 215, 469; Derbyshire, 118, 146; Devon, 469, 874; Dewsbury, 650, 544; Donegal, 617; Dorking, 399, 433; Dorset, 756; Downpatrick, 581; Dudley, 118; Dulverton, 215; Dumbarton, 717; Dundee, 276, 469; Dunfermline, 508; Dunoon, 836; Durham, 544; East Grinstead, 246, 651; East Ham, 904; Eastleigh and Bishopstoke, 836; East Suffolk, 276; East Sussex, 681; Edinburgh, 26, 544, 581, 618, 904; Edmonton, 756, 874; Evesham, 618; Exeter, 118; Exmouth, 146; Faversham, 681; Finchley, 215; Finsbury, 146; Frinton-on-Sea, 717; Gainsborough, 247; Galashiels, 332; Galway, 26, 276; Glamorgan, 146; Glasgow, 332; Gosforth, 304; Gower, 836; Grantham, 247; Greenock, 717; Greenwich, 26, 247, 681; Grimsby, 756; Guildford, 26; Hackney, 276, 874; Hailsham, 469; Halifax, 26; Hammersmith, 215; Hampshire, 756; Hampstead, 681; Hampton, 717; Hampton Wick, 651; Hanwell, 545; Harrow, 618; Hartlepool, 508; Hastings, 247, 433, 756; Havant, 332; Haywards Heath, 718; Headington, 651; Heaton Norris, 179; Heckmondwike, 304; Helston, 469; Hemel Hempstead, 874; Hendon, 247; Heston and Isleworth, 618; Hexham, 756; Hitchin, 618; Horncastle, 718; Hornsea, 807; Hornsey, 651; Horsham, 545; Hove, 215, 874; Hursley, 365; Isle of Wight, 399; Islington, 26, 146; Kanturk, 618; Kensington, 651; Kent, 332; Kesteven, 247; Kingston, 26, 146, 581, 904; Kingstown, 118, 276; Knaresborough, 618; Lancashire, 179, 276, 681; Larne, 365; Leeds, 146; Lewes, 509; Linlithgow, 304; Liskeard, 216; Llandudno, 146, 304; London, 651; Louth, 276, 618; Loughborough, 179, 216; Lowestoft, 399; Lurgan, 681; Luton, 399, 837; Lynn, 545; Lynton, 179, 365; Maesteg, 399; Maidenhead, 276; Maldons and Coombe, 118, 399, 433, 581, 718; Mallow, 146; Malvern, 365; Marylebone, 118, 146; Merton, 146; Middlesborough, 26, 179, 216; Middlesex, 71, 837; Monaghan, 545; Montgomery, 433, 469; Nelson, 247; Newcastle-on-Tyne, 544; Newhaven, 399, 756; Newport, 681; Norfolk, 146; Northam, 904; North Riding, 216, 651; North Tipperary, 399; Northumberland, 682; Nottingham, 565, 756; Notts, 246; Nuneaton, 681; Okehampton, 146, 618; Ottley, 433; Oxford, 365; Paisley, 399; Penybont, 795; Perth, 71; Perthshire, 146; Petworth, 304; Plymouth, 469, 904; Poole, 399, 874; Porthcawl, 118; Portsdale, 837; Preston, 837; Ramsgate, 256; Rawmarsh, 756; Richmond, 756, 874; Rowley, 433; Roxburghshire, 26; Runcorn, 837; Saffron Walden, 469; St. Germans, 681; Saltash, 365; Seaton, 651; Sheringham, 469; Shoreditch, 365; Shrewsbury, 179; Southampton,

Municipal Work in Progress and Projected *(continued)*:—

Roads and Materials *(continued)*:—

756; Southend, 26, 469, 718; Southmolton, 333; Southport, 71, 618; Southwark, 119; Southwick, 26, 681; Stafford, 26, 509; Staffordshire, 651; Steyning East, 544; Stirling, 304; Stoke Newington, 795; Sunbury, 365; Surbiton, 276; Surrey, 718, 795; Swanage, 304; Swansea, 119; Swindon, 837; Taunton, 333; Tavistock, 545; Teddington, 545; Teignmouth, 365, 509, 682; Tenby, 837; Tewkesbury, 469; Thames Ditton, 718, 756; Torquay, 795; Tottenham, 247; Tring, 216; Twickenham, 119; Tyrone, 874; Uckfield, 179, 681; Walsall, 399, 837; Wanstead, 717; Ware, 119; Warrington, 618; Warwickshire, 247; Waterloo-with-Seaforth, 365; Watford, 874; Wellingborough, 26; Wembley, 247; Weobley, 305; West Bromwich, 147, 837; Westhampnett, 216, 837; Westminster, 180; West Suffolk, 276, 333; West Sussex, 180, 247, 756; Weymouth, 399; Whitby, 681; Wincanton, 333, 904; Windermere, 795; Withernsea, 469; Woodford, 905; Woolwich, 71, 216; Worsborough, 399; Worthing, 508

Sewerage and Sewage Disposal:—

Acton, 837, 905; Alsagar, 874; Altrincham, 874; Andover, 545; Arundel, 71; Ashby, 433; Audley, 276; Ballymena, 682; Barnard Castle, 718; Barnet, 365; Barnsley, 119; Bath, 216, 682; Batley, 399; Belfast, 71, 651; Belper, 333; Bentley, 545; Berkhampsted, 333; Beverley, 509; Birmingham, 26; Blean, 119; Bognor, 71; Brierley Hill, 147, 247; Brighouse, 469; Bristol, 682; Brampton, 618; Brynmawr, 581; Buckingham, 305; Bucklow, 365; Bulkington, 333, 837; Caerphilly, 180; Camberwell, 905; Camborne, 180; Cambridge, 147; Cannock, 545; Carrickon Suir, 545; Chapel-en-le-Frith, 333; Chelmsford, 795; Cheltenham, 545, 874; Chesham, 26; Chipping Norton, 216; Clevedon, 837; Clones, 756; Coatbridge, 119; Cockermouth, 582; Cosford, 399; Coventry, 26, 147, 305; Dartmouth, 545; Derby, 247; Devonport, 756; Dewsbury, 682; Dorchester, 147; Docking, 365; Downham, 545; Droitwich, 247; Droylsden, 276; Dunmow, 333; Durham, 276; Earby, 469; Easingwold, 26; East Ashford, 305; East Cowes, 365; East Grinstead, 247, 509; Eccles, 618; Edinburgh, 399; Ellesmere, 26, 718; Epsom, 71, 582; Exeter, 651; Fareham, 469; Fleet, 216; Godalming, 247; Goole, 26, 305; Greenwich, 509; Grimsby, 119; Halifax, 305, 837; Hampton, 147, 276; Hastings, 147; Hemel Hempstead, 756; Hexham, 469; Hinckley, 180; Hitchin, 718; Hove, 71, 247; Hunsworth, 618; Ilkeston, 399; Isle of Wight, 333; Kendal, 682; Kidderminster, 469; Kineton Park, 874; Kingston, 433, 582; Kirkcaldy, 874; Larne, 180, 837; Laurencekirk, 72; Leeds, 365, 545; Leicester, 216, 618; Leigh, 469; Lichfield, 718; Linlithgow, 618, 718; Linthwaite, 276, 469, 718; Lisburn, 333; Littleborough, 26; Llandilo, 756; Llanelly, 837; Loughborough, 305, 507; Lymm, 180; Mansfield-Woodhouse, 276; Marple, 365; Middlesbrough, 26; Middleton, 180, 399; Milton, 147; Mossley, 399; Nantwich, 119, 618; Neath, 682; Nelson, 545; Newcastle, 469; North Bromsgrove, 72, 682; Norwich, 119, 905; Oakengates, 72; Oswestry, 147; Oulton Broad, 365; Paignton, 905; Pontardawe, 874; Poole, 433; Preston, 433; Radcliffe, 26; Rainham, 72; Rawmarsh, 795; Repton, 582; Ripley, 874; Rochester, 905; Romford, 72, 305; Rothesay, 756; Runcorn, 147; Rushden, 756; Ruthin, 305; St. Columb, 682; Scarborough, 837; Sedgley, 399; Settle, 333; Southampton, 433; Southport, 147; South Westmorland, 26; Southwick, 26, 509; Spalding, 399, 469, 509; Spennymoor, 365; Stoke-on-Trent, 469; Street, 756; Sunbury, 682; Surbiton, 874; Swadlincote, 718; Swindon, 682; Teddington, 545; Tenby, 180; Thirsk, 276; Tipton, 333; Tiverton, 433; Tredegar, 469, 582; Tring, 216; Truro, 905; Tyldesley, 333;

Municipal Work in Progress and Projected *(continued)*:—

Sewerage and Sewage Disposal *(continued)*:—

Upton, 305; Walsingham, 147; Warwick, 837; Wellingborough, 682; West Bridgford, 180; Whitby, 905; Whitstable, 72; Whittington, 582; Wigan, 582; Winchcombe, 247; Windsor, 618; Wirksworth, 756; Witham, 682; Wombwell, 399; Woolwich, 905; Worcester, 545; Worthing, 247, 509; Wrexham, 582, 795.

Water, Gas, and Electricity:—

Abercarn, 874; Aberdeen, 305, 582, 837; Abersychan, 119; Aberystwyth, 180; Alnwick, 72, 305, 651; Alsager, 276; Ammanford, 147; Ashby, 72; Ashwell, 216; Atherton, 216; Ayr, 582; Banbridge, 618, 905; Bangor, 365, 509; Barry, 246; Batley, 399; Belfast, 72, 333; Beverley, 837; Bewdley, 795; Billinge, 72; Birkenhead, 365, 509; Birmingham, 756, 874; Blackburn, 119; Bolton, 618; Bo'ness, 874; Bournemouth, 147; Bridlington, 905; Cannock, 837; Cardiff, 72, 469; Cardigan, 618, 837; Carlisle, 837; Chapel-en-le-Frith, 333; Chelmsford, 333, 469, 682, 905; Chester, 180; Chirk, 795; Clevedon, 682; Coleford, 718; Cottingham, 119; Coventry, 26, 119; Cromer, 582; Croydon, 874; Cwmamman, 682; Darlington, 216; Darwen, 582; Derry, 837; Dewsbury, 216; Dingwall, 147; Droitwich, 795; Dromore, 509, 582, 718; Dudley, 305, 365; Dufftown, 718; Dunbar, 365; Dundee, 277, 333; Dunfermline, 682; Dunmow, 119; Easingwold, 305; East Cowes, 26, 216; Ebbw Vale, 905; Edinburgh, 399, 469; Egremont, 795; Elgin, 248; Evesham, 469; Exeter, 365; Exmouth, 509, 545; Falkirk, 72; Felixstowe, 718; Fifeshire, 433, 682; Gainsborough, 248; Gelligaer, 147; Glasgow, 180, 509; Godalming, 248; Goole, 756; Gosford, 399; Gourock, 365; Greenock, 277; Grimsby, 756; Guisborough, 333; Haddingtonshire, 216; Halstead, 682; Haltwhistle, 874; Hammersmith, 277; Hampton, 582; Hastings, 433, 837; Hinckley, 180, 333, 688; Holborn, 216, 651; Hornsey, 147; Hove, 545, 718, 875; Howden, 469, 545; Huddersfield, 837; Ilkeston, 399; Islington, 217; Keighley, 837, 905; Kingston, 147, 180; Kirkcaldy, 333; Lampeter, 217; Lanarkshire, 248, 837; Leeds, 470, 582; Leicester, 618; Lexden and Winstree, 433; Llandrindod Wells, 582; Llandudno, 72, 756; Llanfairfechan, 545; Loftus, 277; Lossiemouth, 305; Lostwithiel, 217; Louth, 277; Lowestoft, 905; Maldens and Coombe, 718; Malton, 180; Manchester, 26, 509; Margate, 26; Market Harborough, 72; Marston Sicca, 905; Maryport, 756; Mayfield, 582; Merthyr, 217, 618; Middleton, 399; Midlothian, 147, 683; Morpeth, 651; Mossley, 399; Neath, 718; Newmarket, 434; Newport, 305; Newry, 795; Newton Abbot, 26, 545; North Walsham, 217; Norton, 305; Norwich, 757; Nottingham, 180; Nuneaton, 180, 837; Oldham, 26; Oswestry, 795; Oystermouth, 26, 147, 757; Penzance, 277; Perth, 119, 683; Phillack, 545; Pittenweem, 582; Plymouth, 72; Pontardawe, 470, 718; Port Glasgow, 545; Portland, 305; Prestatyn, 27; Rathdown, 582; Rothesay, 119; St. Columb, 248; St. Helens, 72; Scunthorpe, 545; St. Pancras, 72, 795; St. Thomas, 618; Salford, 837; Sedgeley, 399; Selby, 72, 582, 905; Settle, 366, 509; Sheerness, 248; Sheffield, 248; Shoeburyness, 582; Shoreditch, 366; Skelton, 27; Sleaford, 837; Slough, 27, 470; Southampton, 180; Spalding, 277, 399, 795; Stafford, 718; Stalybridge, 509; Stepney, 119; Stirling, 509; Stockton, 72; Stoke Newington, 72; Stourport, 366, 682; Street, 383; Sunderland, 72; Tanderagee, 718; Tavistock, 277; Teignmouth, 119; Tetbury, 719; Thakeham, 545, 796; Ticehurst, 333; Tipton, 333; Torquay, 217, 719, 837; Totnes, 333; Truro, 119; Twickenham, 181; Tynemouth, 796; Uckfield, 433; Ulverston, 500; Walton-upon-Thames, 217; Warrenpoint, 757; Wellingborough, 651; Welshpool, 277; Westbury, 217; Whitwood, 719;

Municipal Work in Progress and Projected *(continued)*:—

Water, Gas and Electricity *(continued)*:—
Widnes, 248, 277, 305; Wigton, 277; Withernsea, 618; Wolverhampton, 119, 719; Wombwell, 399; Worcester, 719; York, 72, 807

Miscellaneous:—
Aberavon, 305, 719; Aberdeen, 181; Ayr, 366; Barry, 72; Beccles, 333; Beeston, 545; Birmingham, 545, 582; Bradford, 305; Brierley Hill, 333; Burley-in-Wharfedale, 582; Bushey, 27; Calne, 796; Cardiff, 181; Carnarvon, 399; Chertsey, 719; Chester-le-Street, 757; Coventry, 27, 217; Crosdon, 509; Cuckfield, 333; Darlington, 366; Doncaster, 651; East Grinstead, 719; Edinburgh, 470, 582, 651; Esher and the Dittons, 119; Fairnham, 399; Glasgow, 181, 217; Harrogate, 366; Hastings, 651, Hollingbourne, 470; Hove, 399; Huddersfield, 396; Hunstanton, 906; Huthwaite, 874; Keighley, 333; Kenilworth, 433; Kingswinford, 147; Leamington, 72; Leeds, 509; Leicester, 433; Lincoln, 509, 683; Little Lever, 366; Llandudno, 470; London, 651; Maldons and Coombe, 433, 545; Manchester, 333; Market Bosworth, 277, Newcastle-on-Tyne, 683; Nottingham, 837; Okehampton, 396; Otley, 433; Paisley, 399; Ramsbottom, 72; Rowley, 433; St. Austell, 582; Sheffield, 399, 683; Skegness, 147; Southampton, 181; Southport, 719; Stockport, 305; Stockton, 217, 719; Sunbury, 906; Surbiton, 277; Tilbury, 618; Tipton, 72; Troon, 874; Twickenham, 618; Uckfield, 509; Wandsworth, 796; Watford, 27; Wednesfield, 305; West Hartlepool, 248, 582; West Sussex, 757; Winchester, 545; York, 181, 399

N

National Association of Local Government Officers, 539
National Fire Brigade Union, 303
Newcastle Corporation Tramways, 331
Newcastle-on-Tyne, Municipal Engineering Work at, 95, 113
New Hampshire Highways, 140
New Method of Road Coating, 792
Newport Pagnell: A Report, 811
New Streets and Buildings: Revision of Obsolete By-Laws, 338
New Type of Dwelling, 785
New York Harbour, Sewage Pollution in, 798
New York, Sewerage and Sewage Disposal at, 1, 21, 557, 571
Norfolk, Flood Havoc in, 327, 532
Northampton Polytechnic Institute, 744
Northumberland Roads, 294
Norwich Motor Fire Engine, 78

O

Oakengates, Sanitation at, 559
Officials as Architects, 662, 668
Oldham, Refuse Disposal in, 347
One Solution of the Sludge Problem, 163, 207
Open Windows, Compulsory, 69
Oppressed Officials, 457
Ottawa River Survey, 286, 288
Overtime, 315, 327

P

Paris Housing, 69
Pavilion, Torquay's New, 278, 334
"Perma" Buildings, 537
Permanent Building with Two-Inch Walls, 752
Persecution: The Cause, 411
Personal, 27, 73, 119, 148, 181, 217, 248, 277, 306, 334, 366, 400, 433, 470, 509, 545, 583, 618, 651, 683, 719, 757, 796, 838, 875, 906
Petroleum, Use of Residual, 640
Petrol Tax, Municipal Engineers and the, 714
Philosophy of Engineering, 377, 384
Physics of Air in Relation to Ventilation, 297
Pipe Lines, Sub-Street, 886
Pitting of Steel Pipes, 854, 871
Plans, Filing of, 487
Plaster Work, Metal Lathing for, 16
Poisonous Street Dust, 82
Pollution of Public Water Supplies, Recent Examples of, 859
Pollution of Streams, 199, 200
Pooh-Bah in Chilliwack, 205
Portland Cement, 705
Portland Cement Works, Isis, 169
Portland Stone, Experiments on the Weathering of, 380
Port of London's New Offices, 116
Portsmouth, Municipal Profits at, 277
Powell System of Wood Seasoning, 361
Power Saving Pulley Coverings, 390
Prestwich Town Planning Scheme, 427
Prevention of Smoke, 154
Private Tramcars, 382
Producer Gas, Generation and Distribution of, 825
Professional Defence, 535
Progress in Town Planning, 227, 228

Publications:—
Applied Mechanics and Mechanical Engineering, 900
Applied Science, 751
A Primer of Scientific Management, 847
A Text-book on Roads and Pavements, 800
British Rainfall, 1911, 294
Building Construction, 760
Cheap Cottages and Small House, 685
City Diary, 724
Coming of Petroleum, 175
Common-sense Homes, 724
Diaries and Calendars, 900
Diaries and Year Books, 847
Dictionary of Railway Terms, 724
Early Christian and Byzantine Architecture, 761
Eason's Diaries, 688
Electrical Review, 724
Engineering and Metallurgical Books, 688
Enquire Within upon Poultry and Egg Production, 403
Estimating, 619
Everybody's Guide to the National Insurance Act, 1911, 88
Fire Resistance of Doors and Shutters, 552
Gasworks Directory and Statistics 1912-13, 761
Geology of Soils and Substrata, 881
Householder's Cabinet, 88
Hunt's Law of Boundaries, Walls and Fences, 337
Laboratory Manual for the Use of Students in Testing Materials of Construction, 150
Land Union's Handbook on Provisional Valuations, 337
Law and Practice of Rating, 619
Law of Repairs and Dilapidations, 653
Law Relating to Electric Lighting, Power, and Traction, 800
Law Relating to Tithe Rent-charge and Other Payments in Lieu of Tithe, 337
Local Government Case Law, 1911, 337
Local Legislation, 900
London County Council, 619
Main Drainage of Towns, 122
Modern Road Construction, 402
National Insurance: Questions and their Answers, 688
Nothing Gained by Overcrowding, 403
Practical Geometry and Graphics for Technical Students, 760
Practical Mathematics for Technical Students, 760
Practical Mechanic's Handbook, 847
Practical Methods of Sewage Disposal, 88
Preliminary Studies in Bridge Design, 403
Preparation and Design of Reinforced Concrete, 847
Problems in Engineering, with Solutions, 122
Proceedings of the Institution of Civil Engineers, 800
Public Works and Engineering Review of Reviews, 88
Rail Corrugation, 687
Rating of Gas and Water Undertakings, 515
Records of the Survey of India, 150
Reference Book for Statistical Calculations, 337
Reinforced Concrete Construction, 760
Reports of Rating Appeals, 515
Road Material Resources of Minnesota, 150

Publications *(continued)*:—
Royal Colonial Institute Year Book, 175
Rules of Golf, 881
Salon, 455
Sewerage Engineer's Pocket Book (in German), 122
Southern England Coast and Countryside, 455
Specification and Agreement, 761
Statistical Abstract for London, 175
Street Pavements and Paving Materials, 800
Stresses and Strains, 337
Structural Economy, 881
Surveying and Surveying Instruments, 653
Taxation of Land Values as it Affects Landowners and others, 337
Transactions of the Concrete Institute, 688
Transactions of the Edinburgh Architectural Association, 403
Transactions of the Institution of Municipal and County Engineers, 900
Transactions of the Institution of Water Engineers, 455
Where to Live Round London, 619
Public Health Congresses, 131
Public Health, Influence of Town Planning upon, 547, 588
Putney Bridge, 21, 116

Q

Quantities, Furnishing of, 84
Quantity Surveyors and Reinforced Concrete, 771, 786

R

Rail Corrugation, 814
Rapid Methods of Construction, 597
Rat Plague in France, 415
Rats in a Town Hall, 303
Reeves System of Sewer Ventilation, 361, 390
Refuse Collection: Improved Bin, 909
Refuse Destruction at Cromer, 288
Refuse Disposal at Stourbridge, 52
Refuse Disposal in Oldham, 347
Refuse Disposal in St. Petersburg, 138
Refuse, Disposal of, 137
Refuse "Tips," Manchester and its, 343
Refuse Wagons, Steel Tipping, 513
Reinforced Concrete and Bridge Construction, 446
Reinforced Concrete, Bills of Quantities for, 771, 786
Reinforced Concrete Loading Pier, 723
Reinforced Concrete, Local Government Board and, (7)
Reinforced Concrete Reservoir at East Cowes, (8)
Reinforced Concrete Retaining Wall at Basford, 643
Reinforced Concrete, Some Notes on, 174
Reinforced Concrete, Test Deflections of, 771, 801
Reinforced Slabs and Piles, 149
Removal of Gas and Water Mains, 446
Resurfacing Carriageways on "Chadwick" System, 299
Richardson, Death of Mr. F. W., 620
Richmond Bridge, Motor Traffic over, 683
Rivers and Waterways, Standards of Purity for, 734, 744

Roads and Streets:—
A Dangerous Turning and an Important Improvement, 94
Akonia, 27
American Road Congress, 28
American Road Expenditure, 85
American Road Stone Tests, 799
Antrim, 360
Armagh, 289
Asphalt-Macadam, 95, 108
Aylesbury, 280
Bituminous Bound Carriageways: Suggested Clauses, 257, 260
Bituminous Road Materials, 257, 299, 612, 637, 694, 712, 747, 789, 833, 869, 899
Breaking Tests of Concrete Slabs for Road Bridge Floors, 245

Roads and Streets *continued*:—
Bridlington, 5
"Camarco" on the Bath Road, 709
"Carpeting" Principle, 426
Cartels Against Tar Macadam, 641
"Chadwick" System, 290
Clitheroe, 172
Concrete Foundations, 630, 642
Concrete in Road Construction, 14
Concrete Paving: Expansion Joints, 3, 32
Condition of Roads in Ireland, 259
Congress Delegates' Expenses: Local Government Board Statement, 36
Construction of Surfaces with Bituminous Materials, 637, 694
Contract System in Herefordshire, 201
Conversion of Macadam to Wood Paving, 358, 394
Cornish Roads, 734
Cost of Repaving Works, 775
County Borough Improvements, 920
County Surveyors and Motor-cars, 557
Creosoted Wood Paving, 415, 461
Crompton Pavement, 462, 505, 529, 577, 714
Croydon and Motor Omnibuses, 211
Damage from Tarred Roads: Counsel's Opinion, 207
Damage to Road by Motor Omnibuses, 436
Drainage and Foundations, 8, 7, 907
Dust Prevention in France, 122
East Suffolk, 282
Effect of "Maining" upon Average Costs of Maintenance, 205
Egypt, 867
European Road Materials, 660
Factors Affecting Cost of Road Maintenance, 198, 205
"Ferro-mac" Construction, 534
Fifeshire, 78
French Road System, 88, 695
Glasgow, 891
Good Roads Movement in Canada, 352
Grays, 418
Gritting, 593, 613
Group Names of Rocks, 770
Heavy Motor Traffic, 552, 566
Herefordshire, 197, 200, 220
Highway Bridges and Culverts, 579, 586
Horse Shoes and the Road Crust, 597
Hours of Roadmen, 32
Improvements in the Metropolitan Area, 510, 536
Instalment Payments for Road Construction, 102
International Road Congress and Exhibition, 17, 34, 245, 673, 714, 811, 883
Irish and Scottish Roads, 287
Is the Road Board a Failure? 399, 420, 463
Johannesburg, 301
Kent, 46
Labour, 280
L.G.B. Auditor and Repaving Works, 775
Limitations of Surface Tarring, 455
Lithofalt Block Paving, 758
Local Authorities and Motor Bus Traffic, 496
London and Brighton Road Proposed Relief Thoroughfare, 402
London Road Repairs, 833
Maintenance Charges, 282
Mid-Lothian, 307
Mixing Cement with "Bitumen," 642, 645, 675, 713
Modern Road Construction, 713, 769
Money Wasted on the Roads, 661
Motor Vacuum Street Cleaner, 866
New Hampshire Highways, 140
New Method of Road Coating, 792
New Type of Road Surface, 426
Non-Slippery Whinstone, 438, 506
Northamptonshire, 75
Northumberland, 254
Omnibus Companies' Liability for Maintenance, 620
Oxfordshire, 549
Paris Testing Laboratory, 608
Paving Tramways with Nidged Setts, 666
Perthshire, 78
Poisonous Street Dust, 82
Private Street Works Dispute, 513
Proposed Western Approach Road, 78, 397, 465, 513, 563, 614
"Rewmac," 840
Road Board Administration, 940
Road Board and Improvements in and adjoining County Boroughs, 940
Road Board and Road Improvements, 168
Road Board and the Metropolis, 810, 846
Roads and Streets *continued*:—
Road Board Finance, 241
Road Board Grants, 82, 403, 499, 608
Road Board's Policy: Position of the Boroughs, 211
Road Board's Second Annual Report, 203, 285
Road Crust as an Arch, 130
Road Efficiency, 685
Road Maintenance Problems, 271
Road Menders' Work in Great Britain, 758
Roadmen's Wages, 502
Road Ramming for Road Rolling, 139
Roads Improvement Association, 149, 563, 723, 761
Roman Roads, 104
Rubber and Leather as Measuring Value of Road Crusts, 409
Sand Drifts on Roads, 277, 315
Saskatchewan, 760
Scarifiers, 272
Scotland, 879
Scottish Roads, 292
Sheffield, 653
Sir George Gibb and Maintenance Grants, 702
Soft Wood Paving: Paris Experiments, 559, 566
Somersetshire and Main Road Maintenance, 562
Southport Demonstrations of Street Cleansing, 866
Specifications for Carriageways, 257, 260
Staffordshire, 42
Standardisation of Road Materials, 20
State Highway System for California, 869
Statistical Pitfalls, 388
Statistics of Cost of Road Maintenance, 198, 205
Steam Rolling in County Armagh, 250
Street Cleansing by Electricity, 272
Street Corner Mirror at Beckenham, 299
Street Dust and Street Pavements, 420
Surrey County Council and District Road Improvements, 211
Surveyors and their Roads, 1, 19
Tar and Cement Pavements in Germany, 415
Tar Macadam Plant at Stourbridge, 53
Tar No Improvement, 361
Tarred Roads and the Weather, 341
The Modern Road, 383
Thin Carpet Layers of Bitumen and Sand, 30
Thrift and Footpaths, (4)
Trackless Trolleys and Road Maintenance, 723
Traction Engines v. Roads, 3
Traders and the Road Congress and Exhibition, 631
Tricycle Street Sweeper, 75
United States Office of Public Roads, 723
Use of Bituminous Materials in America, 84
Utilisation of Road Sweepings, 151
Uxbridge Road Tarring, 605
Vacuum Street Cleaners, 70, 866
Warwickshire, 256
Where Microbes Nest, 20
Whinstone Setts and Portsmouth, 185, 596
Why Tar Particularly? 661
Wiltshire Roads, 257, 286
Wood Paving in Belgrade, 562
Worcestershire, 549, 879
Wrexham, 565
Rolling, Resistance to, 752
Romance of a Large Bookstore, 331
Roman Roads, 105
Roofing Materials, (8)
Royal Commission on Sewage Disposal: Eighth Report, 716, 733, 885, 888
Royal Institute of British Architects, 654

Royal Institute of Public Health:—
Berlin Congress, 156

Royal Sanitary Institute:—
Alton Meeting, 609
Annual Congress and Exhibition at York, 159, 165, 182, 206, 238, 265, 297, 335, 401
Doncaster Meeting, 750
Henry Saxon Snell Prize, 893
Lectures and Demonstrations, 331
Lewes Meeting, 399
London Meeting, 661, 669, 696, 736
Runcorn's Hard Water, 613
Rural Council and War Office, 436
Rural Districts, Sewage Disposal in, 161
Rural Housing, 599, 601, 770, 774

S

Safety Locks for Automatic Lifts, 223
St. Ann's Well, Buxton, 138
St. Paul's Bridge Scheme, 716
St. Petersburg Refuse Destructor, 138
Salford Sewage Works, 348
Sanatoria and Isolation Hospitals, 537
Sanatoria Exhibition, 306
Sand Drifts on Roads, 277, 314
Sanitary Engineers, Training of, 630, 639
Sanitary Laws, 161
Sanitary Progress and the Law, 155
Sanitary Progress in Dumfries, 3
Sanitation at Oakengates, 559
Sanitation, Improvements in, 160
Sanitation in Small Urban Districts, 227
Saskatchewan, Highway Administration in, 760
School Buildings: Cost and Equipment, 848
Scotland, Electric Traction in, 133
Scottish Roads, 292
Scottish Roads, Sir George Gibb and, 879
Scottish Surveyor's Death, 306
Sea Defence at Bridlington, 7
Sea Wall Construction on the Fifeshire Coast, 683
Seizing the Opportunity, 416
Self-contained Cottages *v.* Block Dwellings, 268
Self-Pollution of Water by Natural Growths, 29
Self-Starters for Motors, 849

Sewerage and Sewage Disposal:—
Adams-Hydraulics' Exhibits at York, 221
Advantages of Land over Artificial Schemes, 162, 206
Aerial Nuisance from Sewage Works, 43, 79
Air Currents in Sewers, 413
Alton, 621
Aylesbury, 281
Bacteria, 129, 134, 183
Barnsley, 515
Birmingham, 693
Blackpool Sewer Outfall Extension, 182, 207
Bridlington, 5
Bristol Sewers, 413
British Practice in Sewage Disposal, 343, 353
Capital Expenditure and Road Maintenance, 713, 769
Cesspool Emptying, 427, 867
Chemical Treatment, 497
Clarification of Sewage, 249
Clitheroe, 171
Combined Drainage, 431
Conversion of Old Sewers into New, 225, 233
Country House Sewage Purification, 335
Design of Works, 459
Discharge of Effluents into Tidal Streams, 500
Disposal by Oxidation Methods, 458, 485, 497
Distribution, 459
Distributors, 20
Drainage of Isolation Hospitals, 342
Drain Blocked by Tree Roots, 347
Elimination of Solids, 458
Emscher Tanks, 498
European Contributors to the International Road Congress, 343, 369
Facilities for Professional Education, 357, 390
Ferro-Concrete Sludge-Pumping Pontoon, 260
"Fieldhouse" Tanks, 249
Filter Construction at Birmingham, 159
Filtering Media, 459, 498
Fleet, 85
Gas Liquor, 199, 201
Grays, 416
Hornsey Works, 360
Ilkeston's New Works, 118, 532, 615
Intercepting Traps in House Drains, 313, 316, 356, 390, 397, 505, 522, 583, 586, 661, 669, 693, 696, 712, 733, 741, 747, 826, 884, 870, 900
Johannesburg, 301
Leeds, 281
Leicester, 641
Lewes, 500
Maintenance, Flushing, and Cleansing of Sewers in Hampstead, 225, 233
Management of Works, 459
Manchester, 759, 785
Manchester Rivers Committee's Report, 427, 562
Mersey and Irwell Joint Committee's Report, 199, 223

Sewerage and Sewage Disposal (*continued*):—
Methods of Differentiating Soils, 93, 109
New Use for Sewer, 32
New York, 1, 21, 557, 798
Oldham Sewage Sludge Disposal Plant, 602
One Solution of the Sludge Problem, 163, 207
Percolating Filters, 598
Percolating Filters *v.* Contact Beds, 468
Percolation Experiments, 111
Pollution of River Mud, 241
Pollution of Rivers, 160
Pollution of Streams, 199, 201, 209
Reeves System of Sewer Ventilation, 361, 390
Ripley's Sewerage System, 263
Royal Commission on Sewage Disposal: Eighth Report, 716, 733, 885, 888
Royal Sanitary Institute Discussion on Intercepting Traps, 661, 669
Royal Sanitary Institute Papers, 153
Salford Works, 348
Septic Tank Process, 497
Sewage Disposal in Rural Districts, 161, 206
Sewer Cleaning Device, 32
Sheffield, 653, 848
Slate Beds, 498, 771, 783
Sludge, 497, 771
Sludge Disposal, 602, 771, 783
South Africa, 558
Standards of Purity for Rivers and Waterways, 734, 744
Sterilisation of Sewage Effluents, 411, 437
Stockport, 242
Storm Water Sewage Disposal at Leicester, 641
Stourbridge, 53
Stratford-upon-Avon, 79
Sydney Sewerage, 663, 664
Tanks, 853, 863
Trowbridge, 24
United States, 445
Utilisation of Humus from Slate Beds, 771, 783
Ventilation of Sewers, 409, 412, 455, 463, 505
West Bridgford, 158
Wrexham, 569
Sewer Ventilation, 409, 412, 455
Sheffield Highways and Sewers, 653
Sheffield, Sewage Disposal in, 848
Sheffield Society of Architects and Surveyors, (8)
Sheffield, Town Planning in, 190
Sheffield University: Department of Architecture, 232
Shopkeeper's Action against Corporation, 105
Shrewsbury County Buildings, 388
Skeleton Frame Buildings: District Surveyors' Fees, 881, 887
Slate Beds, Utilisation of Humus from, 771, 783
Sludge Problem, One Solution of the, 163
Smoke, Prevention of, 154
Society of Engineers, 862
Soft Wood Paving: Effects of Various Treatments, 559, 563
Somerset C.C. and Main Road Maintenance, 562
Something New in "Booby" Prizes, 126
South Africa, Sewage Disposal in, 558
Southend, Reinforced Concrete Loading Pier at, 723
South Fife Development, (6)
South Staffordshire, Generation and Distribution of Producer Gas in, 825
Southwark Bridge Rebuilding, 573
Southwark to Cheapside Tramway, 824
Specifications for Carriageways: Suggested Clauses, 257, 260
Stafford Corporation and the Housing Act, 146
Stafford, Housing Problem at, 782
Staffordshire Public Health, 810, 846
Staffordshire Roads, 12
Standardisation, 197, 202
Standardisation of Road Materials, 20
Standard Pipe Specifications, 420
Standards of Purity for Rivers and Waterways, 734, 744
Statistical Pitfalls, 368
Statistics of Cost of Road Maintenance, 198, 208
Steam Haulage, 834
Steam Rolling in County Armagh, 290
Steel Pipes, Cement Lining for, 829
Steel Pipes, Pitting of, 854, 871
Steel Tipping Refuse Wagons, 513
Stoke-on-Trent New Municipal Buildings, 635
Stourbridge Gasworks, 87
Stourbridge Municipal Works, 50
Street Dust and Street Pavements, 420
Structural Steel for Buildings and General Building Construction: British Standard Specification, 331
Subways for Pipes and Wires, (6), 599
Summer School of Town Planning, 133, 831
Superannuation, Security of Tenure and Mutual Protection, 65, 447, 456, 523, 550, 589, 679, 842, 877
Surface Combustion, 503
Surface Tarring, 455
Surrey C.C. and District Road Improvements, 211
Surveying, The Three Point Problem in, 343, 344, 389
Survey of India, 735, 746
Surveyors and their Roads, 1
Surveyors' Institution, 619, 673
Survey Work, Modern, 723
Swansea, Development of, 314
Sydney Sewerage, 663, 664
Symon's Meteorological Magazine, 20

T

Talbot Cars, 652, 743
Tanks, Sewage, 853, 863
Tar and Cement Pavements in Germany, 415
Tar No Improvement, 361
Tarred Roads and the Weather, 341
Temporary Buildings, Law as to, 388
Tendering by Architects, 887
Tenders for Municipal Works or Supplies, 39, 92, 126, 196, 254, 310, 375, 408, 442, 482, 520, 555, 595, 626, 659, 728, 765, 805, 852, 884
Terrors of the Madras Streets, 359
Tests of Concrete Slabs, 245
Thames Tunnel, New, 606
Thermal Springs, Buxton, 138
Thetford, Norfolk, Workmen's Dwellings, 294, 357
Three Point Problem in Surveying, 343 344, 389
Thritt and Footpaths, (4)
Tiverton, Municipal Work at, 879
Tiverton Road Surveyor's "Reprimand," 131
Toronto Water Supply, 686
Torquay's New Pavilion, 278, 334
Town Free from Debt, 339
Town Planning (see Housing and Town Planning)
Trackless Trolleys and Road Maintenance, 723
Trackless Trolley System at Leeds, 708
Traction Engines *v.* Roads, 3
Traffic Regulations, Gyratory, 43
Training of Engineers, 855
Training of Sanitary Engineers, 630, 679
Tramway Poles, Dangerous, 95
Tramway Rail Corrugation, 814
Tramways, London, 30, 436
Tramway Trailer Cars for London, 148, 241
Trent Protection Works, River, 897
Tricycle Street Sweeper, 75
True Co-operation: The Penzance Policy, 523
True Economy, 723
Tuke and Bell, Limited, 709
Twenty Years' Road Expenditure in America, 85

U

Ultra-Violet Rays, 313
United States Gallon, 357
United States Office of Public Roads, 723
Uxbridge, Road Tarring in, 695

V

Vacuum Cleaning Extraordinary, 438
Vacuum Street Cleaner, Motor, 866
Valves, Protection of, 797
Ventilation of Sewers, 409, 412, 455
Ventilation, Physics of Air in Relation to, 297
Village Water Supply, 642
Virtues of a Water Supply, 333

W

Wakelam on Surface Tarring, Mr. H. T., 155
Warrington Borough Engineer's Death, 334
Warwickshire, Road Maintenance in, 236
Waterproof Concrete, 629, 640
Water Supply and Waterworks:—
Aberdeen, 16
Advances in the Science of Purification, 861
Alkaline Waters of the London Basin, 130, 132
Alton, 622
An Efficient English System, 42
Ashton-under-Lyne, Stalybridge, and Dukinfield Waterworks, 534
Bacteria, 129, 134, 183
Bridlington, 5, 44
Brighton Profits, 20
Buxton's Thermal Springs, 138
Chingford Reservoir, 838
Cleaning of Water Mains, 485, 496
Cleveland, Ohio, 389
Clitheroe, 171
Controlling Arrangements on Sand Filters, 515
Derwent Valley Water Dispute, 655
Derwent Valley Waterworks: Completion of Works, 269, 352
Design and Construction of Masonry Dams, 632
Detection of Waste, 688
Developing and Conserving Supplies, 695, 721
Diss, 359
Electrolytic Disinfectant, 286
Essex, 393
Exmouth's New Works, 205
Geology of Cheltenham, 121
Gold Coast, 359
Hemlocks Dam, 620
Hinckley Waterworks, 133
Ilkeston, 474
Johannesburg, 264, 301
Large Reservoir for Buenos Ayres, 141
Lincoln, 69
Lincolnshire Village Supply, 677
Liverpool, 327
Llwyn-on Reservoir, 435
London, 133, 642, 769
Madras, 226, 228, 315
Masonry Reservoir Dams: a Simple Formula for their Design, 93, 100
Morley, 896
Municipal Waterworks Association, 598, 603
Ottawa River Survey, 286, 288
Pitting of Steel Pipes, 854, 871
Pressure Filters, 534
Protection of Valves, 797
Puech-Chabal System, 359
Recent Examples of Pollution of Public Supplies, 859
Removal of Mains, 446
Runcorn's Hard Water, 643
St. Austell, 688
Self-pollution of Water by Natural Growths, 29
Sleaford, 677
South Lincolnshire Scheme, 243
Sterilisation by Chlorine, 378, 389, 861
Sterilisation by Ultra-Violet Rays, 313, 322
Sterilising Plants Wanted, 879
Stockport, 69
Stourbridge, 83
Toronto, 686
Troon and Prestwick Water Supply, 133
Ultra-Violet Rays, 313, 322
United States, 695
Use of Copper Sulphate in Purification, 30
Waste, 95, 688
Water Regulations Committee's Report, 121
Water Tower for Village Supply, 642
Wooden Water Pipes, 573
Waterways, Use of, 865
Weather Forecasts, Dissemination of, 140
Weathering of Portland Stone, Experiments on the, 380
Weighbridge for Motor Vehicles, 750
West Hartlepool, Local Government Board and, 557
Wiltshire Roads, 257, 286
Wimbledon Common Extension, 665
Wooden Water Pipes, 573
Wood Paving in Belgrade, 562
Wood Seasoning, 361
Woolwich Footway Tunnel: Description, 606
Worcestershire Roads, 549
Workmen's Cottages in Hadham Rural District, 137
Workmen's Insurance Contributions, 390
Work of Road Surveyors, 1, 19
Wrexham and its Municipal Works, 565

Y

Yeadon's Municipal Bazaar, 259
York, Development of, 401
York, Municipal Works in Hand at, 812

AUTHORS OF PAPERS, ARTICLES AND ADDRESSES.

Anderson, T., 401
"A. J. M.," 114
Ball, W. V., 776
Barr, A., 384
Bell, H. D., 79
Blanchard, A. H., 84, 560
Bleazard, A. R., 171
Blomfield, R., 654
Boulnois, H. P., 669
Brodie, J. S., 182, 260
Burr, W. H., 386
Campbell, A. H., 323
Caplen, L., 774
Carr, W. L., 547
Charlesworth, S., 43
Corbett, J., 348
Cowan, P. C., 156
De Pulligny, M., 895
Dibdin, W. J., 783
Dorman, R. H., 289
Elford, E. J., 202
Elliott Cooper, R., 636
England, J., 565
Fellowes, C. L., 686
Fiddian, W., 83
Fowler, G. J., 109, 497
Fuller, A. E., 347
Garrett, J. H., 29
Gettings, C. F., 549
Gourley, H. J. F., 632
Gray, A. W., 550, 842
Greatorex, A. D., 159
Hartfree, G. B., 621
Hazen, A., 721
Hindle, A., 163
Hope, P. M., 106
Hoyt, C. H., 386
Humphrey, H. A., 825
Jack, G. H., 200
Jackson, H. S., 33
James, A. C., 416
Jones, A. S., 588
Kemna, A., 861, 889
Kilford, H. J., 474
Labordere, P., 563
Laing, A. J., 772
Latham, F., 527, 840, 844
Laxter, R. A., 601
McCrae, G., (7)
Macdonald, J. H. A., 383
Manley, J., 162
Martin, A. J., 353, 863
Mason, J. W., 268
Matthews, E. R., 4, 438
Meade, T. de Courcy, 412
Mesnager, A., 600
Nathan, C., 108
Owens, J. S., 380
Page, L. W., 149
Palmer, S., 878
Platt, F. W., 536
Powell, J. G., 271
Price, W. H., 184
Priestley, C. H., 435
Raikes, H. P., 148
Ransom, W., 134
Redfern, J. L., 456
Reeves, R. H., 741
Ricardo, H., 265
Richardson, L., 121
Rideal, E. K., 438
Roberts, D., 500
Rodwell, A., 161
Rucker, W. C., 279
Ryves, R., 903
Scorgie, N., 496
Shenton, H. C. H., 533
Shrapnell Smith, E., 685
Smith, J. W., 240
Snell, A. S., 297
Sopor, J. A., 571
Spurr, F. W., 812
Stevenson, A., 292
Stokes, H. P., 477
Strutt, E. G., 673
Symon, G., 745
Theobald, J. M., 786
Thomas, R. J., 64
Thomas, W. N., 344
Thresh, J. C., 132, 859
Tubbs, P. B., 668
Tuke, J. E., 335
Uren, F. C., 100
Wakelam, H. T., 461, 814
Watson, J. D., 458
Webb, C. H., 87
Wells, E. P., 704
Whipple, G., 871
Whipple, M., 871
Whitaker, P. H., 163
Whyatt, H. G., 238
Wike, C. F., 190
Willis, E., 826
Wilson, H. M., 201, 209
Winter, O. E., 233
Woodward, F., 50
Wyand, B., 787
York, Archbishop of, 159

ILLUSTRATIONS.

A

Adams-Hydraulics Exhibit, York, 221
Australian Federal Capital, 185
Avery Motor Weighbridge, 750

B

Barrow-in-Furness Central Fire Station, 856
"Batheater" System of Hot Water Supply, 166
Baths, Stourbridge, 52, 54
Blackpool Outfall Sewer Extension, 182
Bridge for Motor Vehicles, 862
Bridlington Public Works, 6
Bridlington Town Planning Scheme, 189
Buxton, St. Ann's Well, 138

C

"Camarco" on the Bath Road, 769
Chiswick New School, 424
Contour Survey of Bushey, Herts, 772

D

Dundee Central Reading Rooms, 650

F

Ferro-Concrete Sludge Pumping Pontoon, 269
"Fieldhouse" Tank, 249
Filters, Controlling Arrangements on, 515
Floor Construction, 210

H

Hampstead Sewers, 234
Hereford New Secondary School, 429
Highway Bridges and Culverts, 386, 544
Horbury Sewage Works, 359

I

"Ideal" Sewage Distributor, 167
Ilkeston Public Buildings, 474
Ilkeston Sewage Disposal Works, 448
Infectious Diseases Hospital Ward: Cross Section, &c., 75
Institution of Municipal Engineers at Keswick, 106
Interlocking Slabs and Piles, 149

L

Leigh-on-Sea Council Offices and Fire Station (1)
Lithofalt Block Paving, 758
London Western Approach Road, Proposed, 614

M

Madras Water Supply, 230
Marshall's Road Scarifier, 272
Masonry Reservoir Dams, Designs for, 101
Mather and Platt's Pressure Filters, 534
Mon-A-Ro Mudguards, 619
Motor Vacuum Street Cleaner, Hill's, 866

P

"Perma" Buildings, 567
Percentmeters, 109, 110
Portraits:—
Campbell, A. H., 323
Charlesworth, S., 41
Hurst, J. S., 4
James, A. C., 416
Kilford, H. J., 473
Latham, F. (Facing p. 521)
Mabbett, H., 524
Matthews, E. R., 4
Moss, Alderman, 472
Rice, A., 856
Ransom, W., 134
Richards, W., 473
Shaw, S., 472
Stokes, H. P., 473
Sudbury, C. A., 472
Thomas, R. J. (Facing Title)
Uren, F. C., 100
Winter, O. E., 223
Woodward, F., 50

R

Rail Corrugation, 815
Refuse Wagon, Steel Tipping, 513
Reinforced Slabs and Piles, Interlocking, 149
Reservoir Dams, Designs for Masonry, 101
Retaining Wall, Basford, 643

S

St. Ann's Well, Buxton, 138
Sankey's Down Draught Preventing Chimney-pot, 675
Sewer Cleaner, Turbine, 32
Shaft Kiln, Isis Portland Cement Works, 169
Shrewsbury County Buildings, 388
Southwark to Cheapside Tramway, Proposed, 824
Stourbridge Public Baths, 52, 54
Suri Bath, 237
Sydney Sewerage Scheme, 664

T

Talbot Car, 652
Thetford Workmen's Dwellings, 294
Three Point Problem in Surveying, 344
Tree Roots in Stoneware Drain, 347
Turbine Sewer Cleaner, 32

V

Valves, Protection of, 797

W

Water Towers for Village Supply, 642, 647
Working Class Housing, 294, 878
Wrexham Abattoir, 566

Y

Yeovil Housing Scheme, 771

The Surveyor

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Minutes of Proceedings.

Surveyors and their Roads.

A few days ago we were reading a report of an address to engineering students in America, in which there stood out above every other remark and every other argument the statement that what engineers want is not more knowledge and information, but more wisdom. The same principle underlies the interesting letter from Mr. W. H. Baxter which is reproduced in another part of this issue, and the burden of which, if reduced to a practical policy, simply amounts to this—that in road maintenance in this country there should, somehow or other, be brought to bear the broader education, the wider experience and the capacity for appreciating relative values, which have turned local and partial success into general success in other great organisations.

We are not concerned either to criticise or to apologise for Mr. Baxter's methods of putting forward his views. We will only say that, as in other cases, a senior man is entitled to put forward his ideas and the results of his experience with a force which might be regarded as unjustifiable in the case of the best informed amongst junior men in the same profession or concerned in the same affairs. Our readers will not fail to see that a good deal of the substance of Mr. Baxter's letter bears a strong resemblance to much of the matter which has appeared in these columns during the last year or two and previously. As a matter of highway administration we have thought it desirable, and we shall always think it desirable, that if some men reduce the costs of road maintenance considerably and others not only fail to reduce costs but are obliged to face year after year steadily increasing figures for annual maintenance, we should go most carefully into that part of the history of those particular roads which is likely to throw light upon the causes of these differences, entrusting the task of making comparisons and preparing reports to specially qualified engineers whose time would be devoted to these and kindred matters. There is no doubt at all that the practice in one county is in many instances far in advance of the practice in an adjoining or a distant county with respect to similar roads. More than that, there are large areas with similar physical characteristics which may be compared in a way entirely unfavourable to one if we consider the success of the local surveyors in meeting the demands of traffic in another. It is impossible to maintain that all these differences are due to differences in local conditions or in administration or in financial arrangements. As we have frequently pointed out, the best practice of one part of the country is not only not to be found, but is not recognised as a fact, in other parts of the country. The best that can be done with a road crust of ample thickness and made with suitably graded road metal, larger binder and, when necessary, smaller binder, has simply never been approached in some counties. As regards the due proportion of soft binder, Mr. Baxter's remarks are very well worth consideration, and nothing that we have said in favour of the general practice of using considerable quantities of soft binder for roads of a certain class is really contrary to the contention of Mr. Baxter, that on the whole a great deal too much soft binder is used in the construction of road crusts for important roads. A very significant passage is that in which the size of road metal is specified as being determined by the size of a hole, or a *larger* size of a hole in an inclined screen, suggesting the need for definite standards. With Mr. Baxter's criticisms of surveyors generally we are not specially concerned. We leave it to our readers where they feel attacked to reply to definite criticisms and to show, if they deem it necessary, that Mr. Baxter's specific recommendations are either not generally applicable or are wrong.

The Sewerage of New York.

We give elsewhere the suggestion contained in the third preliminary report of the Metropolitan Sewerage Commission of New York. It may probably be taken that the recommendations now made for the disposal of the sewage of the Jamaica Bay division are typical of those which will later be made in the final report for the whole city. In the first report the possibility of collecting all the sewage of New York to one central point for disposal was discussed, with the result that it was found to be impracticable on the ground of expense. The division of the city into several independent areas each with its separate outfall was proposed as an alternative, the possibility of combination at some future date being kept in mind. The second report described the four principal drainage divisions and their requirements. It was pointed out the extent to which New York Harbour needs to be protected is of fundamental importance; that this should be accomplished by means of large collecting sewers and central stations, at which the sewage should be collected and from which it should be discharged after it had received the necessary degree of purification. Further the commission found that

it would not be necessary to keep all sewage out of the harbour, seeing that these waters can absorb a large amount of sewage harmlessly and inoffensively. On the other hand the importance of safeguarding the extensive shellfish interests in Jamaica Bay was emphasised, and one looked forward to the description of some special method of treatment, at any rate for this division.

The commission have, however, only to keep before them the importance of discharging the sewage with a minimum amount of treatment without producing conditions injurious to the public health and welfare, and in the report under consideration they show that, owing to the almost certain development of the shores of Jamaica Bay in order to increase the shipping facilities of New York, it will be practically impossible to use the bay for pleasure purposes and for shellfish culture. Thus, while they do not quite give up the idea of very elaborate sewage disposal works capable of discharging an effluent harmless to shellfish, their estimate only includes settling tanks, filters, and subsidence basins, while all storm water in excess of the ordinary dry-weather flow will have a free outlet after screening. The sludge, which is of course the crux of the whole matter, is to be used to fill in marsh land near the disposal plant, or, if preferred, it can be dumped at sea. One cannot avoid a feeling of disappointment that the commission, after inferring that it would be practically possible to purify the sewage to such a degree that it could be safely discharged in the vicinity of oyster beds, should have come to the conclusion that it will only be necessary to filter the dry-weather flow. Also it seems hardly possible that the dumping of vast quantities of sludge on to the marsh land can be a satisfactory method of getting rid of it. It is well, however, to bear in mind the words of the second report, to the effect that the possibility that a more complete system of protecting the waters may be needed in the distant future, and that this possibility must be kept in mind in preparing the plans. There can be no doubt that, if the shellfish and pleasure uses of the Bay are to be put out of consideration, the proposals of the commission are justified, but experience elsewhere would point to the desirability of dumping the sludge out at sea rather than allowing it to accumulate on land.

* * *

A Marylebone Report.

We have received a copy of the last annual report of Dr. Charles Porter, the medical officer of health of Marylebone, which shows that a vast amount of routine and special work has been accomplished by the Health Department during the year under review. The report contains a considerable amount of statistical information which, while being of great public importance, has no special interest for our readers. On the other hand, some of the matters dealt with, such as water supply, housing and combined drainage directly affect both the public health and the engineers' departments. The very useful power given to metropolitan borough councils by the London County Council (General Powers) Act, 1907, to require the provision of a supply of water to the upper storeys of tenement houses has been used with very beneficial results in Marylebone. During 1911 no fewer than 327 such supplies were provided, and in no case was it necessary to issue a summons against the owner. In regard to housing, too, Dr. Porter and his staff have displayed considerable activity. During the year the work of house-to-house inspection has proceeded steadily and has become more distinctly established as one of the routine parts of the administration of the department. The *modus operandi* is as follows: the house-to-house inspector receives his instructions to examine the houses in a certain street, the "sanitary survey" sheets, prepared by the district inspectors, serving as a guide to the streets calling for attention; houses in which defects are noted by him are referred to the district inspectors; the conditions are further investigated by them, notices served and follow-up visits paid till the defects are remedied and the matter written off. Effects of the utmost value in connection with housing have been produced as a result of this work. Numbers of defects have been found which have been remedied under the powers granted by the Public Health Act. Great improvements have also been produced as a result of indirect pressure brought to bear upon owners, who, to avoid the possibility of action being taken in reference to their property under the closing and demolition sections of the Housing, Town Planning, &c., Act, 1909, consented to carry out considerable alterations or even voluntarily to close the premises. In regard to combined drainage, the report shows that Marylebone, in common with the other metropolitan boroughs, finds itself saddled with the cost of maintaining as "sewers" many pipes which were intended as private drains. This admittedly unjust state of affairs must, however, continue pending special legislation dealing with the subject. It only remains to say that the vital statistics of the borough are satisfactory.

* * *

An Attack on the Leadgate Surveyor.

To the eccentricities of human nature, oral and caligraphic, there is no end, but at first blush it would almost seem that a medical gentleman, Dr. Grainger, of Leadgate, had reached something like the finality of extravagant literary style in a letter impugning the character and professional conduct of the surveyor, Mr. W. Robson, which he has sent to the Leadgate Urban District Council. The matter at issue was the conversion of a house owned by Dr. Grainger into two tenements. Mr. Robson had recommended that, owing to the totally inadequate sanitary arrangements for two families, notice should be served on the owner to abate the alleged nuisance by removing one of the tenants. Dr. Grainger's commentary upon this was so extraordinary in tone and style that the councillors, one and all, did not hesitate to describe it as insolent. The author of the epistle opened by alleging that the surveyor had already expressed his approval of the property, and he then proceeded to dot the i's and cross the t's in these choice terms: "I cannot for the life of me see wherein lies his (Mr. Robson's) consistency or his honesty, much less his sincerity, decency, or manliness. Either his tongue or his pen has played the fool with his brain." The letter is punctuated with a series of metaphoric sarcasms, including such phrases as "mad impulse to stagger humanity," "garbled verbosity," "work of an evil mind," "mental twist that should be put under restraint," and "some whim bred of fancy," all directed with the deadly precision of Dreadnought gunnery at the person of the surveyor. The council, obviously not without good reason, characterised the letter as grossly insulting, and concluded to forward it to the Local Government Board. Mr. Robson was, of course, easily cleared of any imputation upon his personal or professional character. One councillor stated that he remembered distinctly what Mr. Robson told the sanitary committee, and he had said the same thing that night. "He felt sure," he added amid the applause of the members, "that the council would exonerate Mr. Robson from all blame in the matter. It was a shame that Mr. Robson, or any of their officers, should be insulted in that unwarrantable and uncalled-for manner, and more especially from a member of an honourable profession."

* * *

Extraordinary Traffic.

The law relating to extraordinary traffic is in itself not a little obscure, and the cases which from time to time arise for decision are usually further complicated by conflicting evidence as to the facts. Such cases are of peculiar importance and interest

just now in view of the fact that heavy mechanically propelled traffic is undoubtedly generally on the increase. We make no apology, therefore, for directing attention to the case heard by Mr. Justice Bray at the Cambridge Assizes, in which the Cambridgeshire County Council sought to recover damages for injury caused to the public highways under their control by heavy traction engines drawing trucks laden with gravel. The defendants' main contention appears to have been that the road in question had been "starved" for several years, so that it was not fit to bear traffic of the kind complained of, which it was submitted was now usual traffic. It was further argued that it was the duty of the council to anticipate and provide for future increased use of a highway. In our view, however, the law was more accurately stated by the plaintiffs' counsel, who submitted that the duty of a highway authority with regard to the maintenance of a road was no greater and no more than to keep it in a state fit for the traffic which it had to bear for the time being. It was further argued on behalf of the defendants that the gravel industry was an ordinary and recognised industry of the neighbourhood, and that the defendants were carrying it on in the ordinary and recognised manner and were therefore, on the authority of *Rayha Highway Board* v. *Monmouth Steam Company*, 1881, 46 J.P., 598, free from liability. The services of the jury were dispensed with at the commencement of the case, so that it fell to the learned judge to decide questions of fact as well as of law, and in the result he gave judgment for the county council and awarded them £534 damages and costs.

* * *

Traction Engines v. Roads.

It would appear to be a universal cosmic law that every form of created thing has some opposing force deliberately and cunningly designed to bring about its speedy destruction—for example, we have cats *v.* mice, Persians *v.* Babylonians, and traction engines *v.* roads; but it is with the last-mentioned antagonistic couple that we are at present more particularly interested. Without running any risk of being unduly complimentary, there is no manner of doubt that that huge, ugly, ponderous monster the traction engine—so common in some parts of the country, is the arch-enemy of road engineers. This unwieldy form of conveyance, with its three lumbering, rickety, and much overloaded trucks trailing behind, is, to the sorrow and regret of all road-makers, unusually common in the county of Kent, where frequent evidence is to be seen of the serious destruction to road surfaces, particularly those coated with tar-macadam. While we are in no sense opposed to mechanical traction of proper form and design, we see no real justification for so cumbrous and destructive a form of transport as the type named. The material to be conveyed is usually such as can be very readily divided up into small parcels or units, such as stone, gravel, bricks and so forth, and it is, perhaps, some small source of comfort to know that the lighter and quicker travelling form of mechanical tractor is fast taking the place of the heavy type of traction engine. There is little doubt that every ratepayer and road engineer will devoutly pray—may they all speedily wear out!

* * *

Sanitary Progress in Dumfries.

In addressing the Annual Congress of the Sanitary Inspectors' Association of Scotland, which was held this year at Dumfries, Mr. John Barker, the burgh surveyor, proceeded upon somewhat unconventional lines and made a most interesting excursion into the past history of this ancient town from a sanitary point of view. The records of the council are available from the early days of the sixteenth century, and the extracts which Mr. Barker quoted revealed a condition of affairs which ought to make the present-day inhabitants devoutly thankful for the achievements of modern health science. The existence of a permanent sanitary staff in the service of the municipal authority for Dumfries dates from the year 1704, when George Miller, "indueller in this brugh," was appointed "scaffinger thereof," and it was ordained that the inhabitants should have "tymeous advertisement" of his approach "by touk of drum." It was not, however, until the fearful lessons of the cholera visitations of 1832 and 1848 had been taken to heart that sanitary administration began to develop on modern lines. Even then there was determined opposition to the inauguration of a comprehensive scheme of water supply. This was at last successfully overcome and the works were completed in 1851. They have been improved from time to time and have now reached a high standard of efficiency. Between 1864 and 1871 the problem of drainage was seriously tackled, and since that time there has been continuous extension and improvement, practically the whole of the burgh being now well drained. In 1900 a scheme of sewage purification was undertaken at a cost of over £40,000, and these works are at present in excellent order. Dumfries may now claim to be thoroughly up to date as regards sanitation, and the efficiency which characterises its municipal administration reflects great credit upon all concerned.

* * *

Concrete Paving: Expansion Joints.

The notes from an account of experience with concrete paving in an Iowa city which will be found on another page of this issue relate, as far as results are concerned, almost exclusively to residential streets, the paving of which is receiving much attention in America just now. The drawbacks to the use of monolithic concrete are so well known by some of us that it is not a matter for surprise that the commissioner of Davenport found it desirable to reduce the sizes of his concrete slabs; and some of our readers will perceive that his experience suggests very strongly the advantages of paving with blocks rather than with large slabs. Mr. Compton thinks that as soon as actual tests have proved some scheme for protecting expansion joints, concrete paving will be a success; but another solution is to make the joints so small that they will not need to be protected. This is achieved, with stone, by making small blocks with joints as thin, or almost as thin, as it is possible to get them. Whether it will be found to be good practice to make some compromise between the block method and the large slab method, with wide expansion joints, remains to be seen. The suitability of concrete for a road crust is a separate matter which need not be considered in the present connection, but it may be pointed out that a sand-cement mortar is by no means likely to provide a satisfactory wearing layer.

* * *

A Batley Accident.

An unsuccessful claim against the Batley Corporation was recently made in the Dewsbury County Court. It appears that the corporation have acquired some property which includes some old cellar dwellings, for the purpose of effecting an improvement in Commercial-street. These cellar dwellings are not fenced off from the footpath, and the first step down encroaches nearly a foot on the public way. The plaintiff in the case claimed damages in respect of injuries which he sustained by falling down the steps when passing along the street at about 11 o'clock on the night of November 3rd. The case contained one or two curious features, as the plaintiff did not consult a doctor for some weeks after the accident, and it further appeared that an injury to his hand which had been included in his original claim was not due to the accident at all. The plaintiff was ultimately non-suited on the ground that there was no obligation on an owner to fence property adjoining a highway.

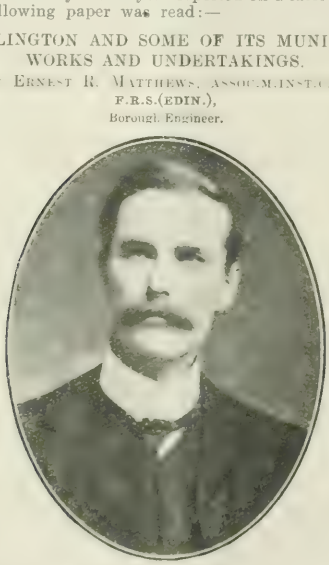
Institution of Municipal and County Engineers.

NORTH-EASTERN DISTRICT MEETING AT BRIDLINGTON.

An altogether pleasant time was spent by those members of the Institution of Municipal and County Engineers who took part in the district meeting of that body on Saturday last. During the greater part of the day the weather was all that could be desired, and the visits which followed the business proceedings were carried out according to the programme laid down. In addition to an account of the municipal works of the town furnished by the borough engineer, Mr. E. R. Matthews, a paper descriptive of the town's waterworks was submitted by Councillor Charlesworth, an interesting discussion following the presentation of the two contributions. The members were the guests of Mr. Frank Massie, the district chairman of the institution, at a luncheon given at the Britannia Hotel, and in the course of the afternoon inspections were made of the Royal Prince's Parade, the Victoria sea defences, waterworks, and other undertakings. Those present at the meeting included: Messrs. A. Beaumont (Beverley), T. C. Beaumont (Driffield), J. E. H. Burton (Wakefield), H. T. Calvert (Wakefield), S. Charlesworth (Bridlington), S. R. Crofts (Bridlington), J. H. Drew (Wath-upon-Dearne), S. Dyer (Bridlington), A. E. Everingham (Bridlington), P. Gaskell (Hull), W. Gibson (Bridlington), A. D. Greatorex (West Bromwich), president, A. E. Green (Castleford), W. Green (Castleford), J. S. Grunwell (Bridlington), J. T. Hill (Bridlington), F. M. Hindle (Chadderton), C. J. Hodgson (Otley), A. Hudson (Wakefield), W. Hudson (Bridlington), J. S. Hurst (Bridlington), L. Ives (Wakefield), J. A. Iveson (Scarborough), A. Light (Otley), F. E. Massie (Wakefield), S. Mason (Grimsby), A. E. Matthews (Bridlington), E. R. Matthews (Bridlington), H. H. Oakes (Ventnor), E. Picker (Beverley), H. Richardson (Scarborough), A. J. Roussell (Whitley and Monkseaton), E. J. Silcock (Westminster and Leeds), J. F. Smillie (Tynemouth), H. W. Smith (Scarborough), J. G. Smith (Beverley), C. G. Southcott (Bridlington), J. Southwart (Rothwell), T. J. Trowsdale (Annfield Plain), T. L. Watchman (Annfield Plain), and W. Welburn (Middleton). Following the official reception of the members by the mayor—reported on a later page—the following paper was read:—

BRIDLINGTON AND SOME OF ITS MUNICIPAL WORKS AND UNDERTAKINGS.

By Ernest R. Matthews, Assoc.M.Inst.C.E., F.R.S.(Edin.),
Borough Engineer.



Bridlington, although one of the oldest corporate towns in the country, is nevertheless one of the most popular health resorts. The town lies due east and its sea front stretches along the shores of one of the finest bays to be found around the coasts, having as Brid[illegible] Head at its north end, and Flamborough Head at its south, the noble promontory which has proved a harbour of refuge for so many mariners during northerly gales. Immediately to the north of Flamborough are Bempton and Speeton where the cliffs rise in places to over 400 ft. The quay existed as a port in Norman times, being mentioned in the charter of King Stephen, confirming to the priory the revenues of the harbour.

PLACES OF INTEREST IN AND NEAR BRIDLINGTON.

Bridlington Priory. — The Augustinian Priory of Bridlington was founded by Walter de Gant, the Norman Lord of Bridlington, in the reign of Henry I. Its charter included the revenues of the harbour, which King Stephen confirmed, with the right to all wrecks on the Flamborough coast. It gradually acquired the rectories of the surrounding parishes, including Filey and Scarborough, and lands in almost every parish in this part of the East Riding. Its nearness to the coast rendering the priory subject to

Mr. J. S. Hurst.
Deputy Borough Surveyor, Bridlington.

descents of sea rovers, it was fortified in the fourteenth century. Of its defences there remains only the principal gateway, there having been originally three others. The church in its present form consists of a nave and side aisles with two western towers. Its dimensions are: Length, 185 ft.; breadth, 78 ft.; height, 70 ft. The original design appears to have been similar to that of Beverley Minster, and the dimensions not inferior.

The Bayle Gate.—The priory entrance, known as the Bayle Gate, near the north end of St. John-street, spans the approach to the precincts of the church. It has two archways, the main and a small side postern, each with beautiful recessed mouldings. Over the main arch is a shield with the three B's, the priory arms. The tower is of three low storeys, the two lower pierced for archery, the upper having three small Early Perpendicular windows. Four buttresses, dividing the front of the tower into three parts, complete the feature of an extremely simple but exquisite architectural composition. The lower rooms of the tower, formerly the porter's lodge and manorial prison, became in later times the town kydcott or lock-up; and the upper chamber, which was the prior's manorial court, became the meeting-place of the lord's feoffees for the transaction of their business. The vista through the main archway towards the western façade and south side of the church is one of the most beautiful views of the kind in England.

Danes' Dyke. This prehistoric wonder is a vast entrenchment, somewhat of the same kind as those which are found in various parts of the Yorkshire wolds. The many flint implements found here in experimental excavations prove that it is of an age earlier than that of the ancient Britons. Danes' Dyke can be easily reached by a short walk about 2 miles along the cliffs in a northerly direction from Bridlington.

Holderness Coast—Coast Erosion.—The coast line extending in a southerly direction from Bridlington to Spurn, about 35 miles in length, is known as the

Holderness Coast of Yorkshire, and has been discussed more than any other portion of our coasts, for the average rate of erosion on this coast is about 11 ft. per annum, and greater than found elsewhere. Many towns and villages which were previously located here have long since disappeared, the sites of some of them being now covered by several fathoms of water at high tide.

When giving evidence before the Royal Commission on Coast Erosion some time ago, the author stated that he estimated that 1 904,194 tons of cliff were washed away annually from this coast, and that since the Roman invasion 115 square miles of land had disappeared between Flamborough Head and Spurn; also that the coast line at that time was about 3 miles further seaward than at present.*

As to the erosion, what is actually taking place is as follows. The boulder clay composing the Holderness cliffs consists of clay, sand, gravel and larger stones; the pummelling action of a wave at the base of the cliff in a short time causes huge fissures to occur in the cliff—these in time open out, until a mass of the cliff falls on to the foreshore. The action of the sea on this is to disintegrate the mass, washing away the sand and fine gravel, and converting the clay into mud, which is also washed away. The larger stones and coarse gravel remain, and these are washed up to the foot of the cliff, affording in a small degree a sort of natural protection to the cliff. Some of the extensive sea defence works (designed by the author) erected during the past few years will be described later. Other places of interest near Bridlington include—

Rudstone (about 6 miles from Bridlington).—In the churchyard of this village, near the north-east corner, is a wonderful monolith of great antiquity, standing some 25 ft. high, and tapering gracefully to the summit; it is said to extend as far below ground as it rises above it. The church has a Norman tower and is itself of great beauty.

Flamborough Caves and Rocks.—A great feature of Flamborough Head is its caves, which are approached by boat from the north landing, and its lighthouse near the south landing. Scores of conveyances (motor and horse) leave Bridlington daily during the season for Flamborough, the charges being: Motor chars-à-banc 1s. 3d. return, horse chars-à-banc 1s. return.

Bempton, Speeton and Burton Agnes.—These are interesting villages a few miles from Bridlington and are well worthy of a visit. The two first-named are the home of the birds' eggs collecting industry.

Filey, Scarborough, and Beverley are also within easy reach of Bridlington.

Other places of interest in Bridlington include the Royal Prince's Parade owned by the corporation, the new spa and gardens, the harbour, and the unsurpassed sands (the children's playground).

GENERAL STATISTICS.

The resident population of Bridlington is 15,000 (if the census had been taken a month later it would have been about 17,000, so many houses being locked up for the winter), the sleeping population during the height of the season being nearly or quite 60,000.

Borough incorporated 1899; rateable value (1912), £96,405; area of borough, 2,751 acres.

Death-rate (1911), 14·81; birth-rate (1911), 20·09.

The rainfall for 1911 was 26·44 in.; the average rainfall for the past five years, 26·55 in.; hours of sunshine (1911), 1,755.

Number of houses in the borough, 4,018, of which only about 40 are empty. Number erected during the past 13 years, 1,200.

Levels: between 21 ft. and 200 ft. above ordnance datum.

Rates.—District rate 7s. 10d.; poor rate (including the county and other small rates and borough rate (3d.), 2s. 6d.; total, 6s. 4d.

SEWERAGE AND SEWAGE DISPOSAL.

Sewerage System.—Up to the year 1878 the drainage system of the district was most defective, several old brick culverts with flat bottoms and arched tops, and built in 4½-in. brickwork with open joints, forming the main sewers of the town. The outfalls were into the harbour and direct on to the north foreshore respectively. The matter came before the Local Board in the year named for their serious consideration, the result being that they instructed Messrs. Brierly & Holt, civil engineers, of Hull, to prepare a main drainage scheme. This they did, and the Local Government Board held an inquiry the same year and sanctioned it, the estimated cost being £11,000. At that time there were in the district only 690 water-closets. This number has since increased to 3,427. The percentage of water-closets to number of houses in 1880 was 33, in 1899 it was 60, to-day it is 80; water-closets have to be put into all new houses. Under this scheme the total length of sewers put in was about 6½ miles, including a 24-in. cast-iron pipe outfall. Several old existing pipe sewers were picked up in connection with the new system.

Between 1880 and 1899 the town developed very rapidly, the population increasing from 7,760 to 12,482. During this period 12 miles of additional sewers were laid and connected up to the main drainage system, and a 12-in. cast-iron pipe outfall was also laid on the north foreshore at the extremity of the borough, and extending well below low-water ordinary spring tides. To this outfall a number of sewers in that part of the town were connected.

In 1899 the author was instructed to examine the sewers in the borough and report as to their efficiency; this he did, and presented a scheme for the remodelling of the system, which included the laying of over 2 miles of surface-water sewers, the construction of 3-ft. by 4-ft. 6-in. in place of 2-ft. by 3-ft. egg-shaped sewers (Fig. 1), and 2-ft. 4-in. by 3-ft. 6-in. egg-shaped sewers in place of 24-in. pipe sewers; also the enlargement of a number of other sewers, the construction of a new screen chamber on the south side of the harbour, the reconstruction of the old screen chamber, and the laying of a new 30-in. cast-iron flanged outfall sewer under the south pier and across the sands in a southerly direction to low-water mark of ordinary spring tides, discharging within a few feet of the old outfall sewer. The outer 615 ft. of the outfall is carried by 12-in. by 12-in. piles (pitch pine), as shown by the drawings.

The scheme also included the putting in of a large number of additional manholes and lampholes, and the building of fourteen automatic flushing tanks, these discharging from 300 to 500 gallons each; twelve additional ventilating shafts were also erected.

The Local Government Board sanctioned this scheme in 1900; the contract was let forthwith, and the whole of the work has now been completed, the total cost being about £12,000.

The redrainage of the Hilderthorpe district was not included in this scheme, but the rapid development of that part of the borough during the past five years has recently necessitated the taking up of several of the sewers and substituting larger ones, and this work has just been completed at a cost of £650. Thus the South Cliff-road 18-in. pipe sewer has been replaced by a 30-in. sewer of concrete tubes laid 4 ft. deeper than the old sewer. The 15-in. pipe sewer in Pembroke-terrace roadway has been replaced by a 24-in. sewer of concrete tubes; these also are laid 4 ft. deeper than the old sewer. A new 15-in. stoneware pipe sewer has also been laid in Hornsea-avenue. New manholes have been built in place of the old ones, and several additional manholes have been added. During the summer months the sewage is screened before being turned into the sea. It discharges at all states of the tide.

WATERWORKS.

The Bridlington waterworks were established in 1865 by the Bridlington and Quay Water Company, Limited, and the works were purchased by the corporation in 1899, the amount borrowed being £70,000. Some important extensions and improvements, costing about £13,000, have recently been carried out, and in connection with these Mr. F. J. Bancroft, B.SC., M.INST.C.E., was engaged to advise the committee. The new pumping station was designed by the author (see Fig. 2), and may be briefly described as follows:—

The cost of these buildings was £2,400, which works out at 4½d. per cubic foot.

Engine-House.—Floor area, 54 ft. by 28 ft. equals 1,512 ft. super. Height, from upper floor level to underside of girders carrying overhead crane, 14 ft. 3 in.; height to bottom of steel roof trusses, 21 ft. 3 in.; height between bottom and top floors, 9 ft. 6 in.

Boiler-House.—Floor area, 55 ft. by 23 ft. equals 1,265 ft. super. Height (to eaves), 17 ft.

Coal Shed.—Floor area, 42 ft. by 20 ft. 6 in. equals 861 ft. super. Height (to eaves), 11 ft.

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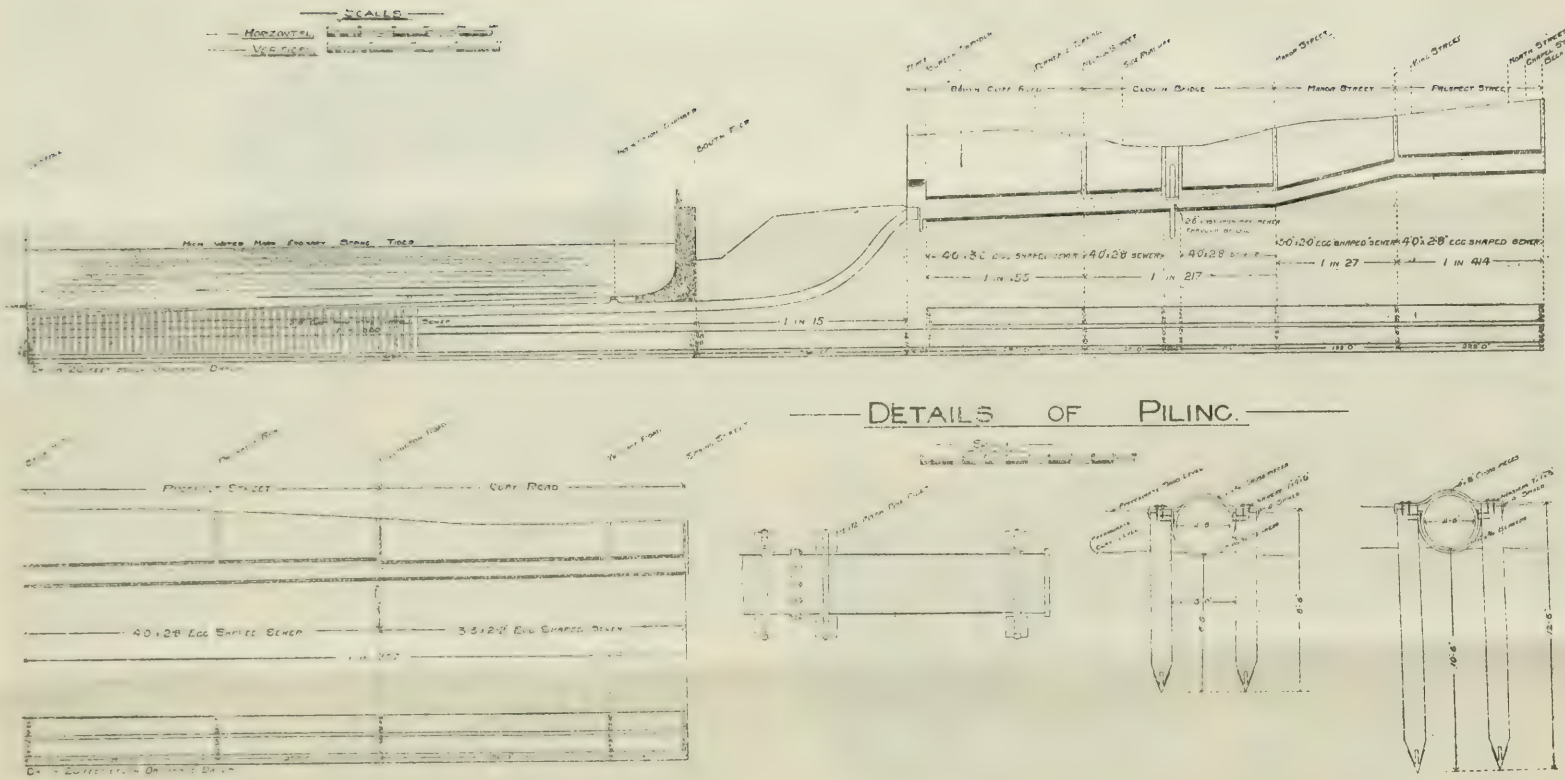
* Further information on the subject will be found in "Erosion on the Holderness Coast of Yorkshire," by E. R. Matthews (Min. Proc. Inst. C.E. 1904-5); "Coast Erosion and Protection," by E. R. Matthews (*Engineering*); "Towns and Villages which have Disappeared from the Yorkshire Coast," by E. R. Matthews (*Contractors' Record*, June 16, 1909).



REMODELLING OF SEWERAGE SYSTEM, BRIDLINGTON.

(Plate 1.)

Workshop.—Floor area, 29 ft. 6 in. by 20 ft. equals 590 ft. super. Height, 12 ft. 6 in.

The works have been properly drained into the corporation sewer in Scarborough-road. For a fuller description of these buildings see THE SURVEYOR.*

The new machinery has been put in under the supervision of the waterworks manager, Mr. Walter Gibson, who has devoted much care and attention to the overlooking of this important work. The new plant will be described in a paper to be read by Mr. Councillor S. Charlesworth (retired mechanical engineer), deputy-chairman of the Waterworks Committee, and a member of the Works Sub-Committee. The mayor, Mr. Alderman L. Mainprize, J.P., is the chairman of this committee.

STREETS AND ROADS.

The length of roads maintained by the corporation is 33 miles. In the quay portion of the borough some of the streets are very wide, Queen-street being 85 ft. in width, Prince-street 100 ft., and Promenade 60 ft.

Tar-Macadam Roads.—There are several miles of tar-macadam roads, and these consist of 2-in. Scotch granite mixed with boiling tar, and laid to a thickness of 4 in. upon a foundation of brickbats; in some cases where the traffic is heavy the centre of the road has a thickness of 6 in. of tar-macadam. A sprinkling of whinstone chips, and in some cases of fine sea gravel, is added while the road is being rolled.

Where there is light traffic, the top layer of tar-macadam consists of 1½-in. stone. The author has erected a furnace and tar-mixing shed, where the materials are dried before mixing.

Ordinary Macadam Roads.—The macadam roads of the town, for the most part, have a chalk foundation; and, where the thickness of metal in the road is not considerable, in severe frosts the expansion of the chalk causes the road to break up. Two-inch and 2½-in. whinstone, obtained from Messrs. Ord & Maddison, of Darlington, is used for the metalling of the roads.

Tar Surface Treatment.—A great many of the roads in the quay portion of the borough have their surfaces tarred, and this is found to be very beneficial in allaying the dust and lessening the noise caused by the traffic on such roads. The method adopted in tarring the roads is as follows:—

A gang of men, eight in number, first sweep the road surface, the tar (cold) is then applied to the road by hand with ordinary brushes. The work only proceeds when the weather is most favourable, hot, sunny days being selected for this. On top of the tar thus applied ¼-in. screened whinstone chips are then spread, or ¾-in. screened slag, and these are rolled in by a 10-ton steam roller, and the traffic is allowed on the road almost immediately. Tar surface treatment is only applied to roads that are in a good state of repair. The corporation have recently asked the county council to purchase for them a tar-spraying machine.

Tar-paved Footpaths.—Most of the footpaths in the borough are tar paved, the surface being retarred about once in every three years; the tar is applied by hand, limestone dust is spread on the surface, and is rolled in by a 15-cwt. hand roller.

Flagging.—In many of the streets the footpaths are paved with York stone flags, and in a number of the principal business streets the author has laid 2½-in. "Non-slip" artificial stone flags, which, in his opinion, are preferable to ordinary York stone flags. Good examples of work of this kind may be seen in Prince-street, Bridge-street, Cross-street and St. John-street. The cost of laying these flags is given later in a tabulated statement.

Asphalt Footpaths.—The asphalt footpaths consist of tarred limestone laid to a depth of 2 in., and put on in two layers, coarse and fine, and upon the surface of the footpath Derbyshire spar is sprinkled.

STREET WIDENINGS.

The corporation have spent a very great deal during the past ten years in carrying out street widenings and improvements.

Cross-street Widening.—Cross-street was widened from 19 ft. (building to building) to its present width of 50 ft., at a cost of £3,650. The road was covered with tar-macadam, laid in the manner previously described; 12-in. by 7-in. granite kerb was laid, 10-in. by 5-in. York stone channel, and the footpaths were flagged with 2½-in. "Non-slip" flags, and are 8 ft. 6 in. and 9 ft. in width respectively.

Bridge-street Widening.—This street was widened in 1903 from 24 ft. in its narrowest part to 50 ft. in its narrowest part, at a cost of £8,200—£5,084 of which came back by the re-sale of the building sites. A mass concrete retaining wall was built on the east side of the street, and upon this the fronts of the houses and business premises on that side of the street are built. The road and footpath were constructed similar to Cross-street, and this is now the principal street connecting the Quay and Hilderthorpe portions of the borough.

St. John-street Widening (Fig. 3).—This is by far the most important street widening which the corporation have undertaken, and has cost over £30,000. It has been necessary in carrying out this work to pull down about sixty houses, including a public-house and a chapel. Most of the surplus land has been re-sold; new lavatories have been built at the north end of the street, and the present average width of the road is 52 ft., compared with about 20 ft. previously; 8-ft. footpaths have been constructed on the east and west sides of the street. On the east side the footpath is flagged with "Nonslip" flags, and on the west it is covered with asphalt. The kerbing consists of 10-in. by 7-in. hard York stone kerb, and the channel 10-in. by 5-in. York stone. The road is metalled with 2-in. whinstone, laid to a depth of 6 in. on a good brick-bat foundation, which is 12 in. in thickness.

Corporation Horses and Carts.—The highways department have nine horses, which are stabled at the corporation depot, the stables being described later. Three of these horses are used for gathering street sweepings, and are light horses, which are used in connection with the fire brigade when required.

The highways department have to hire a good many horses, and the price paid per day for horse, cart and man is 7s., or if by mileage carting metal to outside roads, for example, the price is 8d. per ton per mile.

Cost of Materials.—(When by rail, includes delivery to Bridlington Station; or, if by boat, delivered into corporation carts):

CARRIAGEWAYS.	per ton. s. d.
2½-in. whinstone	11 3
2-in. ,,	11 6
1½-in. ,, ...	11 9
Whinstone chips .. .	7 1
Unbroken whinstone	9 6
2-in. Scotch granite (by boat)	8 6
Tar painting and coating with whinstone chips, 1½d. per sup. yd.	
Tar-macadam, 3s. per sup. yd.	
Brick bats, 2s. per load and cartage.	

FOOTWAYS.
Tar painting and coating with limestone dust or fine sea gravel, 1½d. sup. yd.
"Nonslip" flags, 6s. 2d. laid, or 5s. 6d. not laid.
2½-in. York flags the same as "Nonslip" flags.
Concrete *in situ*, 3s. 6d. per sup. yd.
Asphalt, 1s. 6d. per sup. yd.
10-in. by 7-in. kerb, 3s. 3d. per yd. laid.
10-in. by 5-in. channel, 2s. 5d. per yd. laid.
Limestone dust, 9s. per ton.
Sea gravel for concrete, 3s. 9d. per ton at depot.

Rates of Wages paid to Highways Workmen.—Road foremen (two), 29s. per week each; stable foreman, 29s. per week; road roller drivers, one at 28s., one at 26s. per week; mason, 8d. per hour; road sweepers, 23s. per week and 6d. per hour overtime; general labourers, 23s. per week and 6d. per hour overtime; cartmen, 23s. per week and 6d. per hour overtime; temporary men, 5½d. per hour. Number of hours worked per week, 55½ in summer and 50 hours in winter. Stone breakers, 3s. per ton, whinstone; cobbles, 2s. 6d.

The average number of men employed in the highways department, 50.

PRIVATE STREETS.

Private streets are made up and taken over under the Private Street Works Act, 1892. About forty-five of such streets have been taken over by the corporation since the author's appointment. On the south side of the town many of the roads, it will be seen, are in a deplorable condition, and there is no doubt some of these will be taken over in the near future.

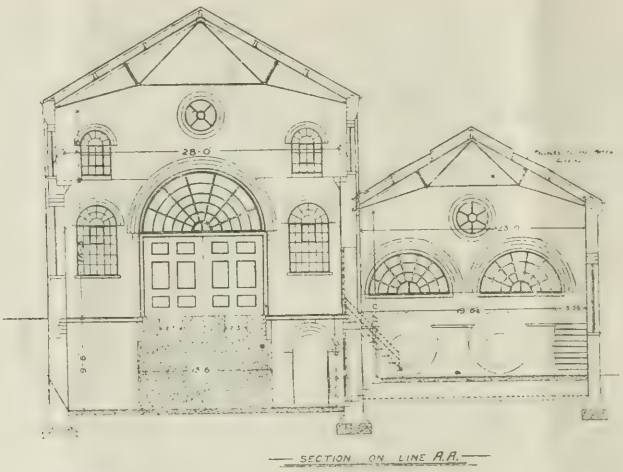
The method of constructing private streets (when being taken over) is the same as that already described in connection with the construction of St. John-street, except that the footpaths are all asphalted. The average cost of private street improvement works is 4s. 6d. per foot frontage. The work is carried out by direct labour. This may seem a very low figure, but in nearly every case the kerbing and channelling has already been put in.

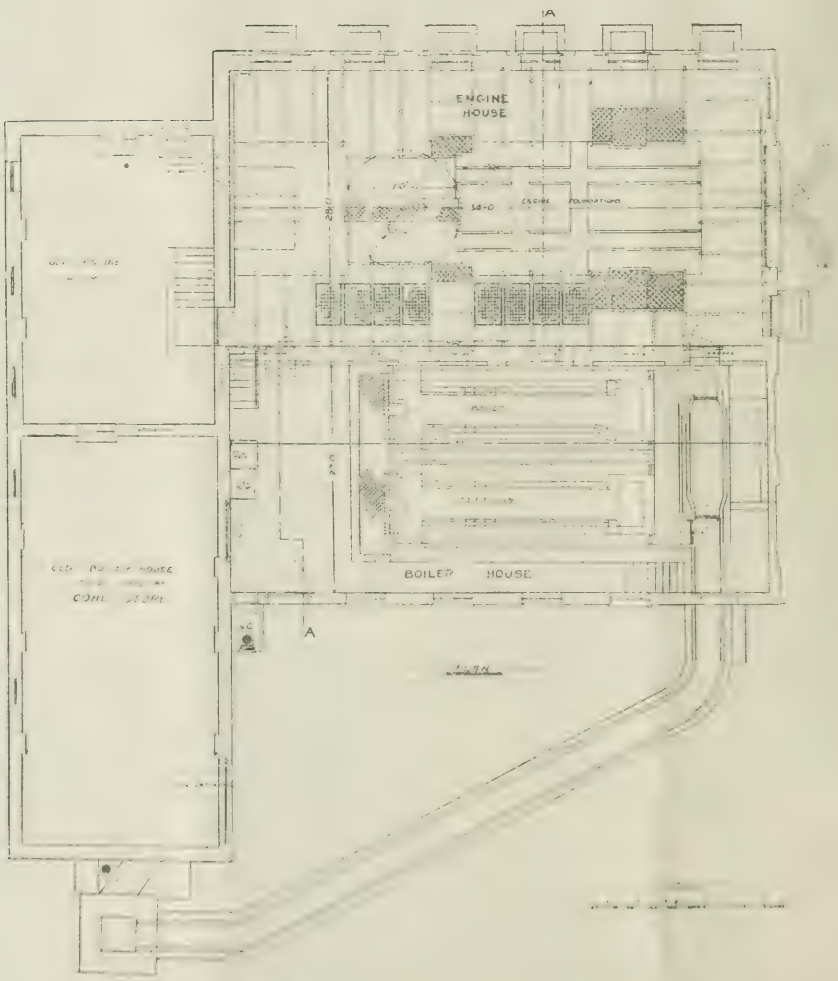
Back Roads.—A number of back roads have also been taken over; these have been covered with tarred macadam on a good brick-bat foundation, and they drain on to a centre channel.

SEA DEFENCE WORKS AND SEA FRONT IMPROVEMENT WORKS.

Bridlington has a frontage towards the sea of about 2 miles. 1 mile south of the harbour and 1 mile to the

* "Notes on the Designing of Modern Waterworks Pumping Stations," by E. R. Matthews, April 23, 1909.





Pumping Station Bridlington New W[illegible]

(Plate 2.)

north. The protection of the portion immediately to the south of the harbour has been carried out by private landowners *viz.*, Messrs. Whitaker Bros. Beyond this a sea wall has been erected by Mr. J. W. Pitt, but this sea defence is just outside of the borough.

On the north side of the borough the corporation have spent during the past forty years in protecting the town against the inroads of the sea and in carrying out sea front improvement works over £100,000, an amount which is larger than the rateable value of the borough.

The works carried out by the author include: The extension northwards and seawards of the Royal Prince's Parade, the construction of the Victoria sea defences, and of the southern portion of the Sewerby sea defences, and of the erection of seventeen groynes upon the foreshore (see Fig. 4). Space will not permit in this paper of a full description being given of these, so that if the members require any additional information on this subject they will find same upon reference to a paper read by the author before the Institution of Civil Engineers, in 1904, on "Erosion on the Holderness Coast of Yorkshire," and one read by him before the Society of Engineers in May, 1905, on "The Parade Extension Works at Bridlington," also in a series of articles on "Coast Erosion and Protection" appearing in *Engineering*.

Royal Prince's Parade.—This is undoubtedly one of the most popular places of resort at Bridlington. The massive sea wall, with the promenade and gardens at the back of same, were constructed about forty years ago, and power was obtained for the parade to be enclosed and a charge made for admission. Since that time, however, it has been so considerably improved and extended that those who have not seen this popular promenade for twenty years would scarcely recognise it to-day. There is covered accommodation for nearly 6,000 people; the grand pavilion at the north end of the parade seats 2,300; here the entertainments, under the supervision of the able manager, Mr. Chas. Palmer, are exceptionally good, some of the best troupes of artists that can be secured being engaged. The floral pavilion, so named because of the delightful manner in which it has been florally decorated by the town's gardener (Mr. S. R. Crofts, A.R.H.S.), also enables visitors to bid defiance to the weather; this building seats about 1,500 people, and it is here that Signor Scoma's well-known municipal orchestra plays during the height of the season three times daily. The Victoria Rooms, a small theatre at the south end of the parade, also provides further entertainment for the people in the shape of cinematograph shows; this theatre seats about 800 people, and has recently been reconstructed throughout, redecorated and re-seated, at a cost of about £400.

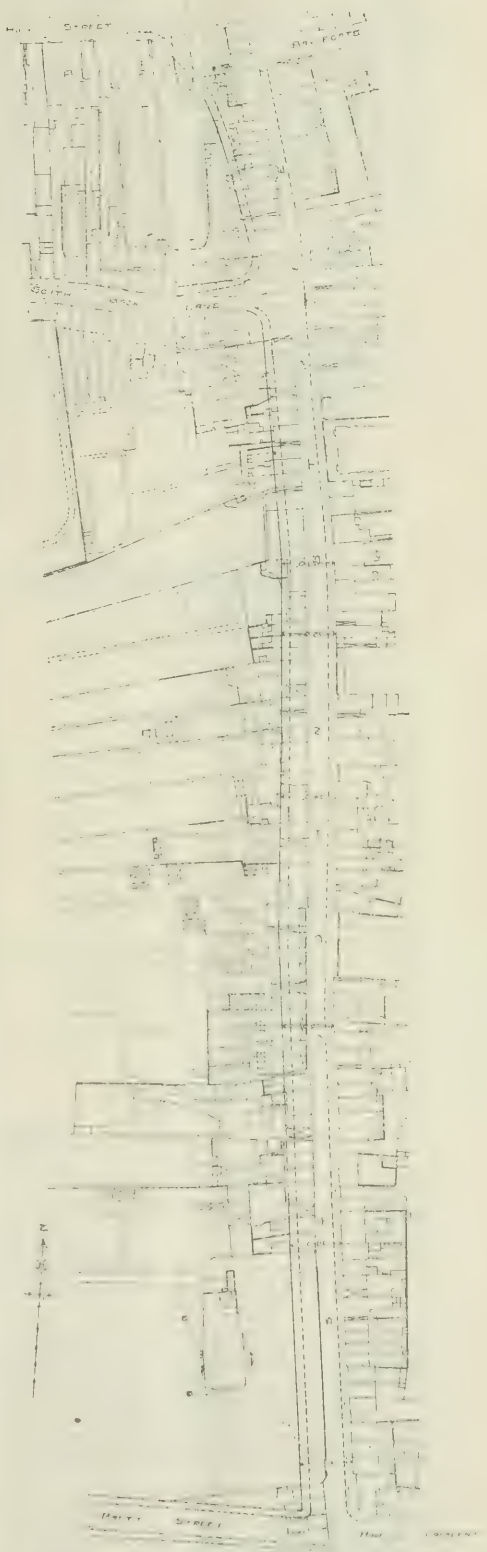
There are also several ornamental colonnades on the parade which afford further shelter.

The floral clock upon the parade is admired by many, and it keeps excellent time; and during the season of 1911 the floral crown designed by Mr. Crofts was a source of great interest. The parade is frequently the scene of fêtes, galas and illuminations, and, being lighted throughout with electric arc lamps, makes an ideal evening lounge. The takings on the parade for the year ending March 31, 1911, were £12,749; the number of tickets sold was 151,634, which does not include special tickets sold on gala nights. The profit was £3,314, and the amount handed over in the relief of rates was £1,750, which equals a rate of about 4½d. in the £, a 1d. rate producing £380.

The lower promenade on the parade has been re-asphalted throughout last spring at a cost of £253 or 1s. 5d. per. super. yard for the asphalting, the cost of preparing the foundations not being included in this. The work has been executed, under the author's supervision, by Messrs. Josiah Smart & Son, of Westminster, the specification being as follows: Total thickness of Derbyshire limestone asphalt, 2 in.; number of layers, two; size of spar sprinkling, ⅜-in.; size of stone in first layer of asphalt, 1 in.; in top layer ⅜-in.

The extension of the Royal Prince's Parade, which the members will no doubt inspect, and the construction of the Victoria sea defences immediately to the north of the parade, were completed in July, 1906, and formally opened, together with the Grand Pavilion, by the Lord Mayor and Sheriffs of the City of London, in the presence of the Lord Mayors and Mayors of most of the cities and boroughs of Yorkshire.

New Sea-Walls.—The new sea-walls are faced with Bramley Fall rock-faced stone, to match the old

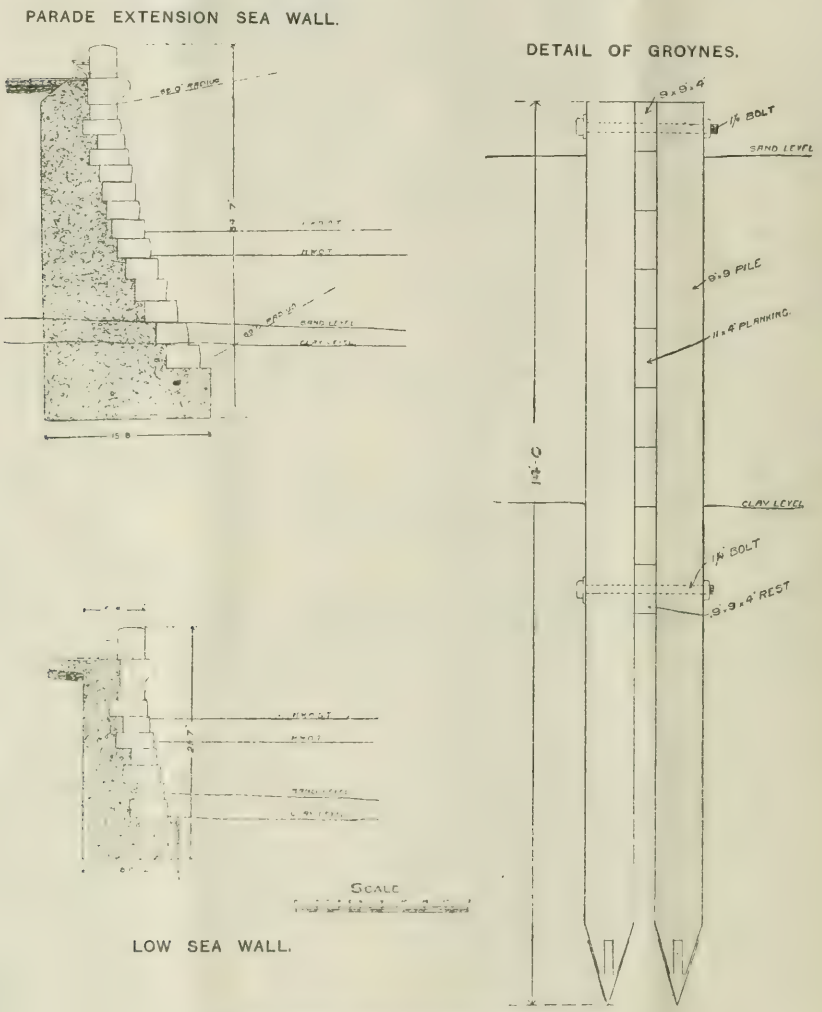


St. John-street Improvement, Bridlington.
(Plate 3.)

Prince's Parade sea-wall. They are built with a stepped face, which, in the author's opinion, is the best type of construction—he considers that where stone can be brought to the site at a fairly reasonable rate, that is the best form of sea wall to construct, as the first cost is the last. The old Prince's Parade wall, which was constructed, as previously stated, forty years ago, has not cost one penny in repairs, except for occasional pointing of the joints. Not only so, but the author's experience teaches him that a wall with a smooth face, especially if it be a curved face, creates a very much greater scour at the base than a wall similar to those under consideration, as the stepped face breaks the force of the wave and pletely tore out the outer half of one of the concrete blocks, and severely damaged several others."*

The cost of the improvements just named—that is, the Parade extension works, new Victoria sea defences, and the Grand Pavilion, was just over £40,000, the Grand Pavilion costing £12,000. This building was designed by Messrs. Mangnall & Littlewood, architects, Manchester, and was the selected competitive design. The foundations, which were of concrete and reinforced concrete, were put in by the author, and certain improvements to the building, particularly the balcony, have since been made by him.

Adjoining the pavilion is a commodious café, sur-



Bridlington Sea-wall and Groynes.

Plate 4.)

becoming a scour at the base of the wall very materially. Walls built of concrete *en bloc* the author appreciates, as they are a constant source of expense. The Alexandra sea-wall at Bridlington is of this construction and is a continual expense, the face of the wall having to be frequently repaired, only the pointing of last year costing £50 in repairs. The stone used in the new sea-walls at Bridlington came from the Leeds district, the railway rate being 6s. 6d. per ton.

* Undoubtedly the most suitable stone to face a sea-wall with is granite or basalt, especially where the foreshore is shelly shingle and H.W.O.S.T. rises to the wall. The author has known cases where a granite wall has been faced with concrete blocks and the force with which the shingle upon the shore was hurled against the wall during a heavy sea com-

mounded by a roof garden. These improvements and extensions were necessary owing to the increased popularity of the Parade.

The terraces at the back of the low sea-wall are paved with 2½-in. "Non-slip" stone flags on concrete; the steps leading from one terrace to the next are of granite, and those which are reached by the sea are of special construction. On the third terrace a large colonnade has been erected, which accommodates several hundreds of people, and the portion of the sea front, as you know, is open to the public.

Floral Pavilion.—The building was erected in 1905, from the designs of Messrs. Mangnall & Littlewood, and has since been considerably improved by the author. It is constructed of wood, iron and glass,

* "Coast Erosion and Protection," by E. R. Matthews (*Engineering*).

with glazed folding shutters at the ends of same, and is a favourite resort with both visitors and residents alike. The cost of the building, including the bandstand, was about £4,080. The Property Committee are now considering the advisability of extending this building, as it is found that if it were double the present size it would not be too large.

Other recent improvements on the Parade include new lavatories for both sexes, and a number of lock-up shops, while the floral clock before referred to and the delightful flower beds add to the charm of the place.

The charges for admission to the Parade are as follows: Day tickets, 6d.; week-end (Saturday to Monday), 1s. 3d.; Friday to Tuesday, 2s.; weekly, 2s. 6d.; fortnightly, 4s. 6d.; three weeks, 6s.; monthly, 7s. 6d.; season, 21s.; children half-price. Bath chairs and perambulators are charged for, and there is an extra fee to pay on the evenings when galas, including firework displays, &c., are in progress.

Groynes.—These may be briefly described as follows:

"The author recommended that the timber groynes adopted should extend seaward, 300 ft. from the sea-walls, but this distance was reduced to 200 ft., on account of the inconvenience which the longer groynes would cause to persons driving along the sands, as low-water mark of ordinary tides is only 390 ft. from the sea-walls. The groynes are constructed of pitch-pine piles and planking. The piles, 9 in. by 9 in., and 14 ft. in length, are shod with 18-lb. wrought-iron pile shoes, and are driven 8 ft. into the boulder clay in pairs, leaving a space of 4-in. between the piles. The pairs of piles are placed 7 ft. 6 in. apart, centre to centre. Planking, 11 in. by 4 in., is inserted in the spaces between the piles, the bottom plank being put down entirely into the clay. At every alternate set of piles a bearer is bolted on for the bottom plank to rest upon. At the intermediate sets of piles the bottom plank is bolted to the piles instead of resting on a bearer, the object being to save excavation around the piles as much as possible, so that their stability shall not be impaired. A crosspiece is fixed at the top of the piles to prevent the latter from rising. The groynes are so arranged that a depth not exceeding two planks usually projects above the sand level. As the sand accumulates, which it does most rapidly when the wind is blowing off-shore, additional planks are inserted, and the groyne is raised without any trouble. The planks are so arranged that one plank spans two bays, and the next three bays, and they are inserted so as to break joint."* The first four (experimental) groynes cost £718, or 18s. per lineal foot, and the remaining thirteen at the rate of 12s. 3d. per lineal foot. This was, however, an exceptionally low tender.

BOROUGH SANATORIUM.

The borough sanatorium, designed by the author, was erected in 1902 at a cost, including purchase of land, erection of buildings and boundary walling, drainage, oil engine, disinfector, road making, furnishing, &c., of about £4,900, or £272 per bed. The site is an admirable one for a sanatorium, being about a mile out of the town and in an elevated position. It is situated on the east side of Bempton-lane, and is from 131 ft. to 168 ft. above ordnance datum. The aspect of the site is south-westerly, and the subsoil consists of gravel on clay overlying chalk. There is plenty of room for extension, as the adjoining 7-acre field on the east side is the property of the corporation.

The buildings consist of scarlet fever pavilion, ward pavilion, observation block, administration block, laundry and disinfecting block, engine-house, stables, and carriage-house, mortuary, and caretaker's cottage.

The accommodation in both the scarlet fever and ward pavilions is for eight beds, and in the observation block for two beds, or a total accommodation for eighteen beds. The buildings are in red brick, with stone dressings. A proper system of drainage has been carried out, with inspection chambers at every deviation in line, and the drains connect into a 9-in. pipe sewer, which conveys the sewage and surface water into a septic tank. The water supply is from a well 8 ft. diameter and 150 ft. deep, sunk into the chalk. The water is pumped up into an overhead tank which is 7 ft. by 7 ft. by 3 ft. 6 in. in depth, and contains just over 1,000 gallons, or two days' supply for twenty-two persons, allowing 25 gallons per head per day.

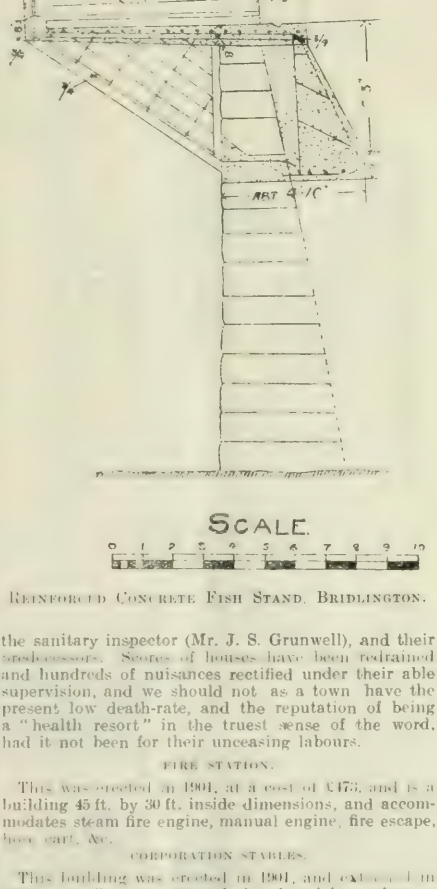
The pumps are worked by one of Crossley's Blake horse power oil engines. From the tank the water flows by gravitation to the various blocks. The wards are heated by hot-air slow-combustion stoves, placed in the centre of the wards. The laundry block is fitted up with wringing machines, stoneware wash troughs, steeping tanks, drying horses, ironing stove, ironing tables, and the usual requisite fittings.

A Thresh steam disinfector is provided in the disinfecting chamber. The present staff consists of a matron, two nurses, wards maid, cook, porter, and laundress.

The Sanitary Committee have recently instructed the author to prepare plans of a new ward block, an extension of the administration block, and the provision of private wards; these improvements he estimates will cost £1,500.

The medical officer of health is also the superintendent of the borough sanatorium.

Sanitary Improvements Generally.—Before leaving the reference to the sanitary improvements carried out in the borough during the past few years the author would not forget to draw your attention to the excellent work in this direction done by his colleagues, the present medical officer of health (Dr. A. K. Jarratt),



Reinforced Concrete Fish Stand, Bridlington.

the sanitary inspector (Mr. J. S. Grunwell), and their predecessors. Scores of houses have been redrained and hundreds of nuisances rectified under their able supervision, and we should not as a town have the present low death-rate, and the reputation of being a "health resort" in the truest sense of the word, had it not been for their unceasing labours.

FIRE STATION.

This was erected in 1901, at a cost of £473, and is a building 45 ft. by 30 ft. inside dimensions, and accommodates steam fire engine, manual engine, fire escape, hose cart, &c.

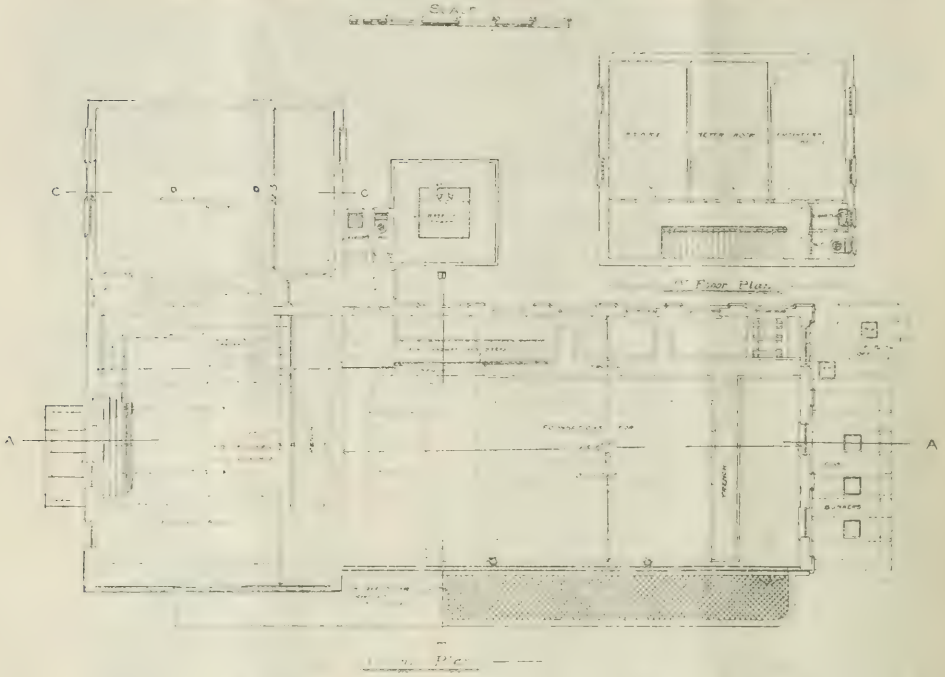
CORPORATION STABLES.

This building was erected in 1901, and extended in 1906, and affords accommodation for eighteen horses, the cost of the building, including extension, being £1,026.

PUBLIC NURSERIES.

These are situated off Quay-road, and adjoining the [illegible] depot, and [illegible] about 1½ acres. The building consists of five greenhouses and a large palm-house, with a great number of cold frames. It is interesting to know that during the past year (1911)

* "Erosion on the Holderness Coast of Yorkshire," by E. R. Matthews ("Minutes of Proceedings," Institution of Civil Engineers, 1910).



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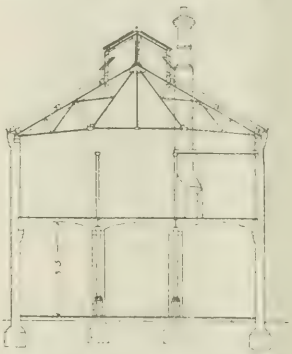

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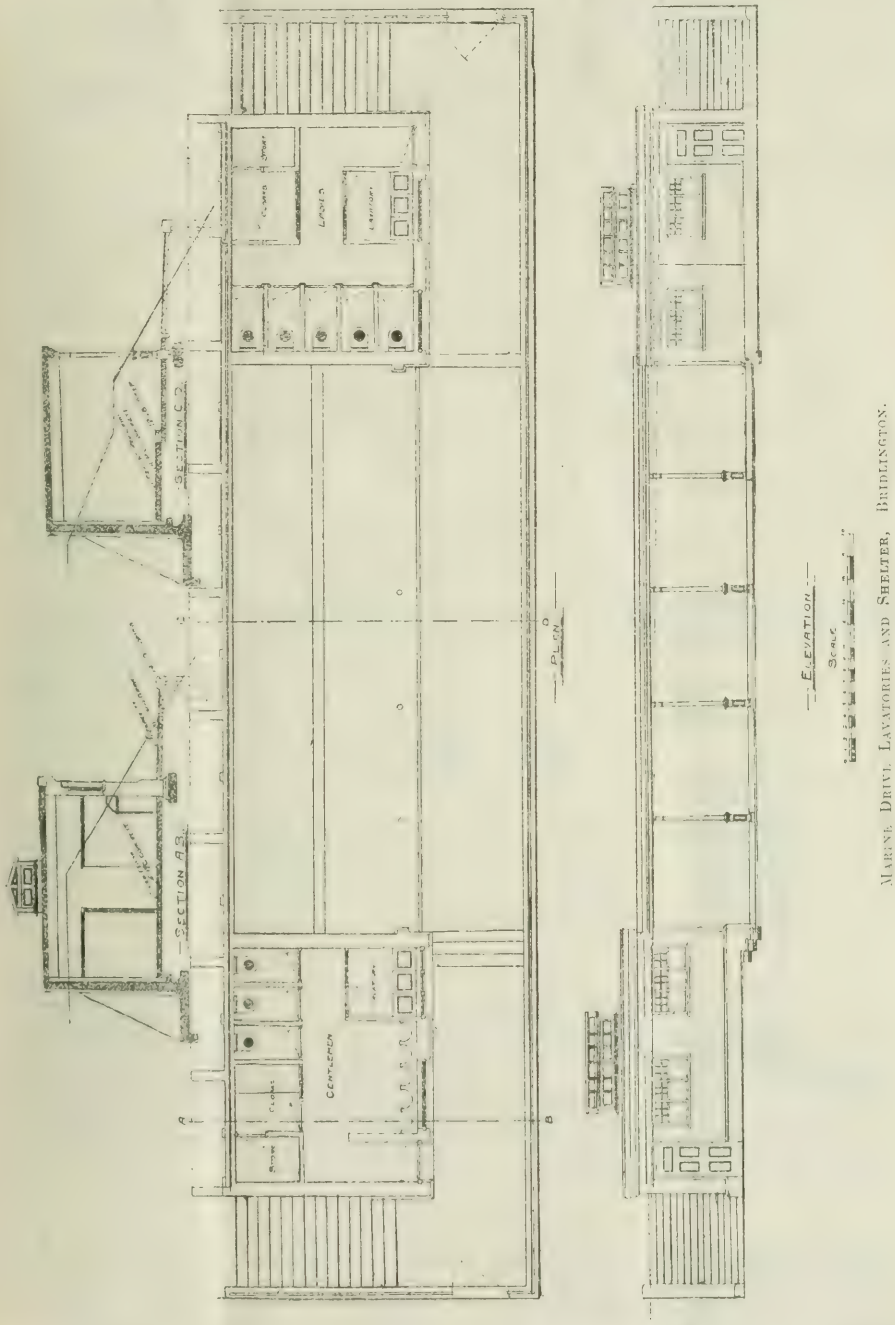
Bridlington Electricity W[illegible]

no less than 100,000 plants were here propagated for use on the Royal Prince's-parade, in the various public gardens, and also for decorating purposes, such as mayoral receptions.

The meteorological observations are here taken by Mr. Crofts, and reports are sent daily to various newspapers throughout the country.



MARINE DRIVE LAVATORIES AND SHELTER, BRIDLINGTON.
(Plate 6.

PUBLIC GARDENS.

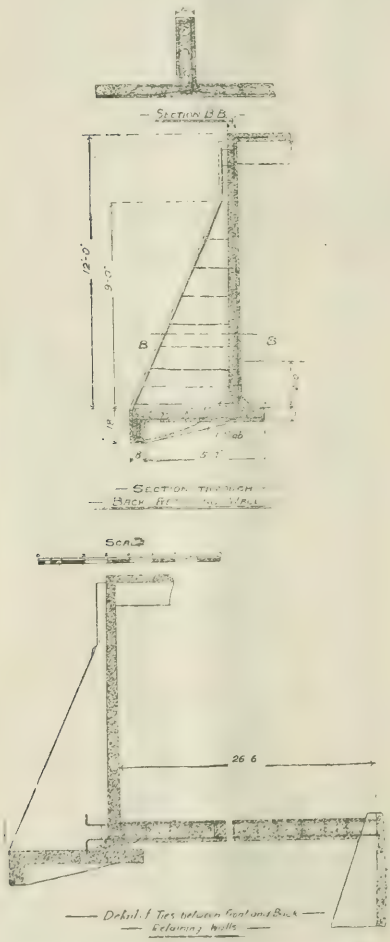
Whenever an opportunity has occurred for obtaining land at a moderate rate for the purpose of beautifying the town by laying out public gardens, the Property Committee of this corporation have been alert, and land has been purchased, the result being that during the past few years the Beaconsfield Gardens, South Cliff Gardens, Pembroke Gardens, Victoria Gardens, Windsor Crescent Gardens, and Vernon Gardens have been laid out and transformed by the skill of our able superintendent of public gardens, Mr. S. R. Crofts (to whom we are indebted to-day for the floral decorations in this building in which we are met), from barren wastes to places of beauty. In connection with the South Cliff Gardens four kiosks and a large colonnade have been erected.

and in the Pembroke Gardens an ornamental shelter has been built.

ELECTRICITY WORKS (Fig. 5).

An Electric Lighting Provisional Order was obtained in 1900. In 1902 it was resolved to proceed with the works. The late Mr. F. H. Medhurst, B.SC., M.I.E.E., of Westminster, was appointed the consulting electrical engineer, and he prepared the scheme, the author designing the buildings, the latter costing £5,562. The sanction of the Local Government Board was obtained to the borrowing of £26,481; this was received early in 1904. In 1906 an additional sum of £8,138 was borrowed, this being for the laying of additional cables, putting in of additional plant, meters, &c.

The charge for street lighting per annum is about £2,504, all the public lighting being by electricity, a thing which occurs in few towns. For private consumption the charge is 5d. per unit up to 500 units



MARINE DRIVE LAVATORIES AND SHELTER. BRIDLINGTON.

(Plate 6.)

per quarter; exceeding 500 and not exceeding 750, 4½d. per unit; exceeding 750 and not exceeding 1,000, 4d. per unit; from 1,000 to 1,500 units per quarter, 3½d.; above this, 3½d. For power and heating, not exceeding 250 units per quarter, 2d.; from 251 to 500 units per quarter, 1½d.; above 500 units per quarter, 1½d. The demand for private lighting purposes, power, public lighting, &c., is equivalent to 34,582 8-candle power lamps. There are now 565 consumers against 300 four years ago. For public lighting there are 54 arc lamps and a number of metallic filament lamps; capacity of plant, 750 kilowatts; maximum load recorded in 1911, 407 kilowatts; total connections to main, 1,037 kilowatts.

From time to time since 1906 further extensions and improvements of the plant have been effected under the able supervision of the borough electrical engineer (Mr. A. J. Beckett), who has designed these.

PUBLIC CONVENIENCES.

During the past few years several public conveniences have been erected within the borough—namely, those in South Cliff-road, Marine Drive, St. John-street, and the Beaconsfield lavatories on the sea front. One of these is illustrated in Fig. 6. There is nothing special about them apart from the fact that reinforced concrete was used largely in their construction.

HOUSING AND TOWN PLANNING SCHEMES.

The Town Council are now considering a scheme for the erection of a number of workmen's dwellings in the old town portion of the borough. These are very much required, owing to the extensive demolition of properties in that part of the town during the past few years for street widening purposes.

A town planning scheme is also being considered by the council, and it might be mentioned that the area which is to be included in this scheme comprises a large portion of the rural district in the vicinity of Bridlington.

EXTENSION OF CEMETERY.

Application has recently been made to the Local Government Board for a loan of £500 for the purpose of extending the borough cemetery in a southerly direction; 1,700 additional grave spaces will be available. The area proposed to be taken in is 1½ acres, and this work it is hoped will be completed in the autumn.

TREES.

There are in the streets of Bridlington 1,017 trees. The varieties best suited for this exposed district are the elm (*Ulmus Campestris*), plane (*Platanus Acerifolia*), service (*Pyrus Sorbus*), sycamore (*Acer pseuda platanus*), and the mountain ash (*Pyrus Americana*). Average cost of planting a tree, including purchase of same, excavating, cartage, &c., 5s. to 6s. Cost of perforated-iron grate, when used, 5s. 3d.—this is placed level with the asphalt, and allows the rain and air to get down to the roots of the tree. The method we find most suitable is to purchase the trees as saplings, about 4 ft. to 5 ft. high, at about 30s. per 100, and grow them in the nursery for five or six years, when they are ready for the streets. By this method they become thoroughly hardened to the district, and grow much more freely than when brought from a distant nursery and planted in the streets forthwith.

USE OF REINFORCED CONCRETE.

This interesting material has been used by the author very considerably in Bridlington, but chiefly in the construction of retaining walls, roofs (slabs and beams), foundations and steps.

Particulars of its use in several works are now given.

BEACONSFIELD LAVATORIES.

A brief description of the reinforced concrete work in connection with these new lavatories is as follows:

*Concrete.** The concrete used was in the proportions of 1:2:3—namely, one part Portland cement capable of passing the standard tests, two parts clean sharp sand, and three parts sea gravel, capable of passing through a 1-in. ring.

Steel.—This had to be of British manufacture, and capable of withstanding a tensile stress of 60,000 lb. per square inch. No reinforcement was allowed to come nearer than 1 in. to the face of the concrete.

Shuttering.—This was substantial, and, for the retaining walls, was formed chiefly out of 7-in. by 3-in. deals and 1¼-in. boarding.

DIMENSIONS OF RETAINING WALLS.

Length	47 ft.
Height above bottom of foundations ...	12 ft. 6 in.
Width of foundations	4 ft.
Thickness of foundations	7 in.
Thickness of walls ...	5 in.
Width of counterforts	2 ft. 9 in.
Thickness of counterforts	7 in.

DIMENSIONS OF REINFORCED CONCRETE BEAMS.

10 in. by 8 in. (longest clear span, 13 ft. 6 in.)

Thickness of reinforced concrete slabs ... 5 in.

Roof Covering. This consisted of 1½ in. of Limmer asphalt, put on in two layers. The cost of the rein-

* "Reinforced Concrete Retaining Walls," by E. R. Matthews (Trans. Soc. of Engrs., August, 1910). *Concrete and Constructional Engineering.*

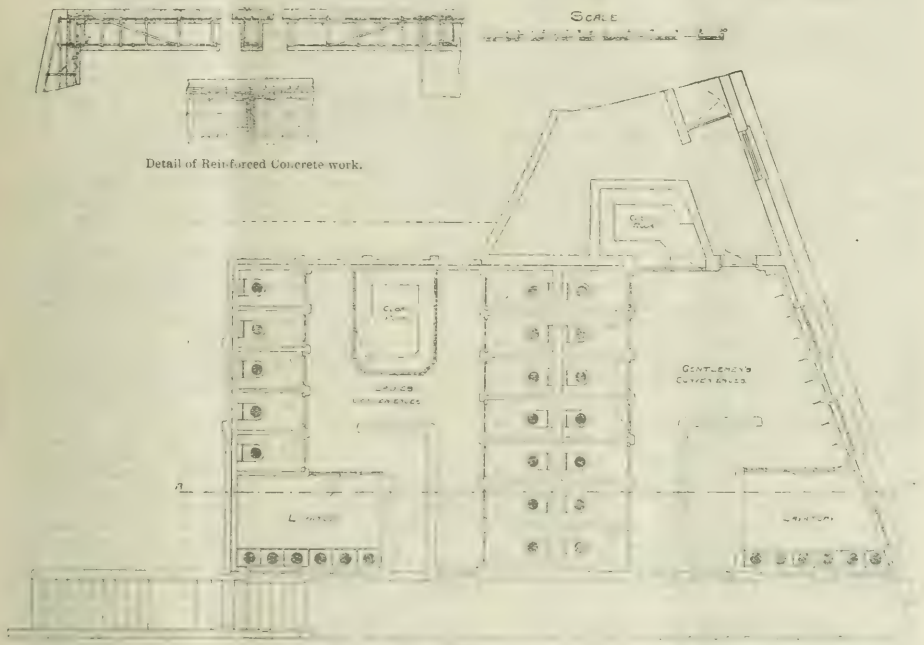
forced concrete work and Limmer asphalting was £293 2s. 5d.; the estimated cost of monolithic concrete walls and asphalting was £368, saving 20 per cent. "The forms were removed after they had been up four weeks. The roof is in every way watertight, and the walls present a smooth and uniform face. The combined live and dead load allowed for was 2 cwt. per square foot. The period for which the Local Government Board granted the loan was twenty-seven years.

A retaining wall of less height and lighter section was built in front of the lavatories, but as this is of similar design to the back wall, the author will not describe it.

Steps.—Two flights of steps, each 8 ft. in width, were also constructed in this material. The work was carried out by the Trussed Concrete Steel Company under their Kahn system, and the length of loan obtained was thirty years.

St. Johnstreet Lavatories. The roof of these lava-

Detail of Reinforced Concrete work.



Plan

Section A B.

Elevation.

BEACONSFIELD LAVATORIES, BRIDLINGTON.

MARINE-DRIVE LAVATORIES AND SHELTER (See Fig. 6).

RETAINING WALLS.

Height of back retaining wall (average)	12 ft.
Thickness to foundation slab	7 in. (base) 4 in. (top)
	6 ft. wide.
	7 in. thick

and strengthened by an inverted reinforced concrete beam, 18 in. by 8 in.

Buttresses, 10 in. in thickness and (average) 10 ft. apart.

Roof slab, 4 in. in thickness, supported by 12 in. by 8 in. reinforced concrete beams.

tories was constructed in this material, and consisted of a 4-in. slab, 6-in. by 4-in. lintels carrying the lantern lights.

REINFORCED CONCRETE FISH-STAND.

This is a small but very interesting piece of reinforced concrete work, and is briefly described as follows:

It consists of a cantilever platform, carried by reinforced concrete brackets, which are 5 in. in thickness, spaced at 6-ft. 2-in. centres, and of 4 to 1 concrete. The platform varies from 4 in. to 8 in. in thickness,

is 50 ft. in length, and the over-all measurement as to width is 9 ft. 6 in. "The reinforcement consists of ½-in., ⅞-in., and ¾-in. rods, with special clips and stirrups, and the work was carried out by the Chain Concrete Syndicate of Leeds, their price being £114 12s. 6d., but this did not include the excavation and the cost of the iron railings. The work was completed in December, 1910, and a test load of 2 cwt. per square foot was applied." *

The author has recommended the council to construct a continuous shelter on the sea front in this material.

TOWN HALL.

In conclusion, the author would say—and he is sure that you will agree with him—that, having provided so admirably for the accommodation of the visitors, it is now quite time that the corporation began to consider the desirability of providing for its own proper accommodation, and erecting a town hall worthy of this up-to-date and progressive borough. By so doing the officials would be able to discharge their duties with much less inconvenience than at present; and while the author does not say that the work would be done any better, he does consider that it would be done more expeditiously.

However, this matter, he has no doubt, will receive their consideration at no very far distant date.

From the foregoing *résumé* of the sanitary and other works which have been carried out during recent years at Bridlington, the author thinks that you will agree with him that the town council's policy has been a progressive one, and that they have moved with the times; and he is sure of this, that if they continue to do so there will be little fear of the popularity of this charming health resort waning. Dr. Johnson used to say, "The business of life is to go forward." The author thinks it might be said that the Bridlington Town Council have realised the truth of that statement, and have tried to act up to it.

He hopes that the next time the institution visit us we shall be able to show you our new town hall, workmen's dwellings, municipal common lodging-house, and last, but not least, our refuse destructor.

He would like to acknowledge the valuable assistance of his deputy, Mr. J. S. Hunt, and of his staff in the designing and carrying out of the various works referred to in this paper.

MAYOR'S WELCOME TO MEMBERS.

Saturday's meeting at Bridlington was held at the town hall, where the members on assembling were received by the mayor (Alderman L. Mainprize, J.P.), who said it was his duty and also his pleasure to offer the institution a very sincere and hearty welcome to Bridlington. They had a winter population of about 15,000, but they nevertheless claimed to be a very progressive town, and during the past forty-six years they had borrowed and spent about £380,000 in the carrying out of various improvements and works. Of that amount he was pleased to say they had already repaid about one-third, with the result that to-day their liability, including poor and education rates, the total rates, amounted to only 6s. 4d. in the £. He knew of few towns that had spent so much and had such a small rate as they had in bright, breezy Bridlington. He was glad to welcome them that day, and hoped they would make their stay in the town as long as possible.

The President said it was with peculiar pleasure that he found himself occupying the chair that morning. His knowledge of Bridlington extended over something like twenty years. For about fourteen years he had spent his holidays in their delightful town, and he had watched the very great improvements which had been made by the authorities. There was a time many years ago when the town did not progress as well as it ought to have done, but of late years the corporation had done its best to cater for not only the townspeople, but for the visitors to the town. He had seen from time to time the works which the energetic borough engineer, Mr. Matthews, had designed and carried out, and he had done well in supporting the council in all they had undertaken. They had been accorded that day a true Yorkshire welcome, and he hoped that the meeting would prove of service not only to the members of the institution, but to the town which they were visiting that day.

Owing to pressure on our space we are unavoidably compelled to hold over until next week the report of the discussion which followed the presentation of Mr. Matthews' and Councillor Charlesworth's papers.

* "Reinforced Concrete Construction in Theory and Practice," by Prof. Hy. Adams and E. R. Matthews. (Longmans.)

NEW AND IMPROVED METAL LATHING FOR PLASTER-WORK.

We call special attention to the interesting announcement which appears among our advertisements (p. xviii.), stating that the Expanded Metal Company, Limited, of York Mansion, York-street, Westminster, London, S.W., and Stranton Works, West Hartlepool, have succeeded in producing a new and improved diamond mesh expanded metal lathing which will be obtainable at prices lower than those for the original expanded metal lathings.

The new lathing is made under a recently patented process. It will be known by the trade name of "BB Expanded Metal" Lathing, and the illustration shows the actual size of its meshes. It is made in standard size sheets, 9 ft. long way of mesh by 2 ft. short way of mesh, which is an increase of 1 ft. in length as compared with the original lathings.

"BB Expanded Metal" Lathing has several important advantages over the original expanded metal lathings. First and foremost, its cost is less; then it may be used at wider spacings, and it requires less plaster.

Several practical tests have been made under ordinary working conditions by well-known expert plasterers, who have used many thousands of yards of the original lathings, and their reports all agree that not only is the new lathing stronger and stiffer than the original lathings, but that, on account of the reduced size of the diamond mesh, together with the improved slope of its strands, less plaster goes through to form the "key," and practically none falls off and is wasted.

"BB Expanded Metal" Lathing is now ready for the market, and as it is sold through the merchant trade only, stocks will be held in most large centres. It is listed in three gauges, thus: BB 26-gauge expanded metal lathing; BB 24-gauge expanded metal lathing; BB 22-gauge expanded metal lathing

Reference to the price list issued by the Expanded Metal Company, Limited, shows that, gauge for gauge, a saving of from 25 per cent to 60 per cent is made by substituting the new lathings for the old. But the saving in cost is really more than the difference between the price list rates for equivalent gauges, because of the wider spacings that may be used with the new lathings. To take one gauge only, in the original lathing, No. 1, 24-gauge is not recommended for spacings over 12 in., whereas "B" 24-gauge may be used for spacings up to 15 in. in ordinary horizontal or sloping work, and up to 18 in. in ordinary vertical work.

Tests have been made at these spacings with entirely satisfactory results, both with ordinary lime and hair mortar and with special quick-setting plaster, and these facts should produce a ready and large sale for the new lathing.

Drainage Works and Sanitary Fittings.—A third edition, revised and brought up to date, particularly as regards the questions of concrete sewers, sewer ventilation and flushing, and the Public Health Acts Amendment Act of 1907, still further evidences the success of this little manual,* which manifestly deserves the attention and confidence of all concerned in the important subject with which it deals.—*The Bookseller.*

Aberdeen Water Supply.—An important report on the water supply of Aberdeen has been issued by the engineers, Mr. C. H. Roberts and Mr. C. P. Hogg, Glasgow. The city, they report, is using 41 gallons of water per head per day, and they estimate that a satisfactory extended supply can be obtained from the Dee of an average of 10 000,000 gallons a day for £511,600. Other charges bring up the total to £557,410, with an additional £35,000 for a reservoir if compensation water is required. The engineers also report on Glen Dye as a suitable source of supply. The river Dye is 14 miles long, and the gathering ground is bare of human habitations. A large part of the area is owned by Sir John R. Gladstone, Bart., of Fasque and used as a deer forest. There is an excellent site for a reservoir, and the water has been shown to be of excellent quality for domestic and trade purposes. A supply of 10 000,000 gallons daily could be obtained from this source for £508,000. The engineers recommend the second scheme, and urge that the work should be commenced without delay.

* "Drainage Work and Sanitary Fittings. By Wm. H. Maxwell. Price 2s. nett. London: St. Bride's Press, Ltd., 24 Bride-lane, E.C.

Third International Road Congress.

LONDON, 23rd TO 28th JUNE, 1913.

On the invitation of the Government of the United Kingdom of Great Britain and Ireland, the Third International Road Congress will be held in London, in 1913, in order to continue the studies, begun in Paris in 1908, regarding the construction and maintenance of roads in view of modern methods of locomotion. This congress, at which the Governments of the different States have been invited to be officially represented, will open on June 23rd and will last six days.

PROGRAMME OF QUESTIONS.

First Section—Construction and Maintenance.
Sub-section A—Construction and maintenance of roads outside towns.
Sub-section B—Construction and maintenance of roads in towns.
Sub-sections A and B sitting together—Questions common to both.
Second Section—Traffic and Administration.
Sub-section C—Traffic and vehicles.
Sub-section D—Administration, finance and statistics.
Sub-sections C and D sitting together—Questions common to both.

1st Section.

CONSTRUCTION AND MAINTENANCE.

Questions common to Sub-sections A and B.

1st Question—Planning of New Streets and Roads.
(*a*) Old towns: 1, in central districts; 2, in the suburbs.
(*b*) In new towns.
(*c*) In the rural areas.

Importance of directness of route—Alignment—Longitudinal and cross sections—Curves—Analysis of practical and economic value of width under various circumstances—Steps necessary to ensure the security of and regularity of the various currents of circulation—Whether local or through traffic—Reconciliation of requirements of each of the former—By-pass roads avoiding towns and villages—Treatment of crossings and corners—Arrangement of metalled carriageways, footpaths, special tracks, taking into account the presence or absence of tramways, of bicyclists, and of the various methods of circulation generally in use.

2nd Question—Types of Surfacing to be adopted on Bridges, Viaducts, &c. (fixed or movable bridges, suspension bridges, railway bridges).

Cost—Wear—Durability of various surfacings—Methods of maintenance and repair, of remaking.

Communications common to Sub-sections A and B.

Communication 1—Improvements adopted since the Second Congress in Machinery Used in the Construction and Maintenance of Macadamised Roads.

Sweepers—Watercarts—Machine rammers—Light rollers—Mixers—Stone driers and heaters—Transport wagons.

Communication 2—Tests of Materials Used in the Construction of Macadamised Roads.

Laboratory and practical tests—Testing machines and appliances—Comparative value of various tests—Statistics of results obtained.

Sub-section A.

3rd Question—Construction of Macadamised Roads—Bound with Tarry, Bituminous, or Asphaltic Materials.

Which are the best methods and materials for the construction in open country of macadamised roads bound with tarry, bituminous, or asphaltic materials?

NOTE.—Reports sent in under this heading must include all or some of the following heads, and furnish, as much as possible, data obtained from practical experience, and more especially on the results obtained in the various trials that have taken place since the Second Congress.

1. Foundations and drainage.
2. Sizes and shapes of broken stone for bituminous-bound surface crust.
3. Use of partially-worn materials in bituminous-bound surface crust.
4. Thickness and composition of the strength crust and of the super or wearing crust under different conditions.
5. Life of surface crust under different conditions of traffic, weather, subsoil, &c.
6. Relative importance of patching, repairs, and periodical renewals of surface crust.
7. Extent of wear permissible before renewal of surface coating.
8. Measurement of wear and appliances used for this purpose.
9. Various methods of bituminous treatment
   (*a*) Mixing methods: 1, in factories, 2, on the spot.
   (*b*) Grouting methods.
   (*c*) Carpeting methods.
   (*d*) Other methods.
10. Relative advantages and use of tar, tarry compounds, asphalt, bitumen, and other materials.
11. Tests and chemical analysis of tarry, bituminous, and asphaltic compounds.
12. Climatic effects causing slipperiness of the roadway—Remedies.
13. Effect on public health, fish life, or vegetation.
14. Specification of the methods of construction.
15. Cost data.
16. Cleansing and watering.

Communication 3—Construction of Water-bound Macadamised Roads.

Which are the best methods of construction and maintenance for water-bound macadamised roads, used in country or suburban districts since the second congress?

NOTE.—Reports sent in under this heading must include all or some of the following heads, and furnish, as far as possible, data obtained from practical experience.

1. Foundations and drainage.
2. Choice of materials.
3. Sizes and shapes of broken stone and of chippings.
4. Use of partially worn materials in the formation of the surface crust.
5. Thickness and composition of the strength crust under different conditions.
6. Life of the surface crust under different conditions of traffic, weather, subsoil, &c.
7. Relative importance of patching repairs and periodical renewals.—Methods of resurfacing.
8. Specifications of the methods of construction.
9. Cost data.
10. Cleansing and watering.

Communication 4—Technical and Economic Study of the Comparative Advantages of Different Types of Roads.

Under what circumstances and conditions of traffic are the following types of road preferable from the point of view of the traffic and from that of economy?

1. Stone setts.
2. Metalled roads, bound with tar, pitch, asphalt or bitumen by
   (*a*) Mixing or grouting methods.
   (*b*) Carpeting methods.
   (*c*) Other methods.
3. Metalled roads—Water-bound.

Sub-section B.

4th Question—Wood Paving.

Choice of wood—Methods in use—Resistance to wear—Methods of maintenance—Cost—Cleansing and watering.

Communication 5—Various Types of Stone Paving in use.

Advantages of unification.

2nd Section.

TRAFFIC AND ADMINISTRATION.

Questions in common to Sub-sections C and D.

5th Question—Methods of Lighting.
(*a*) The public highway.
(*b*) Vehicles.

Sub-section C.

6th Question—Observations noted since 1908 as to the various causes of Wear and of Deterioration of Roadways.

1. In towns.
2. In suburban districts.
3. In open country.

Effects produced by sun, frost, snow, or any varia-

tions of temperature—Effects due to the circulation of self-propelled and horse-drawn vehicles—Mixture of fast and slow traffic, aggregate volume and density in busy hours—Effect of speed, weight, construction, position of the exhaust, width and diameter of wheels, various kinds of tyres, shoeing of horses.

7th Question—Regulations for Fast and Slow Traffic on Roads.

Conditions to be observed with a view to the safety of the public—Precautions to be taken during progress of repairs—Regulations for the use of the roads during frost and thaw—Positions of lamp-posts and other obstructions.

Communication 6—Direction and Distance Sign-Posts.

Communication 7—Development since the Second Congress of Self-propelled Public Service Vehicles.

Dimensions—Weight Capacity—Cost of upkeep—Mileage worked.

Sub-section D.

8th Question—Authorities in Charge of the Construction and Maintenance of Roads, Functions of Central Authorities and Local Authorities.

Advantages and disadvantages of centralisation and decentralisation—Area and organisation for construction, maintenance, repairs—Staff employed, its composition and whence drawn—Systems of inspection.

9th Question—Finance of the Construction and Upkeep of Roads. Provision of Revenues.

Special taxes—on what classes of persons, vehicles, or objects would the taxes weigh? bases on which the incidence of taxation should be founded—Borrowing for road construction and renewals—Methods of repayment.

Communication 8—Qualifications of Engineers and Surveyors in Charge of the Construction and Maintenance of Roads. Wages and Conditions of Service of Foremen and Roadmen.

Communication 9—Statistics of Cost of Construction and Maintenance.

Methods of keeping accounts—Repartition among the various authorities, boards, &c., interested—Comparative statistics per unit of population, mileage, traffic, &c.

Communication 10—Terminology adopted or to be adopted in each Country relating to Road Construction and Maintenance.

CONGRESS PROGRAMME.

Monday, June 23rd.

9 a.m. to 6 p.m.—Registration of members at the Surveyors' Institution, Great George-street, Westminster. Issue of membership cards, badges, invitations, tickets, programmes, &c.

10 a.m.—Meeting of the Permanent International Commission of the Road Congress at the Institution of Mechanical Engineers, Storey's Gate, Westminster. Consideration of the report of the Permanent Council.

11.30 a.m.—Meeting of the Permanent Council, appointment of General Committee and Sectional Committee and officers of the Third Congress.

2.30 p.m.—Opening meeting of the Congress. The honorary president of the Congress, the Right Hon. the Chancellor of the Exchequer, in the chair.

Opening address by the Right Hon. the Chancellor of the Exchequer.

Address by the chairman of the Organising Council, Sir George S. Gibb.

Address by president of the Permanent International Association.

Replies by delegates of Foreign Governments.

5.15 p.m.—Reception of members of the Congress at the Road Exhibition at the Royal Horticultural Hall, Vincent-square, Victoria-street, S.W., by the president of the Exhibition Committee, the Right Hon. Earl Beauchamp, H.M. First Commissioner of Works.

Afternoon tea and music.

7.45 p.m.—Reception and conversazione at the Guildhall, City of London. Members of the Congress will be received by the Lord Mayor and Corporation of the City of London at the Guildhall, City.

Tuesday, June 24th.

10 a.m.—Meetings of the sections for the consideration of papers and reports.

1st Section. Sub-sections A and B combined, at the Institution of Civil Engineers, Great George-street, S.W.

Question 1.

2nd Section. Sub-sections C and D combined, at the Institution of Mechanical Engineers, Storey's Gate, S.W.

Question 5.

3 p.m.—1st Section. Sub-sections A and B combined, at the Institution of Civil Engineers, Great George-street, S.W.

Question 2 and Communications 1 and 2.

2nd Section. Sub-section C, at the Institution of Mechanical Engineers, Storey's Gate, S.W.

Question 6.

Sub-section D, at the Surveyors' Institution, Great George-street, S.W.

Question 8.

Wednesday, June 25th.

10 a.m. and 3 p.m.—Meetings of the Sections for the consideration of papers and reports.

1st Section. Sub-section A, at the Institution of Civil Engineers, Great George-street, S.W.

Question 3 at 10 a.m.

Communications 3 and 4 at 3 p.m.

Sub-section B, at the Surveyors' Institution, Great George-street, S.W.

Question 4 at 10 a.m.

Communication 5 at 3 p.m.

2nd Section. Sub-section C, at the Institution of Mechanical Engineers, Storey's Gate, S.W.

Question 7 at 10 a.m.

Communcations 6 and 7 at 3 p.m.

Sub-section D, at the Surveyors' Institution, Great George-street, S.W.

Question 9 at 10 a.m.

Communications 8, 9 and 10 at 3 p.m.

9 p.m.—Reception by the Institution of Civil Engineers at the Albert Hall, or the new premises of the institution (if completed) in Great George-street, S.W.

Thursday, June 26th.

Group "A."—Inspection of roads in Surrey, Middlesex, Berkshire, Buckinghamshire, Hertfordshire and Essex, in motor cars provided by members of the Royal Automobile Club, and organised by the committee of the club. This group, which will be limited in number, will be divided into parties which will make inspections under the guidance of a leader assisted by gentlemen able to act as interpreters. (Number limited.)

Group "B."—Visit to Windsor Castle, on the gracious invitation of H.M. the King, to afternoon tea.

A special train will leave Paddington Station about 2 p.m., returning from Windsor about 6 p.m. (Limited to 1,000 members.)

Group "C."—River Party.—A special train will leave Paddington Station about 10 a.m. for Henley, and a launch will be provided to enable the members of the party to see one of the prettiest reaches of the river Thames, from Henley to Goring and back. Lunch and tea will be provided on the launch. Return train from Henley about 5 p.m. (Limited to 150 members.)

9 p.m.—Reception of the members of the Congress at the Royal Automobile Club by the chairman, the Hon. Arthur Stanley, M.P., and the committee of the club.

Friday, June 27th.

10 a.m.—Meeting of the Permanent Council.

10 a.m.—Further meetings of the Sections which have not completed their business.

2.30 p.m. Final meeting of the Congress at the

Institution of Civil Engineers, Great George-street, S.W.

3 p.m. to 7 p.m.—Garden party, given by the president, council and members of the Surveyors' Institution. (Number limited.)

Visit of the members of the Congress to representative London theatres:—

(1) Drama.—His Majesty's Theatre, limited to 276 seats in the dress circle.

(2) Musical Comedy.—The Gaiety Theatre, limited to 168 seats in the dress circle.

(3) Variety Entertainment.—The Coliseum, limited to 979 seats in the stalls and dress circle.

Saturday, June 28th.

Group "A."—Programme to be arranged by the Automobile Association and Motor Union.

Group "B."—Inspection of roads in Kent, including the section on which tests of road materials have been made at Sidcup. The members will be divided into parties which will make inspections under the guidance of a leader assisted by gentlemen able to act as interpreters. (Number limited.)

Group "C."—Visit to Garden City at Letchworth.

Group "D."—Visit to the National Physical Laboratory at Bushey, and to Hampton Court Palace.

7.30 p.m.—Banquet at the Hotel Cecil.

SPECIAL INSPECTIONS AND EXCURSIONS.

June 30th to July 5th.

A programme will be arranged for the week following the Congress of visits and inspections to places of interest, quarries, engineering workshops and roads in West of England, the Midlands, North Wales and Scotland, of which announcements will be made at a later date.

EXHIBITION.

An exhibition of road materials and machinery will be held at the Royal Horticultural Society's Hall and in adjacent ground during the session of the Congress. The Royal Horticultural Society's Hall is situated in Vincent-square, Victoria-street, S.W., and is about five minutes' walk from the halls of the institutions in which the sectional meetings are held.

W. REES JEFFREYS,
Hon. General Secretary.

Queen Anne's Chambers,
Westminster, S.W.

Town Planning in Sussex.—A motion has been carried at this week's meeting of the Shoreham Urban District Council affirming that at a meeting to be held on a date not earlier than two months from July 2nd the council will consider a resolution empowering them to make application to the Local Government Board for authority to prepare a town planning scheme for the district.

Municipal Work at Wednesbury.—It is the intention of the Wednesbury Electricity Committee shortly to bring forward a new scheme for making electricity extensions on a new site, which will be on the canal or railway, or both, although the present station will be useful for stores, offices, and for generating purposes. With respect to the proposed extensions of the municipal buildings and public baths, it has been necessary to ask for £6,000 instead of £5,000, owing chiefly to the increased cost of materials.

Municipal Engineers and Town Planning.—From an editorial article in the *Contract Record* of Canada we quote the following: "It would seem that the first popular belief to be overcome is that city planning schemes mean the hiring of a number of artists to make the city 'beautiful'; that under such enterprises the city will be bankrupted, industry hampered, and old landmarks destroyed. These ideas are most delusive. City planning, to be successful, must be the work of several experts, each skilled in his special line. The city engineer should take a more important part in this field. It is difficult to understand why this is not more appreciated when it is considered that city planning involves so many engineering works with which the municipal engineer is so prominently identified. We are inclined to think that this has been due rather to lack of appreciation on the part of the public than to lack of initiative on the part of the engineer. Certain it is that city planning will never meet with a fair measure of success in Canada until the municipal engineers throughout the country are enrolled in the work."

CORRESPONDENCE.

"Be calm in arguing; for fierceness makes
Error a fault and truth discourtesie."
— GEO. HERBERT, "*The Temple*."

THE WORK OF ROAD SURVEYORS.

To the Editor of THE SURVEYOR.

SIR,—I detest to repeat myself, and I did hope that my letter which appeared in your issue of October 29th, 1909, would have caused some of our do-as-others-say road repairers in the North to try and think out the problem, Why. In that letter I thoroughly condemned 3 in. broken stone for macadam, tar grouted or otherwise grouted roads. The Great North Road one has heard so much about, and which so many have visited, is still being repaired with 3 in. hand and machine broken stone, between Berwick and Newcastle. Many other roads are being treated likewise, while the only reason for this must be Mr. So-and-So recommends it. Near Berwick I found them, after tarring the stone, grouting it with engine ashes; or was this intended as a binder? Is there any wonder at the present state of the rocky road to Berwick from Newcastle?

Why do our road surveyors continue this impossible smooth road method? Is it because Macadam did otherwise, and I have so often and so long condemned it? I have never seen a failure of all stone of 1½ in. and ½ in. material; one road I see daily has been down six years, a water-bound all-stone road, and it still remains a smooth road to walk or drive over. The Thames Embankment demonstrated that 1½ in. was better than 2½ in., for the larger the stone the more muck in all or any form (ashes included) is required, the latter the worst material that can be used.

Taking the whole country generally, one continually comes across samples of broken stone, or a large proportion equally as bad as was condemned thirty years ago by the then practical road surveyors (not boys from school). Why do our present so-called road makers accept chippings, and chipping shaped unangular, material such as can be often seen on our road sides, when stone can be broken by the latest and best machinery, better and more uniformly in size than by present-day hand-breaking?

The country, our towns and counties, are not being governed: they are drifting as the water drifts into the sea, and the brains of the population are doing likewise, for Acts of Parliament are making it more difficult year by year for practical men to rise to superior positions and become employers instead of employed. There are fewer practical experienced employers and supervisors, and when the practical experienced man finds it impossible to step upwards, we only drift all the faster into the depths, like the water to the sea. Our roads suffer as well as mankind, for what is everyone's duty becomes no one's duty, not even to think how to improve one's self: hence we are relying more and more on Acts of Parliament to remedy every evil. If, however, we preserved and used our brains, we should realise that all things necessary for the good of mankind must come from the individual, good roads included. Once more I say think, and if men in position of supervisors of our roads cannot or will not think, let them make room for someone else who can and will think out the problem why roads become bumpy, full of holes, and wear irregularly almost as soon as the road-roller leaves the surface, and why some roads last for years and do not wear into holes.

Why can some men reduce costs 75 per cent and have better roads, and others increase cost 100 per cent and have worse roads? Once again, large stone, with or without muck to bind it, never can nor ever did make a lasting smooth road surface that would wear smooth, not even a large sett-paved road on concrete, for the larger the setts, more concussive the road becomes, and as 3 in. setts make better roads than 6 in. setts, so would 1½ in. setts make better roads than 3 in. setts, and so does 1½ in. macadam make better, smoother, and more durable roads than 2½ in. or 3 in. macadam. Then do as Macadam did, who used his brains 100 years ago, and which I have seen wherever 1½ in. has been used ever since 1881. If such a road was, as soon as thoroughly consolidated, tarred and coated with ⅜ in. sharp angular broken material, free from dust, once a year, not soft sand, as used by those who will not think, not soft sand, which, with tar after rain, works up into slurry and is gone, few other systems would be more economical,

This I first recommended to Dr. Guglielminetti at Monte Carlo more than nine years ago, and its value has been proved by Mr. Prescott of Eastbourne, during his surveyorship there.

Some ask what is 1½ in.? It is broken stone, good, sharp angular material, free from chippings, which has passed through holes in an horizontal screen with 1¾ in. round holes, or a declining screen with 2 in. holes. Try it grouted with a good covering of ¼ in. free from dust. Do not sprinkle it after a larger portion of muck has been used, as I see done in the West Riding of Yorkshire, but cover it, using nothing else except it be tar and not less than 20 per cent to 80 per cent of 1½ in., and it cannot fail, either as a water-bound stone road or a tar macadam or tar grouted road, when the under foundation surface is first coated with tar. Here we get the surest preventive against failure: hence the Gladwell and Rocmac systems of first sealing the prepared foundation by giving it a coating of fine prepared waterproofing material to bed the broken stone into, and not using muck.

Why do rocky roads continue? We are getting rid of them in Leeds by tarring the prepared foundation and using not larger than 1½ in. material (tar macadam) and finished with ¾ in. red, untarred granite. Why not all roads from John o' Groats to Land's End? It is cheaper than muck and stone (or anything softer than stone), and if such a road was tarred and coated with ⅜ in. once a year, what a pleasure it would be to all, users and makers, and why not? My answer is, after thirty years' study, it is want of brains and the power to think and take one's own responsibility, hence such can only do as some one else suggests. If the suggestion is by a man with a title, or letters after his name, it is all right to put the cause of failure, if it proves one, upon him.

First learn how to preserve your brains, then you will have the power to learn how to make and preserve roads. It is simple, but it requires each one to take his own responsibility and make the necessary effort. Some have done it and benefited thereby. Demonstrate ye highway men before the 1913 Road Congress, and do not give any foreigner the chance to say we can teach old England something which its forty years of Government education, school and office trained road-makers have forgotten. The education and training given has been repetition and not practical, something memorised from a book, to pass an examination, to obtain their now altered M.INST.C.E., or some other title. Subsequently the examinee refers to a book, and does as others recommend, instead of solving difficulties by practical experiment and brain effort. This process, like that of Government, of Town and County Councils' procedure, means drifting, not initiating; copying, not creating. Come back to individual action and responsibilities, then rocky roads to anywhere will be roads of the past, as well as many other troubles; nor should I feel it my duty to try to wake up my fellow-Englishmen and fellow-workers in the interests of good road-repairing by having to repeat the proved results of practice and experience. They ought to press such as myself to assist in providing the necessary machinery to do it better every time.—Yours, &c.,

W. H. Baxter.

Leeds, June 20th, 1912.

STANDARDISATION OF ROAD MATERIALS.

To the Editor of The Surveyor.

Sir,—With reference to the Conference on the above subject held on June 21st at the Surveyors' Institution, do we understand that it is the intention of the Committee to standardise or specify any one particular bitumen for road-work? If this is the case it will not only be creating practically a monopoly of the bitumen so specified but it will also put a ban on research work and the experience that any may have had in the manufacture of bitumen, &c.

It would, we consider, be grossly unfair to specify our or any other make of bitumen materials for road construction, and seeing that there are bitumens from various parts of the world that have never yet been used for this particular purpose, and as the length of life of these materials is all-important, might we ask how the committee will decide as to their suitability?

It is agreed by all authorities that bitumen is a natural product, and we only, of course, refer to it as such, and not to those bituminous products obtained as the result of destructive distillation or by other artificial means.

It has also been proved by practical experience that the characteristics of native bitumen are not shared by artificial products, and will these and all other important points be taken into consideration by the committee? With all due respect to the delegates, we do not recognise in the list you give of those present at the meeting the names of very many who are authorities on bitumen.—Yours, &c.,

A. E. H. Dussek (The Dussek Bitumen Co.).

SEWAGE DISTRIBUTORS.

To the Editor of The Surveyor.

Sir, In case there should be any misapprehension on the part of those of your readers who may have been interested in the account of the meeting of the Association of Managers of Sewage Disposal Works at Southall-Norwood which appeared in your issue of the 28th inst., I would like to say that I only touched upon "fixed sprays and revolving sprinklers," and did not refer to travelling distributors as obviously, so far as cost is concerned, they would be more expensive than either of the other types. The reference under "Effect of Spray" as to the number of nozzles being 625 should obviously read "arranged on the *former* principle." Referring to the question of costs, Mr. Watson, the president of the association, whose presence was appreciated by all, gave figures prepared by Mr. Hart, the sewerage engineer of Leeds, showing costs for 1-acre beds at Hampton (£200 18s.), Nuneaton (£202 15s.), Birmingham (£131) and Hanley (£212), and in connection with these I would like to point out that the whole of the figures, except Birmingham, were for *travelling* distributors (and not for revolving sprinklers), some of them being *power driven*.—Yours, &c.,

Reginald Brown.

21 Old Queen-street,
Westminster, S.W.
June 29, 1912.

SYMONS'S METEOROLOGICAL MAGAZINE.

To the Editor of The Surveyor.

Sir,—This small Magazine, which is published post-free at 5s. per annum, gives an account of the meteorological conditions during the preceding month throughout the British Isles, and sets out not only useful information as regards the weather, but, what is more useful to those in charge of sewers, sewage treatment works and water supplies, giving details which are not got in any of the annually published tables. Unfortunately the small circulation of the Magazine does not allow of its being as full as it might be, and it has occurred to me that brother Surveyors and Medical Officers of Health would derive much useful information if the Magazine were more generally procured.—Yours, &c.,

C. H. Cooper, M.INST.C.E.,
Borough Engineer, Wimbledon.

June 28th, 1912.

[From a perusal of a recent issue of the Magazine we feel fully justified in endorsing our correspondent's view as to its merits and his plea for support for it.—Ed. Surveyor.]

Brighton Water Profits. The water undertaking of Brighton shows a profit for the past year of £5,116.

Where Microbes Nest.—On the ground that wood paving becomes sodden and "a veritable nest of microbes," a deputation, headed by Dr. Angus, has asked the Paddington Borough Council to lay down asphalt.

The Growth of Motor Traffic.—The growth of motor traffic in London is shown by figures given by Mr. John Burns on Tuesday. The motor vehicles registered with the London County Council in 1904 numbered 4,941 cars, no "heavy cars," and 3,327 motor cycles; for 1911 the figures were 8,703 cars, 1,069 "heavy cars," and 3,294 motor cycles. The totals from January 1, 1904, to December 31, 1911, reached 18,701 for cars, 3,379 for "heavy cars," and 16,874 for motor cycles, or a grand total for the eight years of 68,945. If the first half of this year equals last year's figures, this grand total must have increased now to over 75,000.

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
A Batley Accident	3
A Marylebone Report	2
An Attack on the Leadgate Survey	2
Appointments Vacant	36
Assistants' and Students' Section	22
Association of Managers of Sewage Disposal Works	35
Bridlington and Some of its Municipal Works and Undertakings	4
Concrete Paving Expansion Joints	3
Correspondence	19
Disinfectants, Antiseptics and Deodorants, with Examples of each	33
Extraordinary Traffic	2
Improvements in Road Machinery	34
Institute of Sanitary Engineers	36
Institution of Municipal and County Engineers	
North-Eastern District Meeting at Bridlington	4
Notices	34
Institution of Municipal Engineers Notices	22, 35
Institution of Water Engineers: Summer General Meeting at Cheltenham	29
Local Government Board Inquiries	25
Meetings	30
Municipal Competitions Open	36
Municipal Contracts Open	36
Municipal Work in Progress and Projected	25
New and Improved Metal Lathing for Plasterwork	16
Personal	27
Road Congress Delegates' Expenses	36
Royal Institute of Public Health Congress	28
Royal Sanitary Institute	35
Sanitary Progress in Dumfries	3
Self-Pollution of Water by Natural Growths	29
Sewage Distributors	29
Sewerage of New York	1, 21
Sewer Cleaning Device	32
Standardisation of Road Materials	26
Surveyors and their Roads	1, 19
Symon's Meteorological Magazine	20
Tenders for Municipal Works or Supplies	39
Third International Road Congress	17
Traction Engines *v.* Roads	3
Use of Copper Sulphate in Purifying Water Supplies	30

THE DISPOSAL OF NEW YORK'S SEWAGE.

PRELIMINARY REPORT NO. 3.

The third of the preliminary reports issued by the Metropolitan Sewerage Commission of New York deals with the collection and disposal of the sewage of the Jamaica Bay division.

In the previous reports the commission has shown the desirability of separating the City of New York into a number of divisions to facilitate the design of a system of main drainage. It is proposed to deal with the sewage of each district separately, with due regard to the possibility of combination in the future if this is ever required. In the present report plans and sections are given showing the scheme for the Jamaica Bay division. This area includes a thickly settled district in Brooklyn, many separate villages. Parts are strictly rural territory, there are large stretches of salt marshes, and there are also some largely attended day summer resorts, such as Coney Island and Rockaway Beach. It appears that the shores of the bay are now devoted almost exclusively to the uses of a transient summer population, and the waters to sailing, bathing, and the cultivation of shellfish. The shellfish interests are extensive; but, important as they undoubtedly are, it is clearly the intention of the commission to recommend their abandonment. "The future development of the bay will make shellfish culture unsafe from the standpoint of disease."

So far as the commission can foresee, the future of Jamaica Bay will be on the lines proposed by the Jamaica Bay Improvement Commission, an agreement having been entered into between the United States Government and the City of New York for that purpose. Moreover, outline plans have been officially adopted and money appropriated to begin the work. It therefore appears reasonably certain that the shellfish interests will have to go. The proposals involve extensive engineering works, the construction of a substantial and regular shore line, deep, wide channels for ocean-going vessels, and harbour approaches for the entrance at Jamaica inlet. It is also proposed to construct a number of canals on the northern shore, each about 300 ft. to 400 ft. wide, and from 4,500 ft. to 12,000 ft. long, so as to increase the water front. The object of this development is to increase the shipping facilities of New York by providing additional wharves, storehouses, terminal facilities, and space for handling vessels.

On the other hand, the commissioners are of opinion that Coney Island and Rockaway will long remain pleasure resorts, but if the waters are to be kept pure enough for bathing, boating and shellfish culture, it is quite evident that the method of sewage disposal suggested will be insufficient. We are told that the development of the bay for commerce must necessarily exclude its use for pleasure; hence it is difficult to see how such places as Coney Island and Rockaway can continue their existence as pleasure resorts, at any rate in the same degree as they have hitherto existed.

The population of the division was 366,000 in the year 1910, but the scheme brought forward by the commission will provide for a population of 1,415,700 persons.

GENERAL OUTLINE OF SCHEME.

It is proposed to collect the sewage by the separate system as far as possible, while allowance is made for an unavoidable inflow of ground water. Where sewers are designed on the combined system it is proposed to intercept the dry-weather flow only, and to provide storm overflows above the points of interception. Grit chambers and screens will be placed at the storm-water outlets, but reliance will be placed on dilution for the purification of the liquid discharged.

The sewage will be pumped to Barren Island or carried to Jo Cos Marsh, and will be treated at these places before it is discharged into the sea. As to the purification works, little is said. We are told that the degree of purification required is unknown at this time, but that a rough computation indicates that if all the sewage which would naturally drain to Jamaica Bay by the year 1960 were thoroughly diffused therein, the sewage would, under ordinary conditions, be diluted by about 147 volumes of water at times of low tide. This would be about six to seven times the amount of theoretical dilution required to provide sufficient oxygen to digest the organic matter during the summer months, the most unfavourable of the year. As this ideal condition, however, cannot be relied on, treatment to remove the grosser solids and a certain amount of the dissolved impurities must be ultimately provided. Thus for estimating purposes it is assumed that sewage will have to be treated in settling tanks, and that the tank liquid will be treated in sprinkling filters and settling basins. With regard to the sludge difficulty—the crux of all works of this kind—we are informed that "the inoffensive sludge from the settling tanks can be used for many years to fill in marsh land near the plant," or, "if preferred, it can be dumped at sea."

The total estimated cost of construction for the system is $11,830,000, or £2,464,583.

It is also to be noted that a warning is given with regard to the projected canals. It is stated that there will be but little flow in them, and practically no flushing effect from the tides. These long canals may become nuisances similar to Gowanus Canal and Newtown Creek, and others which could be named. We are told that this must inevitably happen "unless proper measures are taken to protect them." On this point the commission are at present silent, but the question is one of considerable importance, and should be dealt with later.

Housing at Liverpool.—The Liverpool Corporation have resolved upon another important demolition and reconstruction scheme for the following areas: Prince Edwin-street, Rathbone-street, Mason-street, Saltney-street, Blenheim-street, Penrhyn-street, Gore-street, Sparling-street, and Jordan-street. The approximate cost of clearing the land, demolishing existing insanitary property, and building new dwellings will exceed £200,000.

Putney Bridge.—The town clerk of Fulham has communicated with the London County Council urging the necessity, in the interests of public safety, for the widening of Putney Bridge. Accidents which have recently occurred in Fulham-road have directed the attention of the local authority to the matter, and the condition of the bridge is described as dangerous on account of its inadequacy to deal with the great volume of traffic. The Fulham Council has applied for the imposition of a speed-limit for motors from Stamford Bridge to Putney Bridge.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

The premium for June is divided between

MR. H. F. WILKINSON,
Borough Engineer's Office,
and Tottenham,

MR. G. B. R. PIMM,
Melrose Gardens,
Wexford,

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

QUESTIONS.

This week answers are invited to the following questions:—

252. Girder Bridge—Design a girder bridge to carry a 24-ft. road over a river and railway (at an angle of 60°) of two spans, 70 ft. and 42 ft. respectively. The mean height of road surface above bed of river is 21 ft. 6 in., and 17 ft. above rails, and the foundation is clay. Please show calculations and give an estimate of the cost. ("Nomad.")

253. Hospitals.—Give a typical cross-section of an infectious hospital ward. Specify for finishing the internal surfaces. Give detail sketches of a window. ("M. and C.E.")

256. Leak in Drain Pipes.—What is a reasonable amount of leakage to be expected in newly laid stoneware drain pipes of 6 in. and also 12 in. diameter? State the type of joint, average depth of trench, and class of soil. Is one gallon per mile of pipe per hour a permissible amount? ("Welsh.")

257. Brick-plant. Sketch and describe a plant for making bricks and flags from refuse destructor clinker. (T. R.)

REPLIES TO QUESTIONS.

254. Books.—Would any of your readers kindly recommend any books on bridge construction and tramway construction suitable for the examination of the Institution of Municipal and County Engineers? (F. H. H.)

The following books are recommended for the subjects mentioned:—

"Bridge Construction," by T. Claxton Fidler. Price 30s. Charles Griffin & Co.

Tramway Construction.—"Electric Tramway Traction," by A. D. Greatorex. Price 2s. 6d. St. Bride's Press, Limited.

"Model Answers to Questions set at recent Examinations of the Incorporated Association of Municipal and County Engineers." Price 3s. 6d. St. Bride's Press, Limited. (W. D., *Dudley.*)

255. Surveying.—What effect has a steep hill of moderate height on a survey whose accuracy is important. It is obvious that if the reading of the chain line was taken and plotted the resultant plan would be distorted. Describe the means taken to obviate this distortion. (H. S. G., *Ashford.*)

In surveying, all measurements upon the ground are *reduced* to the *horizontal*, as when plotted the survey represents a perfect plane; and in chaining the line every length should be exactly equal to the base of a right-angle triangle, whose hypotenuse is the corresponding length of slope. Now if the length of the line was measured along the slope of the hill, and this line was plotted as exactly measured, it would be longer than it should appear, and consequently the plan would be distorted. There are several ways to obviate this distortion in making the survey of the hill—namely, by

(1) "Stepping."

(2) Reducing the hypotenusal measure by calculation, having obtained the angles of slopes with the clinometer, Abney level, or any suitable angular instrument.

(1) In "stepping" short lengths of the chain are held in a horizontal position and the extremity transmitted to the ground by means of a plumb bob; the greater the angle of slope the less will be horizontal distance for a given length of slope.

(2) The angle of slope is generally taken with the Abney level, the necessary reduction in the chainage being done as the work proceeds, by setting back the chain the required number of links, as is shown in a table corresponding to the angle of slope observed. Another way is to take the angle of slope and the measurement of the sloping ground and reduce for inclination when plotting. The writer is of opinion, however, that stepping is the best method, as any offsets that may be required will be more easily got by that than by the other methods. (W. D., *Dudley.*)

NOTES.

The errors corrected by the Editor in "C. F. B.'s" answer to Question 238 are received by him with thanks. The figures are a simple clerical error and should be $27 \times 6 \times 6 = 972$ cubic feet = 6,075 gallons. With regard to the detritus tank it was already stated to be too large, and if the plant is for sewage only it is not necessary. Further the word *septic* was inserted by mistake in my reply, as I by no means intended to infer that they were septic tanks. Again, as to the filter it is based on W. Stoddart's figures, and I personally have found it quite sufficient with land treatment—*viz.*, 1 cubic yard for every 10 persons. As to the walls and distributor, that depends entirely upon circumstances. The walls may be strengthened with an earth embankment, probably with soil removed from the site for making the works; and lastly I should advise "Somerset" to use Stoddart's Distributor with the special drip points. When sending in my answer I was taking into consideration the fact that this plant was only required for about 6 years. (C. F. B.)

INSTITUTION OF MUNICIPAL ENGINEERS.

NORTHERN DISTRICT.

A meeting of the above will be held at Keswick on Saturday, July 13th.

PROGRAMME.

10.15 a.m.—Meet at Town Hall. Short paper by Mr. P. M. Hope, on "Keswick and Its Municipal Undertakings."

11.0 a.m.—Leave Town Hall for Thirlmere Waterworks (Manchester supply).
Light refreshments at Nag's Head Hotel, Wythburn, after inspecting waterworks.

1.30 p.m.—Drive to top of Dunmail Raise to inspect new road made by the Cumberland County Council.

2.0 p.m. Drive west side of Thirlmere Lake (over road made and maintained by the Manchester Corporation) to inspect dam and valve house.

2.30 p.m.—Inspect Smaithwaite Bridge and drive through Vale of St. John's to Threlkeld.

3.0 p.m.—Inspect Threlkeld Granite Quarries with the kind permission of the Threlkeld Granite Company.

4.0 p.m.—Return journey to Keswick.

4.40 p.m.—Dinner at Keswick.

Members who are obliged to arrive in Keswick on the Friday evening will be accommodated at the Queen's Hotel (bed and breakfast 4s. 6d. each).

The charge for the motor char-a-banc will be 5s. per head.

The return train leaves Keswick on Saturday evening at 6.29, arriving in Newcastle at 11.5.

JOHN ROBINSON,
Hon. District Secretary.

Union Offices,
Darlington.
July 4, 1912.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Abersychan U.D.C. (June 25th. Mr. Edward Leonard).—£26,000 for the purpose of erecting 156 houses under the provisions of the Housing of the Working Classes Act, being 50 houses at Talywain and Garndiffaith respectively and 56 at Pontnewynydd. Dr. J. W. Mulligan, the medical officer, stated that there had been some overcrowding, and that there were insanitary properties in the district, and that when the council's houses were erected they hoped to deal with the insanitary dwellings.

Alfreton U.D.C. (June 20th. Mr. Edgar Dudley).—£500 for the purposes of public conveniences for women. The council have provisionally acquired premises in King-street, Alfreton, from Mr. Morewood, and it is proposed to construct the conveniences, which will be managed by the present tenant of the shop premises. The clerk, Mr. Cleaver, explained the application, to which there was no opposition.

Crediton U.D.C. (June 27th. Mr. A. W. Brightmore).—£16,300 for the purposes of sewage disposal, including the execution of works in the parish of Crediton Hamlets. The clerk, Mr. J. Symes, stated that of the £16,300 loan, £8,500 was in respect of land, for which a period of 80 years was asked, and £7,800 for sewage works, which it was proposed to repay in 30 years. The chairman of the council, Mr. H. Elston, said they only required five acres of land, but the owner refused to sell that quantity, and they were forced to buy 61 acres. It was proposed to let the remainder for small holdings. Mr. N. Paul Jasper, the engineer, explained the scheme in detail, and evidence was also given by the surveyor, Mr. T. Jones.

Dawlish U.D.C. (June 26th. Mr. W. O. E. Meade-King).—£350 for the widening of the narrow entrance to High-street from the Exeter-road.—There was no opposition.—The clerk (Mr. F. S. Cole) stated that the present balance of loans owing by the town was £9,230.

Falmouth T.C. (June 27th. Mr. W. O. E. Meade-King).—£600 for effecting improvements at Green Bank, and £65 for improvement in Swanpool-street.—It was stated by the borough surveyor (Mr. J. S. Walton) that with regard to the proposal for the improvement at Green Bank it had been brought about by the collapse of the existing retaining wall. With respect to Swanpool-street the borough surveyor said the improvement gave an average widening of about 6 ft. and a width of 18 ft., measured from the existing centre of the present street, and the line had been set out to allow for a continuation of the widening at any future time.

Kirkby-in-Ashfield (June 18th. Mr. R. G. Hetherington).—£10,000 for purposes of sewage works.—There was no opposition to the application.—The inspector made a very exhaustive inquiry into the scheme, which proposes a new line of sewer from the northern point of Low Moor-road to the outfall works; new sewer in Prospect-street and Victoria-road, and a large amount of new work and revision of existing plant at the outfall works.—The inspector afterwards visited the various points affected.

Leeds T.C. (June 14th. Mr. H. R. Hooper). - £58,960 for the purpose of providing additional generating plant with the necessary boilers and accessories at the Whitehall-road station.—The town clerk, Mr. R. E. Fox, stated that it was proposed to put in a 7,500 k.w. turbo alternator with the necessary condensing plant at a cost of £23,000; four boilers and accessories costing £11,300, and switch gear, &c., the estimated cost of which was £9,650.—The plant was not required to replace any existing plant, but was an entirely new addition designed to meet an increase in the demand for electricity. It took twelve months to construct, and several months must be allowed for experimental running. In view of the urgency of the matter the contract had been let pending the inquiry.

Penzance T.C. (June 28th. Mr. W. O. E. Meade-King).—£2,350 for works of water supply.—The town clerk, Mr. T. H. Cornish, stated that in 1902, with the consent of the Local Government Board, they sank a well 100 ft., equipping it with an engine and engine-house, and driving an adit. Now the corporation wanted to extend the adit 360 ft., having discovered that the farther the adit went the greater the supply. To prove that they were proceeding in the right direction the council sank a borehole at Hendra, about a quarter of a mile away, and that hole had just been completed. The bore was put down 120 ft., and they struck a very heavy stream of water. The borough surveyor, Mr. Frank Latham, said the only way to obtain a greater quantity in a given time was to let down the water from the upper country more quickly. This could only be done by extending the adit farther into the elvan formation, which it was proposed to do.

Rawtenstall T.C. (June 18th. Mr. T. C. Ekin).—£2,600 for the purposes of extending and heating the central market hall; £7,500 for purposes of the electricity undertaking; and £423 for the purpose of widening Miller Barn-lane, Waterfoot.—Mr. James Whalley, town clerk, stated that the existing market hall, which was opened on January 18, 1906, was too small, and applications for stalls from existing and intending stallholders were being made. In addition, the existing passages between the stalls were too narrow for the convenience of the public and the stallholders. No arrangements at present existed for the heating of the market hall, and during the winter months it was found to be too cold; hence the reason for the proposals to heat and underdraw the existing and proposed new portions. The application for the loan of £7,500 for the electricity station was made on account of the general development of the work.

Sheffield T.C. (June 25th. Major J. Stewart).—£43,025, of which £27,727 is required for sewage and £15,298 for paving.—Mr. R. M. Prescott, town clerk, said the policy of the council was to expedite as far as possible the conversion of all the existing defective rubble or stone sewers into brick or earthenware pipe sewers. Since 1898, when that policy was inaugurated, the length of the defective sewers in the city had been reduced from about 119 miles to 35 miles. Works of sewerage forming the subject of that inquiry affected sixty-three streets in various parts of the city. In regard to the paving, the town clerk said there were back lanes for which it was sought to get sanction to the borrowing of £9,953. It was proposed to spend £2,812 on Manor-lane from City-road to the ruins of the old Sheffield Manor. The portion of the main road to Rotherham to be paved out of the proposed loan, at an estimated cost of £2,533, was situated in the Tinsley area recently added to the city by the Sheffield Extension Order, 1911. It was an indication that the corporation were giving supervision to their new responsibilities, and looking after their added areas. Mr. W. J. Hadfield, surveyor of highways, asked by the inspector to give reasons for early sanction to the borrowing of the money, stated that it was proposed to double the existing single tramway tracks in Barber-road and Crookes-road, but before doing that they wanted to put the sewer right. In Wilfred-road they wanted to carry out private street works and desired to get the sewer done first.

South Shields T.C. (June 25th. Mr. H. R. Hooper).—£8,301 for new municipal buildings.—The town clerk (Mr. J. Moore Hayton) stated that the corporation obtained their borrowing powers for the municipal buildings under their Act of 1903, the specific sum of £60,000 being fixed for the completi n of the work.—They had expended the £60,000 sanctioned by the Act, and the Local Government Board also sanctioned the further loan of £8,231. The corporation were now asking for sanction to borrow a further sum of £8,301, which would make the total cost of the scheme up to the time of the application £76,532. He was afraid, however, that it would be necessary to apply for a further sanction in respect to the balance due to the architect, and also the costs in connection with an action brought by the architect against the corporation, which, he was glad to be able to say, had now been settled. The settlement of the action was a great relief to the council, who felt that the committee who had charge of the negotiations had come to a very favourable compromise. He estimated that £3,000 of the £8,301 was well within the mark for extras ordered by the corporation, and the litigation accounted for the balance.

Sunderland T.C. (June 26th. Mr. H. R. Hooper).—£37,207 for the purpose of developing the electricity undertaking. Mr. G. D. Duncan, assistant town clerk, said that the application was necessary because of the revival of activities in the shipbuilding and engineering world, the output having largely increased during the past year, and it was necessary to be prepared for the coming winter. Alderman Bruce asked that the Local Government Board might give an early decision, and the Inspector replied that it was clear that additional plant was very desirable, and he would advise the board accordingly.

Tottenham U.D.C. (June 14th. Mr. F. O. Stanford).—£3,021 for inverting and culverting a portion of the Stonebridge brook near the Midland Railway at South

Tottenham, at the rear of Townsend-road, and lowering the invert under the railway bridge. Mr. V. A. Hall, assistant clerk, supported the application on behalf of the council, and said the section under consideration formed part of a comprehensive scheme which the council desired to carry out. The total cost involved in the present work was £4,817, of which the Midland Railway were contributing £1,000 and the Middlesex County Council £796. Mr. W. H. Prescott, Assoc.M.Inst.C.E., said the necessity for the work arose owing to Hornsey sending a considerable quantity of surface water into Tottenham, which frequently had the effect of flooding the Green-lanes and St. Ann's districts, and it was hoped when this improvement was carried out it would relieve those districts.

Winchester T.C. (June 18th. Mr. W. O. F. Meade-King).—£4,361 for the provision of a cemetery at Magdalen Hill Down, in the parish of Chilcomb Without. —The city surveyor, Mr. W. V. Anderson, gave a detailed description of the site and proposed works. The site was chalk, with an overlying surface of 5 in. or 6 in. of soil only. The surface water would be disposed of by surface pits. It was proposed to build a lodge which would give full accommodation for the public on the ground floor, and the first floor would be for the caretaker.

APPLICATIONS FOR LOANS.

Battle U.D.C.—£1,550 for the provision of workmen's cottages.

Bexhill T.C.—£1,190 for the protection of the sea-wall, £300 for groynes, and £140 for road widening.

Branston R.D.C.—£1,375 for the erection of eight cottages.

Chester-le-Street R.D.C.—£2,824 for improvements at Pelton.

Chorley T.C.—£656 for automatic meters and cookers.

Coventry T.C.—£67,000 for municipal buildings.

East Grinstead U.D.C.—£1,000 for works of sewerage.

Glossop T.C.—£7,725 for the provision of new schools.

Southwick (Sussex) U.D.C.—£450, further loan for sewerage works.

Todmorden T.C.—£7,746 for paving works.

Twickenham U.D.C.—£675 for constructing an inclined embankment, faced with stone, along the river-side at Radnor Island.

Wellingborough U.D.C. £3,500 for a road improvement.

LOANS SANCTIONED.

Bexhill T.C. £3,163 for the construction of a new road.

Bishop's Stortford U.D.C.—£1,650 for an improved water-supply scheme.

Eastbourne T.C.—£3,475 for sewerage purposes.

Fulham B.C.—£3,200 for electricity purposes.

Halifax T.C.—£24,000 for the construction of an outfall sewer.

Halstead R.D.C.—£400 for experimental waterworks at Earls Colne.

Haslingden T.C.—£6,250 for street improvement works.

Lancaster T.C.—£1,200 for the provision of a refuse tip.

Llanelly U.D.C.—£770 for the purchase of land for a housing scheme, and £3,900 for the erection of the houses.

Mansfield T.C.—£1,225 for street improvements, and £2,150 for sewerage works.

Nuneaton T.C.—£3,910 for a cookery centre.

Penge U.D.C.—£519 for making up passages.

Penybont U.D.C. £3,690 for sewerage and sewage disposal works.

Southend T.C.—£5,000 for the erection of a swimming bath on the Western Esplanade.

York T.C. £5,423 for the purchase of properties and a new street.

FORTHCOMING INQUIRIES.

JULY.

		£
9.	**Castle Donington.** For sewage disposal purposes (Mr. R. G. Hetherington)	700
9.	**Cwyrfai.** For the provision of workmen's dwellings (Mr. Edward Leonard)	520
9.	**Kenilworth** For the provision of a cemetery (Mr. M. K. North)	3,700
9.	**Norden.** For works of sewerage (Mr. A. W. Brightmore)	1,109
9.	**Shanklin.** For the provision of council offices (Mr. H. R. Hooper)	1,500
9.	**Southend.** For street improvement works (Mr. F. H. Tulloch)	4,769
9.—	**Willesden.** For the provision of public conveniences and street works (Mr. F. O. Stanford)	23,882
10.—	**Ashton-in-Makerfield.** For sewage disposal purposes (Mr. A. W. Brightmore)	23 319
10.	**Bournemouth.** For the erection of law courts (Mr. H. R. Hooper)	12,170
10.—	**Dunmow.** For sewerage and sewage disposal works (Mr. F. O. Stanford)	6,400
10.—	**Gloucester.** For the provision of a fire station (Mr. M. K. North)	
10.—	**Grays Thurrock.** For street improvement purposes (Mr. F. H. Tulloch)	465
10.—	**Paignton.** For the provision of a refuse tip (Mr. Courtenay Clifton)	397
10.	**Ruthin.** For the erection of workmen's dwellings (Mr. Edward Leonard)	800
11.—	**Ashbourne.** For the provision of workmen's dwellings (Mr. Edward Leonard)	1,030
11.—	**Ipswich.** For road improvement works (Mr. F. O. Stanford)	1,300
11.—	**Plymouth.** For bathing facilities and pleasure ground purposes (Mr. Courtenay Clifton)	1 780
11.—	**Rowley Regis.** For the provision of a burial ground (Mr. M. K. North)	2,850
11.—	**Weymouth.** For the electricity undertaking (Mr. H. R. Hooper)	7,500
12.—	**Crewe.** For the provision of a public convenience (Mr. M. K. North)	160
12.—	**Hay.** For sewage disposal works (Mr. R. G. Hetherington)	4,000
12.—	**Ramsgate.** For the erection of a shelter and lavatories (Mr. F. O. Stanford)	4,178
12.—	**St. Helens.** For culverting and street works (Mr. H. Shelford Bidwell)	8,598
12.—	**Southall-Norwood.** For recreation ground and street purposes (Mr. Courtenay Clifton)	5,648
15.—	**Buckingham.** For the provision of workmen's dwellings (Mr. Courtenay Clifton)	1,200
16.—	**Exeter.** For an improvement scheme (Mr. W. H. Collin)	8,847

Sewage Disposal at Trowbridge.—With regard to the proposals for extending and improving the sewage disposal works at Trowbridge, the surveyor, Mr. H. Lailey, has prepared plans embodying the conversion of the sedimentation tanks on the "Fieldhouse" principle and double percolation and humus tanks.

Matlock Sewerage.—In connection with the new sewerage scheme at Matlock, the tender of Mr. J. Cottele, of Southport at £24,993, has been accepted for laying the pipe track from Matlock to the outfall works at Cromford, and the tender of Mr. J. W. Wildgoose, of Matlock and Chesterfield at £12,076, for the construction of the outfall works.

Municipal Engineering (Edited by Sydney G. Turner, Assoc.M.Inst.C.E. Price 3s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.).—This volume consists of model answers to questions set at recent examinations of the Institution of Municipal and County Engineers, and is the second edition. It is practically identical with the first issued. It is not suggested that it should take the place of recognised text-books, but it provides useful summaries of various subjects, as well as indications as to how different types of questions may be answered. Every effort has been made to render the answers as accurate and comprehensive as possible, though they contain more than a candidate would be expected to supply. The answers are founded upon examinations held in Birmingham, London and Manchester. The appendix contains examples of questions on sewerage, sewage disposal, tramway construction, bridges, water supply, road construction, buildings, sanitary science as applied to towns and buildings, drainage, and other matters. It will be seen, therefore, that the book is comprehensive, practical and exhaustive.—*Local Government Journal.*

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Coventry £60,375, Glasgow, Glossop £7,725, Hackney £5,280, Liverpool £60,000, Wandsworth; housing and town planning—Chelmsford; roads and materials—Camberwell £9 291, Middlesex £7,563, Stafford £10,000; sewerage and sewage disposal—Coventry £40,000, Ellesmere, Goole, Middlesbrough £33,000; water, gas and electricity—Margate £17,000.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

ADMINISTRATION.

Bishop's Stortford U.D.C.—In the course of a report to the council on the recent audit the district auditor, Mr. Herbert Lyon, writes: "During the past year the duty of paying the wages to the labourers employed by the council has been transferred from the surveyor (Mr. R. S. Scott) to the clerk. I find that the clerk provides himself with the necessary cash every Saturday morning—about £40—and hands it to the foreman, who carries this considerable amount of cash on his bicycle to the depot, and there pays the men. I understand that the surveyor was relieved of this duty with the view of lightening his work, and I hesitate to recommend anything likely to add to his duties, which seem to me to be even now more than he is easily able to carry out single-handed. I may perhaps be allowed to incidentally mention here that I am informed the surveyor, in order to cope with the work of his office, finds it necessary to be on duty every day from early morning till 10 o'clock every night, as well as half the day on every Sunday. If the surveyor was in a position to employ some clerical assistance in his office, I should recommend that he should be responsible for the payment of the labourers' wages, and that this should be done by means of cheques with endorsed receipts. This practice is one which is adopted by a large number of local authorities, and has many advantages. For this purpose the surveyor would, of course, open a highway account at the bank."

BUILDINGS.

Coventry T.C.—The tender of Messrs. H. Wilcock & Co., of Wolverhampton, for the erection of municipal buildings, at £60,375, has been accepted, subject to the receipt of the necessary sanction of the Local Government Board. Plans are being prepared for two more swimming baths, intended chiefly for school children.

Dumbartonshire C.C.—It has been decided to purchase South Hutcheson Farm, near Drumchapel, consisting of 119 acres, for the sum of £3,250, as a suitable site for the erection of a small-pox hospital, and also in view of the possible arrangements for the erection of sanatoria in conformity with the provisions of the Insurance Act.

Glasgow T.C.—The tender of Messrs. R. McAlpine & Sons, at £13,303, has been accepted for the construction of two bridges over the Forth and Clyde Canal at Dalmuir and Kilbowie, so as to allow the corporation cars to run up to where the Dumbarton and Balloch cars start.

Glossop T.C.—It has been agreed to build a new elementary school, at a cost of £7,725, and to ask the Local Government Board to extend the repayments of the loan over sixty years.

Hackney B.C.—It is proposed to build a branch library in Northwold-road, at an estimated cost of £5,280. The building, of brick with stone dressings, will be arranged on two floors, with similar accommodation to that provided at the Homerton and Dalston branches. On the ground floor there will be a combined news, magazine and reading room, with a juvenile reading-room, the whole being controlled from the porter's room in the entrance hall. The lending library will be on the first floor on the open access system, with bookcases arranged round a gallery over the reading-room, affording the attendant supervision of both the lending library and the reading-room.

Kirbymoorside (Yorks) R.D.C.—The surveyor, Mr. W. D. Rickaby, has been authorised to carry out the widening of two bridges and three large culverts on the Welburn to Nunnington road, at an estimated cost of £150.

Liverpool T.C.—It is reported that the Mersey Docks and Harbour Board have approved the plans and elevation for the new Pierhead Baths which the corporation propose to erect. The site cost £18,500, and it is intended to erect a building for £60,000, to include offices which will probably produce about £1,500 in rent.

Selby U.D.C.—The council have accepted a tender of over £2,000 for the erection of fifteen cottages in East Common-lane. It was decided to negotiate for land in Cow-lane for other working-class dwellings. Eight cottages built on land owned by the council are about ready for occupation, the rents being 5s. 3d. per week clear.

Spalding R.D.C.—The tenders of Mr. George Barnsdale, of Donington, at £998, for the Donington cottages, and that of Mr. John William Derby, of Boston, at £736, for those at Moulton, have been accepted.

Wandsworth B.C.—A letter has been received from the London County Council stating that the council propose in a short time to obtain tenders for reconstructing the bridge over the river Wandle at High-street, Wandsworth, and that in connection with the widening of the road in front of the public baths it is proposed to erect from the river to the entrance gates a wall similar to that at present there, and to re-erect the existing iron railings on the other side of the entrance gates.

HOUSING AND TOWN PLANNING.

Chelmsford T.C. The council have approved of the scheme of the borough surveyor, Mr. P. T. Harrison, for the erection of forty-eight additional houses on the Rainsford-lane site, and the borough surveyor has also been instructed to prepare plans, specifications and estimates for fifty-five more cottages, so as to complete his scheme.

PARKS AND OPEN SPACES.

Bath T.C.—The improvement of Orange-grove is to be carried out, at an estimated cost of £3,500.

Wallasey T.C.—A shelter and pleasure grounds were formally opened at Egremont Ferry on Tuesday last.

REFUSE COLLECTION AND DISPOSAL.

Middlesbrough T.C.—The borough surveyor, Mr. S. E. Burgess, has presented a report, which the Sanitary Committee have approved, for the disposal of the town's refuse by the construction of a staith dock and barge to sea. The suggestion was to build a staith dock on the vacant land at the ferry. There would be an inclined road to a tip from which the refuse would be tipped into the barge lying in the dock at all states of the tide, and then taken out to sea. The dock would be covered with a steel and corrugated-iron roof, and there would be sprinklers working to keep down the dust and smell. Asked if the smell would not still be there and cause a nuisance, Mr. Burgess observed that "people often see smells," and the barge would be out of sight, and if dealt with as was proposed the refuse would not cause any nuisance. The annual cost of the scheme would be £1,317 for the disposal of 20,000 tons, or 1s. 4d. per ton.

ROADS AND MATERIALS.

Berwickshire C.C.—The East District Committee intend to carry out an extensive road improvement on Tower Bridge and Glenfyn roads, and it has been intimated that the Road Board will give a grant of £3,300 towards the total cost, which is estimated at £4,480.

Bexhill T.C.—The tender of Mr. S. Carey, at £1,465, has been accepted for the construction of a new road from North-street to Alexandra-road.

Camberwell B.C.—The Works Committee recommend that Pickwick-road be taken over under the 105th sec. of the Metropolis Management Act, 1855, as a new street.—The same committee recommend that the west side of Peckham Rye from Nigel-road to Barry-road be paved with specially dressed granite setts laid to a close joint, in accordance with the report of the

borough engineer, Mr. W. Oxtoby, at an estimated cost of £9,291, the work to be done by direct employment of labour.

Chelmsford T.C.—The Road Committee have directed the surveyor, Mr. P. T. Harrison, to prepare a scheme for paving with asphalt-bound granite High-street, Springfield-road (between High-street and the iron bridge), and Moulsham-street (between the bridge and Writtle-street). He has also been requested to report on the financial effect of the scheme in regard to the main roads expenditure for a period of five years.

Edinburgh T.C.—The Streets and Buildings Committee have again considered the question of the smooth paving of Montague-street and Learmouth-terrace. The council referred back the previous recommendation of the committee, which was that there be accepted the estimate of the Limmer Asphalt Company for compressed asphalt for Montague-street and of mastic asphalt for Learmouth-terrace. In the first case the estimate is £1,099, and in the second £1,053. The committee adhered to their former recommendation, including paving at High-street, Portobello, at an estimated cost of £1,197.

Galway C.C.—Owing to the increasing disinclination of contractors to tender for road work, the county surveyor, Mr. Moran, has been authorised to increase by 25 per cent the amount of the estimate for each work.

Greenwich B.C.—Tenders are being invited for the forming and paving as a "new street" of that portion of Thorley-place, East Greenwich, which has been added to the "ancient highway" on the south side.

Guildford T.C.—The North-street improvement has been carried out at a cost, as regards work only, of £290. Alderman Ellis said the fact that the estimate for this work was £400, and it had been carried out for £290, reflected great credit on the borough surveyor, Mr. C. G. Mason, and he was entitled to the thanks of the council.

Halifax T.C.—The borough engineer, Mr. J. Lord, has received instructions to reconstruct part of the tram track, at an estimated cost of £2,890.

Islington T.C.—With regard to the proposed scheme for avoiding the expensive widening of Ball's Pond-road for tramway purposes, by making a short length of line through Dorset-street, the council have approved the recommendation of the Joint Committee of the Works Committee and Parliamentary Committee that consent should be given to the county council to proceed with the electrification of the track on the old lines (with passing loops at certain intervals), pending Parliamentary sanction for the Dorset-street line, which will ultimately take the inward traffic.

Kingston (Surrey) T.C.—Under the direction of Mr. R. H. Clucas, the borough surveyor, the contour of an important section of the Portsmouth-road has been improved by raising both carriageway and footway on the riverside, and treating the road surface, formerly water-bound, with "Roadamant." The work has occupied six weeks.

Middlesex C.C.—The wood paving in the Edgware main road from the Metropolitan Railway Bridge to a point near Ash-grove is to be relaid, at an estimated cost of £7,563.

Roxburghshire C.C.—The Hawick District Committee have agreed to lay portions of the Carlisle-Edinburgh road between Mosspaul and Groundistone with Rocmac, at an estimated outlay of over £1,000, and to apply to the Road Board for a contribution towards the work.

Southend T.C.—Warrior-square and the Broadway-market are to be made up under the Private Street Works Act.

Southwick (Sussex) U.D.C.—The surveyor, Mr. G. W. Warr, has been instructed to communicate with the local owners of property with the object of ultimately forming a through road from New Church-road, Hove, to the Southwick railway station.

Stafford T.C.—A scheme has been advanced for the formation of a new road between Laurmascote-road and Lichfield-road, at an estimated cost of £10,000.

Wellingborough U.D.C.—It is estimated that the improvement at the corner of the main road from Finedon leading into Cambridge-street, will cost £3,500. The corner is probably the most dangerous in the town being a right-angle turn at the bottom of a hill.

SEWERAGE AND SEWAGE DISPOSAL.

Birmingham T.C.—An expenditure of £19,000 has been authorised on the construction of a mile of extension of the large main sewer along Highfield-road and Robin Hood-lane. It has been agreed to authorise the committee to reconstruct the culvert of the Hockley Brook under Factory-road and Newton-place, and to carry out other works for preventing the flooding of the Factory-road area, at an estimated cost of £2,700. Drainage and sewerage works are also to be carried out in Wheelwright-road and neighbourhood, at an estimated cost of £3,340.

Chesham U.D.C.—The tender of Mr. W. Wright, of Chesham, at £5,893, has been accepted for the construction of the new sewage outfall works, and the tender of Messrs. A. Mead & Son, of Chesham, at £1,090, for works of sewerage.

Coventry T.C.—The Sewage Farm Committee have in contemplation a scheme for the extension of the system of bacteria filtration, at an estimated cost not exceeding £40,000.

Easingwold R.D.C.—The tender of Messrs. T. Wood & Sons, at £116, has been accepted for the work in connection with the Huby drainage scheme.

Ellesmere R.D.C.—The council have consulted Messrs. Berrington, Son & Watney, engineers, of Westminster and Wolverhampton, with a view to the preparation of a complete sewerage and sewage disposal scheme for the village of Baschurch.

Coole U.D.C.—Tenders are to be obtained for the construction of a pumping station and outfall at Westfield, and also for five main trunk sewers.

Littleborough U.D.C.—The tender of Messrs. Ham, Baker & Co. has been accepted for the supply of sprinklers, iron pipes, and closing valves for the sewage disposal works.

Middlesbrough T.C.—It has been agreed to adopt a portion of the drainage scheme prepared by the borough engineer, Mr. S. E. Burgess (referred to in last week's SURVEYOR), at a cost of £33,000.

Radcliffe U.D.C.—A sewerage scheme for Bank Top is to be carried out at an estimated cost of £900.

South Westmorland R.D.C.—A sewerage scheme is to be carried out for the village of Milnthorpe, at a cost of £341.

Southwick (Sussex) U.D.C.—The council have adopted the original surface-water sewage scheme, as submitted by the surveyor, Mr. G. W. Warr, at an additional total estimated cost of £915. The scheme will be submitted to the Local Government Board with an application for sanction to borrow a further sum of £450 to carry out that portion of the proposed works from the north end of the Green to the termination of the works covered by the present sanction, the balance of the required amount to be applied for when required.

WATER, GAS, AND ELECTRICITY.

Coventry T.C.—It has been agreed to purchase land from Nuneaton Grammar School trustees for erection of the reservoir at Coundor, and to procure an additional supply of water from the Birmingham Corporation.

East Cowes U.D.C.—A report has been approved recommending the adoption of a new water supply by means of a pumping station. The site suggested for the experimental works was the one selected by Mr. Percy Griffiths, M.INST.C.E., in the chalk south-east of Newport, at Burnt House.

Manchester T.C.—The nett surplus of the electricity department for the year ended March 31st last was £28,319, against £27,573 in the corresponding period of last year.

Margate T.C.—The council propose to provide a new pumping engine and pumps at the Wingham pumping station, the plant to be capable of pumping 3,500,000 gallons in twenty-four hours through the existing 18-in. rising main. The estimated cost is: Engines and pumps, £12,375; necessary new well, engine foundations, new engine-house, £4,625, making a total of £17,000.

Newton Abbot R.D.C.—A water supply scheme for Olchard, Ideford, estimated to cost £208, has been referred to the Parochial Committee.

Oldham T.C.—The nett profit of the gasworks undertaking for the past year, after transferring £7,500 to the borough fund, is £10,137.

Oystermouth (Glam.) U.D.C.—The award of the arbitration recently held at the Mumbles respecting

the price to be paid by the council for the Oystermouth Waterworks has just been made known. The amount is £7,740, and the costs of obtaining the Act are £1,250, which, with the costs of the arbitration, make the total cost of acquiring the works £10,000.

Prestatyn U.D.C.—It has been decided by the council to borrow £1,500 for gasworks extensions, and to devote £500 of this sum for the laying of a new main in the estate of Lord Aberconway, which is being developed upon the conditions that the trustees guarantee a return of 15 per cent on the capital outlay.

Skelton (Yorks) U.D.C. — The tender of Messrs. O'Doherty, of Stockton, at £699, has been accepted for a water supply scheme.

Slough U.D.C.—In the matter of the purchase of the waterworks by the council, the umpire, Mr. A. J. Ram, K.C., has made an award for the payment of £90 623 for the undertaking.

MISCELLANEOUS.

Bushey U.D.C.—Messrs. P. W. Macvay & Co., civil engineers, 19 Old Queen-street, Westminster, have been instructed by the council to prepare a contour survey of the whole of the district—which is over 3,000 acres in extent—showing every 10-ft. variation of altitude.

Coventry T.C.—Application is to be made to the Board of Trade for sanction to a loan of £220,538 for the purchase of the tramway undertaking.

Watford U.D.C.—Three horses have been purchased at £56, £64, and £65 respectively.

PERSONAL.

Mr. Hugh Owen, borough surveyor of Flint, is, we regret to state, indisposed.

Mr. M. J. O'Boyle has been appointed assistant county surveyor of Mayo.

Mr. J. H. Hill has been appointed joint surveyor and sanitary inspector of Ripon.

Mr. T. Bowen, borough surveyor of Cardigan, has had his salary increased by £10 per annum.

Mr. J. A. Iveson, surveyor to the Scalby Urban District Council, has had his salary increased by £10 per annum.

Mr. W. J. Howard-Smith, of Westminster, has been retained by the Bootle Corporation to advise on tramway matters.

Mr. E. H. Essex, engineer and surveyor to the Leyton Urban District Council, has had his salary increased to £400 per annum.

Mr. J. A. Budge, deputy road surveyor of Birmingham, has been appointed chief road surveyor, as from July 1st, at a commencing salary of £400.

Prof. A. H. Blanchard, of Columbia University, has been retained by the Board of Water Supply of New York City as consulting highway engineer.

Mr. A. J. Lyddon, ASSOC.M.INST.C.E., P.A.S.I., of the Essex county surveyor's department, Chelmsford, has recently been appointed deputy county surveyor of Essex.

Mr. R. S. Scott, surveyor to the Bishop's Stortford Urban District Council, recently received congratulations upon having completed twenty-five years' service with the council.

Mr. W. E. Jones, sanitary inspector, has been appointed surveyor and building inspector for the Llangendeirne district by the Carmarthen Rural District Council at a salary of £120 a year.

Mr. R. O. Wynne Roberts, M.INST.C.E., we learn from a cable which reached London on Tuesday night, is among those who escaped unhurt from the terrible typhoon visitation which has just cost so many lives at Regina.

Mr. Oswald J. Wilkinson, ASSOC.M.INST.C.E., of the firm of Messrs. Jas. P. Wilkinson, MM.INST.C.E., of Manchester, has been instructed by the Barton-on-Humber Urban District Council to prepare a report on the Sewerage and Sewage Disposal of the district.

Mr. John A. Brodie (the city engineer of Liverpool) returned to his office on Tuesday, and (the *Liverpool Post* says) received the congratulations of many colleagues and other friends on his healthful appearance after a strenuous Eastern tour. It was pleasing, also, to learn that Mrs. Brodie had benefited by the visit to India, and especially by the rest at Delhi while her husband was engaged in the great scheme of the town planning of the new capital.

Mr. Sidney Reginald Drake, surveyor to the Leatherhead Urban District Council, was married on June 26th, at the parish church of the town, to Miss Ethel May Williams, daughter of Mrs. L. Williams, of Leatherhead. The presents numbered about 100. The bridegroom presented the bride with a gold and pearl bracelet, and the bride gave the bridegroom a travelling bag. The members of the urban council presented Mr. Drake with a marble clock, and the council employees gave him a silver rose bowl.

Mr. James Gray Lindsay, the city engineer of Belleville, Ontario, was born in Belfast in 1870, his early training being received from Mr. J. J. McDonnell, C.E., J.P., of that city. Among his experiences are an engagement with the contractors on the Belfast main drainage scheme, a project involving an expenditure of £300,000, and acting for the British Government in the West Indies. He was afterwards offered the position of colonial engineer on the Gold Coast, West Africa but declined it in view of the climate.

Mr. T. Salkield, the city engineer of Delhi, who is at present on leave in England, has just had conferred upon him the Kaisar-i-Hind decoration, which is awarded as a distinction for "important and useful services rendered to His Majesty in his Indian Empire in the advancement of the public interest of such Empire." Municipal engineers generally will congratulate Mr. Salkield upon this well-deserved reward, not only for its personal bearing, but for its recognition of the part municipal engineering plays in "the advancement of the public interest."

Mr. Edwin Ault, of the firm of Shone & Ault, consulting engineers, 47 Victoria-street, Westminster, and Wrexham, died, we greatly regret to learn, at Lahore, on the 24th ult., from heatstroke. Mr. Ault had for many years devoted himself to sewerage and sewage disposal work, and had been connected with a number of important works, both at home and in the East. He was so engaged when death overtook him. He was a member of the Institution of Mechanical Engineers, a Fellow of the Surveyors' Institution, and a member of the Royal Sanitary Institution, among other bodies.

Mr. John Spencer Killick has been appointed an assistant engineer to the Road Board. For nearly eight years Mr. Killick has held the position of surveyor of highways under the Croydon Rural District Council, one of the most important rural areas in England. Between 1899 and 1904 he held a similar appointment under the Maidstone Rural District Council, in 1898 he was an assistant surveyor under the Wombwell (Yorks) Urban District Council, in 1897 an assistant in the surveyor's office under the Hoyland Nether (Yorks) Urban District Council, and in 1894 was articled for three years to the present county surveyor of Oxfordshire. Mr. Killick is an associate member of the Institution of Civil Engineers, and a member of the Institution of Municipal and County Engineers.

Mr. Ernest Richard Lewis, surveyor to the Cranbrook Rural District Council, and brother of Mrs. Oswald A. Bridges, wife of the town surveyor of Bognor, was married to Miss Mary Frances Parson, of "Rodboro," Richmond-terrace, Bognor, at St. Mary Magdalene Church, South Bersted, on Wednesday, June 27th. Among those who were present were Mr. H. W. Bowen, county surveyor of West Sussex, Mr. Frank Harris, surveyor to the Tonbridge Rural District Council, Mr. Oswald A. Bridges, town surveyor, Bognor, Mr. Joseph Tubb, town clerk of Bognor, Mr. Herbert Beadle, Gravesend, Mr. Councillor Edwards, Cranbrook Rural District Council, Mr. Councillor Wm. G. Grice, Bognor Urban District Council, and Mr. F. Pye, gas engineer, Chichester. The guests numbered seventy, and the bride and bridegroom were the recipients of many very handsome presents.

Akonia and the French Motor Race.—The Dieppe Circuit, covering a distance of nearly 50 miles, was most successfully treated with Akonia for dust prevention on the occasion of the Grand Prix Race, organised by the Automobile Club of France. The work, which took about 200 tons of Akonia, and had to be executed within two days, was carried out under the personal supervision of agents of Akonia, Limited. It was found that, independently of the road being dustless, the surface was marvellously smooth—a fact much appreciated by the competitors—and in a splendid state of preservation, even after the race.

METHODS OF DEPOSITING CONCRETE UNDER WATER.

This was one of the subjects reported upon by the Committee on Masonry at the annual meeting of the American Railway Engineering Association. The replies to a circular letter of inquiry (says the *Contract Record*) covered nine methods, as follows: (1) Bottom-dump bucket; (2) tremie (or closed chute); (3) open chutes; (4) sacks; (5) sacks withdrawn; (6) paper bags; (7) open depositing; (8) pneumatic grouting of broken stone; (9) concrete blocks. From an examination of the replies the committee has drawn the following conclusions:

(1) Concrete may be deposited successfully under water, if so handled as to prevent the washing of the cement from the mixture.

(2) Cofferdams should be sufficiently tight to prevent current through the pit, and the water in the pit should be quiet.

(3) The concrete should be deposited in place either by means of a drop-bottom bucket or a tremie, and should not be allowed to fall through the water.

(4) Where a bucket is used, it should be carefully lowered to the bottom and raised to the surface, so as to cause as little disturbance as possible.

(5) Where a tremie is used, it should be kept filled with concrete up to the top of the water level; the discharge end should be kept buried in the freshly deposited mass to prevent emptying, and raised a few inches at a time as the filling progresses.

(6) The surface of the concrete must be kept as nearly level as possible, to avoid the formation of pockets which will retain laitance and sediment.

(7) Where concrete is not deposited continuously, all sediment should be removed from the surface of the concrete, by pumping or otherwise, before depositing fresh concrete.

(8) The concrete should be a 1: 2: 4 mixture and of a "quaking" consistency.

(9) Freshly deposited concrete should not be disturbed.

(10) In open water or where flow of water through the pit cannot be prevented, concrete should be deposited in cloth sacks.

AN AMERICAN ROAD CONGRESS.

The American Road Congress will hold its first annual session in Atlantic City, from September 30th to October 5th. The event will mark the consolidation of forty of the most important road organisations in the United States, and will be presided over by President Taft. The active president will be Prof. Logan Waller Page.

In conjunction with the congress the National Association of Road Machinery and Material Manufacturers will organise an exhibition at which, it is stated, every industry relating to the building and care of roads and bridges will be represented. The exhibit of the U.S. Office of Public Roads will consist of a complete set of miniature working models of rollers, crushers, and various equipment operated by tiny electric motors. The Government's priceless collection of models showing the development of transportation from the primitive human burden-bearer to the modern automobile and locomotive may also form a feature of the exhibition. "Old Trails" exhibits, recalling scenes along the famous old roads, and trails such as "The Old Cumberland Road" and the "Santa Fé Trail," will add picturesqueness to the display.

One of the principal organisations composing the Congress will be the American Association for Highway Improvement, composed of about 1,500 members, who are leaders in their respective lines of activity throughout the United States. Thirty-five organisations for road improvement are identified with the association, and twenty railway companies are giving it their support.

The first two days of the congress will be assigned to the road users under the auspices of the American Automobile Association, the second two days to the great problems of legislation, finance and economics under the auspices of the American Association for Highways Improvement, while the last two days will be given up to the engineers, who will discuss problems of construction and maintenance, and to the various associations which will meet and map out their plans of action, correlate their efforts, and make definite arrangements to pull together in what is called "the greatest campaign for road improvement and wise conservative management ever undertaken."

ROYAL INSTITUTE OF PUBLIC HEALTH CONGRESS IN BERLIN.

THE MUNICIPAL ENGINEERING, ARCHITECTURE AND TOWN PLANNING SECTION.

The Congress of the Royal Institute of Public Health, which opens on Thursday, July 25th, in Berlin, and extends over three days, will be conducted in five sections, the one of special interest to our readers being that devoted to Municipal Engineering, Architecture and Town Planning—over which Mr. P. C. Cowan, D.SC., M.INST.C.E., chief engineer of the Local Government Board of Ireland, will preside, among the vice-presidents being Prof. Henry Adams, M.INST.C.E., Sir Alexander R. Binnie, M.INST.C.E., Mr. John A. Brodie, M.INST.C.E. (city engineer of Liverpool), Mr. W. B. Bryan, M.INST.C.E. (chief engineer of the Metropolitan Water Board), Mr. A. D. Greatorex, M.INST.C.E. (borough engineer of West Bromwich), Sir James Lemon, M.INST.C.E., Mr. T. de Courcy Meade, M.INST.C.E. (city engineer of Manchester), Prof. W. C. Unwin, F.R.S. (president of the Institution of Civil Engineers), Mr. G. W. Willcocks, C.B., M.INST.C.E. (chief engineer to the Local Government Board), and Sir John Wolfe-Barry, K.C.B., F.R.S. Mr. A. J. Martin, M.INST.C.E., is one of the secretaries of the section.

The papers to be read during the three days on which the section will meet include:—

"Water Supply in London," by W. A. Richardson, ASSOC.M.INST.C.E., assistant engineer to the Metropolitan Water Board.

"British Practice in Sewage Disposal," by A. J. Martin, M.INST.C.E.

"Sewer Ventilation," by T. de Courcy Meade, M.INST.C.E.

"Building By-Laws," by J. D. Casswell.

"Town Planning," by Thos. Adams, town planning assistant to the Local Government Board.

"Legal Aspects of Town Planning," by R. E. Willcocks.

"Use of Reinforced Concrete in Architecture," by Prof. Henry Adams, M.INST.C.E.

"The Use of Reinforced Concrete in Engineering," by J. H. Waller.

Papers dealing with the sewage arrangements of Berlin, water sterilisation and street cleaning will be contributed by German delegates to the congress.

Visits to a large number of public institutions in and around Berlin have been arranged in connection with the gathering.

FOR OTHER ADVERTISEMENTS
See End of Paper.

COUNTY BOROUGH OF WEST BROMWICH.
REMOVAL OF TRAMWAY CENTRE POLES.

The Council is prepared to receive Tenders for the Removal of the existing Centre Poles, the Supply and Erection of additional Tramway Poles and other Works in connection therewith.

Plans, Detail Drawings, Specification and Conditions of Contract may be inspected at my Office.

Sealed Tenders, endorsed "Removal of Tramway Poles," must be forwarded to my Office not later than noon on the 16th day of July, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

A. D. GREATOREX, M.INST.C.E.,
Borough Engineer and Surveyor.

Town Hall,
West Bromwich.
July 1, 1912.

ASSISTANT (20), two years articled with Surveyor to growing Urban District, three months Assistant, one year Assistant Draughtsman and Estimating Clerk in large Contractor's offices, Surveyor, Leveller, good Draughtsman; private street works, sewage disposal, buildings, roads, office routine, &c. Excellent references.—BOX 1,168, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

FOR SALE. About 100 second-hand tree guards, 6 ft. high, 2 ft. 3 in. diameter; in good condition. —S. J. Lee Vincent, A.M.I.C.E., Borough Surveyor, Newbury.

Institution of Water Engineers.

SUMMER GENERAL MEETING AT CHELTENHAM.

The following papers were among those presented at the final day's sitting of the recent summer general meeting of the Institution of Water Engineers at Cheltenham:—

THE SELF-POLLUTION OF WATER BY NATURAL GROWTHS.

By J. H. Garrett, M.D., D.P.H., F.L.S.,
Medical Officer of Health, Cheltenham.

The organic polluting material found in all water is derived from living organisms immediately or more remotely, and water often becomes polluted by the decaying bodies or products of the fauna and flora to which it supplies the natural medium of existence.

It is said that hard waters are more given to develop organic growths than soft waters, and there are numerous organisms that require a considerable quantity of inorganic material as a constituent of their skeletal parts. But a very small quantity of contained material, whether of organic or inorganic nature, suffices to allow of some growth taking place in water, microbic growth for example, which, though consisting of an enormous number of individual living units, has an almost inappreciable weight of substance. It may be remembered, however, that water to which the air has free access has power of dissolving the several gases of the air, and that these may supply the nitrogen, oxygen and carbon required by living organisms of various sorts to build up the solid substances of their bodies and that these substances from being at first a part of some living animal or plant will sooner or later suffer death and decay and so come to add an organic pollution to the water.

Thus so long as water is hidden in the deep strata of the earth out of reach of the air it remains of the same composition, but the same water brought to the surface and left for some time exposed to the air in reservoirs or receptacles becomes the habitat of organic growths which, in the course of time, prove themselves capable of altering the chemical composition of the waters, sometimes resulting in such considerable pollution as to render a water, which was in the first instance a spring water of excellent potable quality, quite unfit for drinking.

Apart from organisms of bacterial species of very minute size, and certain other large organisms, the admission of light to the water whose surface is exposed to the air is essential to the development of the living organic bodies that are destined to become water polluters. This is the case with all green growths, light being essential for the development of the chlorophyll, and many plants, being dependent on chlorophyll for their existence, cannot grow except with the assistance of daylight. This is an important point to remember when it is required to keep water free from such growths, and from the effect they produce upon the quality of the water, a dark reservoir proving a sufficient preventive to the undesired phenomenon.

It appears that the water derived from certain rocks exhibits a preferential tendency to develop certain polluting organisms. The water that has filtered through the limestone of the inferior oolite of the Cotswold Hills, for example, is particularly prone to develop the troublesome water plant chara, which affects all water derived direct from springs situated at the base of these rocks, when such water is stored for any considerable time in reservoirs. It is possible that small quantities of phosphate and nitrate contained in the water derived from this source may stimulate the growth of this plant, which also seems to require the presence of carbonate of lime, for it exhibits a peculiar power of forming accretions of calcium carbonate in and about its cells.

CHARA.

This chara is a plant of unique appearance, of a sea-green colour, possessing a stem and whorled arrangement of branches which arise at nodes in regular sequence, and under the microscope the whole plant is seen to have a simple structure consisting of very large cells. During the summer months the plant vegetates apace, reaching a height of more than a foot where it grows in large patches upon the sides and bottom of the reservoir, which serves it best when offering a rough surface, such as that of common brickwork, or loosely laid stones, and serves it ill when consisting of quite smooth cement or concrete, into which it is impossible for roots to penetrate. In fact, the covering of the brickwork with a smooth layer of cement has proved preventive of the growth, at least for a considerable time.

Towards the end of summer the chara begins to die down, its green growth losing in substance and becoming duller in colour, and in connection with its decay numerous minute organisms appear and swarm the water. The most prominent swarming organism in the case of our own reservoirs that are affected with chara is volvox globator. This prevailing secondary growth swarms through the water in the form of green moving balls, with a sparkling reticulated surface, just sufficiently large to be plainly visible to the naked eye when a glass of the water is held up to the light. The decaying chara, together with its accompaniments, entirely spoils the water for drinking purposes, imparting to it a disagreeable odour and taste, and on several occasions we have had to turn to waste a quantity of water so affected. From time to time, as opportunity offers, the reservoirs are cleaned of the chara, when many tons of stinking weed have been removed.

A chemical effect of the growth of chara and its accompaniments in our reservoirs is to add considerably to the organic content dissolved in the water, and to reduce the small quantity of nitrate naturally contained in the water to nitrite. This is learned on comparing the results of analyses of the water as it enters the reservoir from the springs with those of the water from the bulk contained in store. The pity of it is that the water, which as delivered from the springs is of the purest nature, is destined to be deteriorated in this manner.

CRENOTHRIX.

Water containing a trace of iron is liable to be affected by the microscopic filamentous alga crenothrix, which contains no chlorophyll, and is capable of growing in the dark, as within water mains, for example, and the thick coating sometimes found deposited upon the inner surface of water pipes may consist of this organism, together with carbonate of lime and iron rust. But crenothrix sometimes swarms through the water of a reservoir, giving it a red-brown colour for a time. The water supplies of several Continental towns have been visited in this way, but in England, I believe, the only recorded instance is that of our own town of Cheltenham, where in the early spring of 1896 the Dowdeswell reservoir, receiving the head water of the small river Chelt, was affected in a very marked manner with crenothrix. There are some oozings of iron-stained water at several places in the banks of the reservoir, and in the year that the water was affected the reservoir was never filled to overflowing, as it generally is, and the water contained was consequently less well aërated, and more concentrated in local constituents than usual. The organism swarmed through the water, rendering it red in appearance, through the presence of flocculent red-brown masses, or zoogloeæ, and innumerable round spore cells of the size of micrococci, which had also a reddish colour. Filtration removed the greater part, and the dirty sand of the filters had a very unpleasant odour, and from this sand the organism was obtained in concentrated numbers, consisting of threads sprouting from the cell masses, or zoogloeæ, and spores. The water pipes were infected by members of the crenothrix that escaped the filters, and the organism underwent further development and multiplication in the pipes, producing there particularly many of the flocculent cellular zoogloeæ and filaments. The experience afforded a charming microscopic and chemical study, the result of which was published in *Public Health* in October, 1896. The water yielded a bad analysis during the period it was affected, and many complaints in regard to it were received, but no harm to health appeared to follow its consumption. The visitation lasted for about six weeks, when it cured itself spontaneously and completely in a manner remarkably analogous to a zymotic malady in the animal body, in which for a time a microbe swarms, reaches its acme of development, and then dies out.

The waters of the lakes in the Pittville Garden-

at Cheltenham is always turbid, and sometimes in the summer this turbidity becomes very marked, the water being untransparent and of a yellowish green colour, and giving off some amount of odour when at its worst. This is chiefly due to the swarming of the water by a biflagellate protozoon of the monad type. This organism renders the water unsightly. In the upper of these two lakes there appeared in the latter part of the summer of one year an appearance resembling what one might expect if a quantity of blue-green paint had been poured upon a considerable part of the surface of the water of the lake. This was due to an extensive multiplication of the small cellular needle-like organism oscillatoria. It gave off a foul smell.

Similarly, organisms allied to the last-mentioned and resembling under the microscope strings of beads (nostoc and anabæna), and a species of diatom (asterionella), as well as other organisms, have given trouble by developing in water supplies in America and elsewhere.

The nature of the odours given off by these several organisms has been studied in America by Calkins and others, who have shown that they are due to the secretion of essential oils in the substance of the organism, similar, but less pleasant, in odour to the essential oils secreted by odorous plants generally, such as peppermint.

One interesting point in connection with the growth of chara in some of our reservoirs is the fact that the numerous organisms that feed and depend upon this weed make excellent food for trout. The fish that are put into the Hewletts reservoirs, which contain the plant, develop with quite amazing rapidity, quickly outgrowing fish of the same size and sort placed at the same time in our larger reservoir where there is no chara. This fact may be of interest to pisciculturists, or at least to those who are using the Cotswold Hills water, or a water similarly charged with carbonate of lime, in the rearing of trout.

THE USE OF COPPER-SULPHATE IN PURIFYING WATER SUPPLIES.

By George Embrey, F.I.C.,
County Analyst, Gloucestershire.

In the year 1870 the author had frequent opportunities for observing the evil effects of plant growth in the artificial lakes of Sutton-Coldfield, Warwickshire. These were used as fishponds and for pleasure-boats, but the growth of weeds was so extensive as to render them almost useless. Attempts were made to destroy the weeds by fixing scythes to the bottom of a punt and dragging this through the water, afterwards removing the weeds by means of rakes. This method was very costly, and not very effective, but in 1872, in the construction of a railway between Sutton-Coldfield and Walsall, an embankment which passed over the end of one of the lakes was constructed with ferruginous sand, and this, washing into the lake, effected in one season what the cutting method had failed to accomplish in seven; the vegetation was entirely destroyed, and this particular pool (Blackroot Pool) was effectually cleared of weeds.

On coming to reside in Gloucester in 1873, the author observed the bad odour and colour of the drinking water, and on inquiry was informed that this was due to plants growing in the reservoir. He at once suggested the use of ferrous-sulphate to the city surveyor, Mr. R. Read, and an experiment was made on one of the reservoirs. About this time some trouble arose at a tannery due to oxide of iron from rusty pipes staining the skins red; this being wrongly attributed to the iron used in the reservoir, the experiment was discontinued, and for many years the weeds were removed by rakes at considerable expense without any satisfactory result.

The establishment of Bell's filters in 1901 to a considerable extent overcame the difficulty, but the author's attention was at that time directed to the reports of experiments made by the United States Department of Agriculture with copper-sulphate, which seemed to be an effective remedy. In the course of that year some watercress beds were treated with copper-sulphate which was found to destroy the algæ, especially spirogyra, without injuring the watercress. In 1904 and 1905 numerous investigations were made to determine the amount which could be used for the destruction of the lower forms of plant life without destroying the fish or rendering the water unfit for human use. It was found that quantities of 1 to 1,000,000 parts by weight of water, but quantities of 1 to 3,000,000 were sufficient to destroy the algæ which were believed to cause the trouble.

In 1908 permission was given by the Sanitary Committee to carry out an experiment at Witcombe reservoirs, which were at the time choked with Chara Vulgaris. This plant is propagated by means of spores contained in an archegonium, and, fertilised by antheridia from an antheridium, the bursting of the archegonium sets free myriads of minute greenish cells, which, with the countless anthrozoids, give the water a distinct colour and a fishy odour. In consequence of this odour it has been suggested that the particular chara was a new species named Chara Fœtida, but the author does not find that the plant differs in any material respect from the well-known Chara Vulgaris, except in regard to the odour. This, however, was removed by washing the plants, and an examination of the washing water revealed the presence of numerous Spongilla fluviatilis, which gave out a distinctly fishy odour. A portion of these was used to inoculate a nutrient agar medium, which, on incubation, yielded Proteus Vulgaris, a microbe well known to evolve a "fishy" odour, and the author therefore believes that this, and not the much-maligned chara, is the cause of the odour.

METHOD OF APPLICATION.

The author's method of applying the copper-sulphate differs from that usually adopted, which is to place the crystals in a canvas bag and trail this at the stern of a moving boat. The defect of this method is that the copper-sulphate solution is very much diluted before reaching the bottom of the reservoir. This, however, is overcome by scattering the fine crystals over the surface of the water, as in sowing seed, the crystals falling rapidly to the bottom before dissolving. The sulphate is used in the form of a fine powder containing 98 per cent of the salt, the present price of this being 28s. per cwt.

The three reservoirs have capacities, when filled, of 60,000,000 gallons (No. 1) and 30,000,000 gallons each (Nos. 2 and 3), and for these 4 cwt. of sulphate is used, giving approximately a proportion of 1 to 3,000,000. Each reservoir is allowed to stand at least three days, and, if convenient, a week, at the end of which period not a trace of sulphate of copper can be found in the water.

The water should be treated in the early spring (about February), when the bottom is usually covered with diatoms only; in March and April the confervæ make their appearance, and later the chara begins to grow. It has been found that if the treatment is applied in the early stages the diatoms are destroyed, and neither the confervæ nor the chara appear.

The Gloucester reservoirs are stocked with trout, and it has been important not to destroy these. In the author's opinion the roach disappeared, not by their having been poisoned, but owing to the removal of the vegetable food on which they live, and this view is supported by the result of an experiment made at the end of last summer, when, No. 3 reservoir being nearly empty, the rest of the water was, with the sanction of the city surveyor, drawn off, and, the trout having been removed to No. 2 reservoir, only a few starved roach were found remaining.

As regards the question What becomes of the copper-sulphate? it has been suggested that it unites with CO_2, and becomes carbonate, but the author has been unable to find this salt. He has, however, noticed that the stones with which the reservoirs are partly lined become coated with the two oxides of copper, bands of red cuprous oxide being traced, which, after exposure, becomes black by oxidation to cupric oxide. After four years' experience the author can confidently say that the odour and colour so frequently met with in reservoirs containing water collected from the upper lias and inferior oolite can be perfectly removed by the use of sulphate of copper, and that no danger need be feared if the operation be performed with care and under proper supervision.

DISCUSSION.

Mr. William Watts (Wilmslow) wrote: Before animal and vegetable growths can exist in water there must be food in it for them to live upon, and attention should be given to the sources whence the supplies come for preventive remedies. Plants and animals feed on the substances in solution and in suspension in water, and if these substances can be kept out of it the chances of such life surviving are destroyed. Streams supplying water in a flooded condition should be diverted and not allowed to mix with potable supplies, and all water for domestic use should be aerated and atmospherically bleached by exposure as much as possible. Natural springs flowing sufficiently high should be collected and piped direct

to a covered receptacle feeding the supply main, and should not see the light of day until it is drawn from the tap of the consumer. Water retained in darkness for some time appears to have an affinity for collecting atmospheric and other impurities more readily than water from a suitable drainage area. Shallow depths should not be allowed in reservoirs more than can be helped. They are favourable cultivating places for chara and other forms of aquatic plant life, and the breeding and nursing ground for many low forms of animal life. It is a wise plan to lower the water in the reservoirs from time to time when the weed is thriving in order to kill, or at least to check, its growth. Plants and vegetable growth of the kind alluded to in the paper do not grow in deep water, therefore it is better, if possible, to excavate the ground in the shallow edges of reservoirs, using the excavated material in the embankment. The working capacity of most reservoirs is confined in the main to the upper half in the depth of it, and it is in this zone where the removal of the excavations should be made. The area submerged by the rise and fall of the water as it is decanted for use should be stone-pitched, not only to protect the slopes from the wash of the wavelets, but also to retard the growth of plant life. The slopes are naturally sweetened by occasional exposure to the air, and the life forms complained of destroyed. Weed of all kinds should be removed as soon as it appears. Moorland water flowing from the Pennine Hills, treated in this way, requires little or no filtration, especially if the flood water be carefully separated from the normal flow of the streams feeding the reservoir. Peaty discoloration, however, is complained of, but it is harmless, and the stain is largely removed by exposure in the reservoirs. By frequently lowering the water in a reservoir it is possible to destroy the small univalve shells, and aqueous plants growing in it. It is unwise to keep the water at a common level too long, especially in the summer months. Money spent in making the water pure at the source is preferable to chemically treating it in any way. Chemical compounds added to the domestic supply of water to cleanse it of impurities give one a feeling that it passes through a chemist's shop before it reaches the consumer.

Mr. W. T. Burgess said that, as an analyst, he had read Mr. Garrett's paper with interest, but he suggested that analyses might have been given of the water in its normal state and when it was suffering from the effect of the chara. The analyses of these waters from the spring head was so very difficult that only those having considerable experience could possibly recognise the changes taking place. The only thing in favour of storage was the reduction of hardness which it effected. He had occasion some years ago to examine a sample of weed, and at once recognised it as chara of the variety which had the power of attracting to itself CO_2. He found from the analysis that 1 cwt. of the weed contained no less than 20 lb. of CO_2, so that they could calculate how many tons were taken out of the reservoir.

Mr. A. B. E. Blackburn (Sunderland) gave an account of a service reservoir, the bottom of which was lined with limestone, in which he had had a growth corresponding to the description of chara referred to. It grew from between the loose stonework on the floor of the reservoir to a height of 4 ft. or 5 ft. but when he had the bottom relaid and smooth surfaced the growth stopped altogether.

Mr. Luke Hill said he had had what was perhaps a unique experience in connection with the storage of water for the supply of a town. In Georgetown, where he had been engaged in work the rain water was made use of, the storage amounting altogether to about 8,000,000 gallons, and although it was collected by means of the roofs of buildings it was always of a pure nature, one reason for that being the absence of smoke from chimneys, while they had a purifying agent in the mosquitoes which fed on any impurities in the water. It had been suggested that in connection with the measures adopted for the prevention of malaria and yellow fever they should make a trial of a system of screening, a well-known water authority in particular trying to impress on the authorities the necessity for that being done. The contention of that gentleman was that it had never been proved that mosquitoes were the means of purifying the water, but as it seemed clear to him that the mosquitoes fed on something, he (the speaker) inquired what they fed on. The reply he got was, "Heaven knows." The general water supply was brought into the town by means of open canals, and in these they were greatly troubled with natural growths, such as had been referred to by Dr. Garrett. These growths sometimes became so thick that they had to be cut away; in length they were often as much as 4 ft., and they were of a branching nature.

Mr. R. Read (Gloucester), replying to the remarks made with reference to Mr. Embrey's paper, said, in answer to Mr. Burgess, that chara was commonly found in limestone water; in a soft limestone like the oolite it grew very freely. He agreed that chara did not grow on the cement bottom of a reservoir, for a few years ago he cemented the bottom of one of his reservoirs, with the result that there had been no growth since. The covering of a reservoir would, of course, have the same effect, but it was out of the question to cover 27 acres of water. With reference to Mr. Hill's remarks, there was no doubt rain water was very much neglected in this country, and it was surprising that more use was not made of it, considering its usefulness in various directions.

Dr. Garrett, in the course of his reply, said there was no doubt as to the effect which chara had in removing carbonate of lime from water; the reduction was as much as 2 deg. He had been very interested in the remarks of Mr. Burgess, and should like to have an opportunity of seeing the analyses he referred to. These growths naturally did pollute the water chemically to a very great extent. They had been discussing the possibility of covering the bottoms of their reservoirs, in order to get over the difficulty, and Mr. Blackburn's statement would encourage them to do that. The larger green growths were, of course, met with more extensively, and although they were not such gross polluting agents their periodical decay was the means of adding smelling products to the water. Mr. Mill's experiences in British Guiana were new to them. The conditions were, of course, very different to what they were here. In that country they were obliged to store in house cisterns, whereas here it was the general desire to draw off the main direct. They had to depend very largely on the rainfall obtainable from the house tops, but although the conditions were so different in this country, there was no doubt the rainfall might be made more use of than was done at present here. He, however, discouraged the practice of collecting rain water in waterbutts in back yards, where the water became extremely foul. In regard to Mr. Hill's further remarks, medical officers of health were doing their best to kill the larvæ of mosquitoes, on the supposition that the mosquito was an intermediary for the spread of malaria, so that his (Mr. Hill's) assertion that the larvæ was a means of purifying water was at variance with prevailing ideas.

(To be concluded.)

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangement well suited for easy reference.—*The Law Times.*

London County Council Tramways.—In submitting the annual tramway accounts at a recent meeting of the London County Council, Mr. W. J. Squires, chairman of the Highways Committee, said the traffic receipts showed an increase of £123,363 on 1910-11. After meeting debt charges, providing for renewals, and making good a deficiency of £11,966 on the horse lines, there remained a surplus of £84,551, which had been placed to the general reserve fund. The electric traction working expenses were 6·63d. per car mile, compared with 6·48d. last year, an increase due to the increased rateable value of the permanent way. It was hoped that at the end of the year only seven miles of horse tramways would remain to be electrified. He regarded the financial position of the tramways as satisfactory, but the council had a heavy responsibility in providing cheap transit facilities for London and in making provision for street widenings, for which the tramway accounts were debited to the end of last March with a sum of £334,792. The council had repaid debt amounting to £2,079,518 out of revenue. In the case of a private company this sum would have been available for dividend.

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* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By Sydney G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

CONCRETE PAVING IN RESIDENTIAL STREETS.

EXPERIENCE IN AN AMERICAN CITY.

The following notes are from an article by Mr. A. M. Compton, Commissioner of Public Works, Davenport, Iowa, appearing in a recent issue of the *Contract Record*:—

The first concrete paving to be put down at Davenport was laid in the autumn of 1909, and in the following year about 16,000 sq. yds. were laid. By the spring of 1911 the condition of this paving, some of which had been through two winters, was such as seemed to warrant the continued use of concrete, and about 18,000 sq. yds. were put down during the year. In the neighbouring village of Bettendorf concrete paving was laid in the main street for a length of about a mile, the area being 29,000 sq. yds. It is intended to pave another 40,000 sq. ft. with this material in Davenport during the present year. With one exception all the concrete paving in the city has been laid in residential streets where there is no continuous, heavy traffic. It has withstood weather and traffic in a satisfactory manner. In 1910 the contract price varied from $1.27 to $1.37 per sq. yd. (5s. 3½d. to 5s. 8½d.). This was for a 5-in. base of 1: 3: 5 concrete, of 1½-in. limestone and river sand, with a wearing surface of 1: 1 sand mortar, corrugated with grooves about 8 in. apart. A transverse expansion joint, filled with pitch, was provided at every 50 ft.

The blocks of paving, 30 ft. wide and 50 ft. long, developed irregular contraction cracks, and in 1911 the specifications were altered, a 5-in. concrete base of 1: 3: 5 concrete being provided, with a 2-in. wearing surface of 1: 2 sand-cement mortar, a 2-in. transverse expansion joint every 25 ft., a 1-in. expansion joint along each kerb, and a 1½-in. contraction joint midway between the transverse expansion joints. All joints were filled with asphalt. This divided the work into blocks 30 ft. by 12½ ft. The contract rates were from $1.25 to $1.30 per sq. yd. (5s. 2½d. to 5s. 5d.).

A REINFORCED CONCRETE PAVING.

In the same season, 1911, a reinforced concrete pavement was put down in a street with a treacherous subsoil, and subjected to heavy and fast traffic. It consisted of 7 in. of 1: 3: 5 concrete with ½ per cent steel mesh reinforcement near the lower surface. This was wire fencing, and cost 93 cents (3s. 10½d.) per sq. yd. The results have been, so far, promising, for although the kerbing settled badly during heavy rains there were no signs of failure in the pavement itself.

With a view to obtaining a thoroughly satisfactory paving at a moderate first cost, Mr. Compton has recently changed his specification, the 5 in. base of 1: 3: 5 concrete being surmounted by a wearing layer not less than 1½ in. thick in any part, and consisting of 1 part of cement, 1 of sand, and 1 of ½-in. to ¾-in. granite chips. Transverse expansion joints of creosoted, long leaf yellow pine, 1 in. thick, with the grain vertical, are placed 20 ft. apart, and there are 1-in. asphalt joints along the kerbs.

So far the first cost of concrete paving at Davenport has been about 65 per cent of the cost of brick paving, and about 59 per cent of the cost of asphalt paving. In order to reduce the glare from the concrete surface, lamp-black is mixed with the cement, from ½ lb. to 1 lb. with each barrel of cement. One of the difficulties encountered is the length of time that must elapse before the paving is fit for traffic, the usual period allowed being ten days; but sometimes as much as thirty days are necessary. Mr. Compton is of opinion that the expansion joint is the weak point of this type of paving, and "as soon as actual test has proven some scheme for protecting expansion joints successfully, then is concrete paving a success."

Bournemouth Street Lighting.—The Town Council of Bournemouth have decided to abandon electric lighting in the main roads in favour of gas. It is estimated that about £662 will be saved yearly.

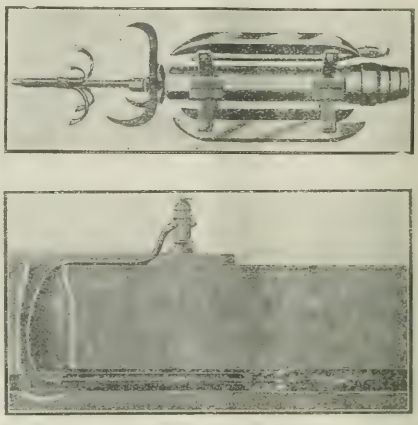
New City of London Subway.—Work is soon to be commenced on the subway beneath Cannon-street from the Mansion House Station to a point opposite Bow-lane. The cost of the work is to be £18,000.

New Bridge at Leeds.—A new bridge spanning the river Aire has been opened at Kirkstall, Leeds. The structure is 156 ft. long and 40 ft. wide, and, including the temporary wooden bridge, the cost was £14,000. The contractors were Messrs. H. Arnold & Son.

SEWER CLEANING DEVICE.

A unique sewer-cleaning machine has recently been developed. It consists of a nozzle supported on runners which discharges through a small turbine water motor, causing one or two sets of hook-shaped blades to revolve rapidly. In so doing the blades stir up the dirt and sediment in the sewer to a thin grout, which the waste water from the turbine carries out. The machine is drawn slowly through the sewer by means of cables operated by windlasses.

A bucket shaped like a half cone and smaller in



Diagrams illustrating Operation of Turbine Sewer Cleaner.

diameter than the sewer is first drawn through backward as far as possible over the dirt, then on pulling forward, the pull comes from the upper back corner of the bucket, and forces the digging edge to the bottom of the sewer. As it is drawn out it carries to the manhole not only the bucket full of dirt, but also a considerable amount of dirt which is pushed ahead of the bucket.—*Scientific American.*

New Use for Sewers.—A Lancashire evening paper two or three days ago advertised in its wanted column: "Wanted, a good sewer, to live in." One of the awkwardnesses of our surprising spelling.—*The Manchester Guardian.*

Alert Siam.—It may be taken as evidence of the widespread interest in modern methods of road improvement, and perhaps also as an indication of the cosmopolitan circulation of The Surveyor, that we should have received recently from Mr. Anuruth Deva, Director-General of the Department of Ways of Communication of Bangkok, the capital of Siam, an order for a copy of "Practical Road Engineering for the New Traffic," edited by H. Percy Boulnois, M.INST.C.E.

The Hours of Roadmen.—The surveyor to the Kirby-moorside (Yorks) Rural District Council, Mr. W. D. Rickaby, at a recent meeting, submitted a revised set of rules under which the roadmen should work, and these contained reference to the hours at which the men should leave home in a morning. Mr. Horton ridiculed the idea of stipulating the hour at which a man should leave home, and said the stipulation should be as to the hour at which the men commenced work. The surveyor replied that such a thing would not work, and would not be quite fair to the men. If a man had to go 3 miles to work in winter, and be on the job at such an hour, it would be unfair. Mr. Horton asked the surveyor if he knew a single farmer in the district who allowed his men to start work at different times. The surveyor replied that he did, and remarked that a roadman started work as soon as he left home. The chairman said he believed it would be very difficult to make the men be at the scene of their work at the hour stated, a lot of them had 4 or 5 miles to go, and he believed it had always been a rule with that council and with other councils to have a fixed time for the men to leave home. The rules suggested were approved.

DISINFECTANTS, ANTISEPTICS AND DEODORANTS, WITH EXAMPLES OF EACH.

By HUBERT S. JACKSON, A.R.SAN.I.

A true disinfectant should destroy sources of infection. Infection is carried by small organisms or germs, each infectious disease claiming a specific organism to itself. Therefore, when we say a disinfectant destroys infection we mean that it destroys organisms which give rise to infection. Temperature has much to do with the prevalence of germs. For instance, a low temperature renders most germs inactive, a medium temperature is conducive to their multiplication, and a high temperature results in their destruction.

We have only to think of the Fire of London in the year 1666, which followed the never-to-be-forgotten plague, to recognise that heat is our greatest disinfectant. Destruction by dry heat, although so sure, is, of course, an expensive way of dealing with infection, and disinfection by dry heat is far less efficacious than by steam, in that a higher temperature can be attained with the latter without danger of scorching, and the steam displaces all the air from the interstices between the fibres of woollen or other material, thus obtaining an even temperature throughout; whereas a bad conductor, such as flannel, would not, if folded, conduct heat to its inner layers. Boiling can be relied on as a safe disinfectant, steam being chiefly recommended in the case of woollen and such other material as cannot be boiled.

On the market at the present time we have disinfectants in every conceivable form—*i.e.*, (1) gaseous, (2) vaporous, (3) liquid, and (4) solid. In the case of gaseous disinfectants, the most frequently practised nowadays is undoubtedly the burning of sulphur (or brimstone) in air. During this process the following chemical action takes place:—

$$S. + 2O_2 = 2SO_2.$$

Sulphur and oxygen yield sulphur dioxide.

It is claimed that sulphur dioxide or sulphurous acid fumes is a great disinfectant, but its efficiency is not determined or fairly tested in a dry atmosphere. Where the atmosphere is damp this disinfectant is most active. It is often used conjointly with a spray disinfector, and the two together are very reliable for safe disinfection. There is, however, a great deterrent to the use of burning sulphur, in that it is a bleaching agent, and also has an action on brass and copper which renders universal use undesirable. As a destroyer of fleas, flies or other vermin, sulphur dioxide has no superior. This disinfectant is also obtainable in a liquid form. It liquefies at −8 deg. Cent., and is then kept under pressure in a sealed vessel and gives off a gas when exposed to air at ordinary temperature. Although this is similar to the product of burning sulphur, it cannot be recommended for the disinfection of rooms, because it has to displace the air before it can itself permeate throughout the room.

A vaporous disinfectant which is well known and used extensively by sanitary authorities is "Formaldehyde." It consists of a white solid that, when heated, gives off a pungent vapour which has very active germicidal properties. If it has a disadvantage it is due to its inability to destroy vermin. A housefly left in a room undergoing disinfection by this method, and hermetically sealed for four hours, becomes stupefied at the end of that time, but readily recovers its vitality on the reopening of the room.

Of the numerous recognised liquid disinfectants carbolic acid is the oldest, but, owing to its poisonous property, it cannot be used with safety. Many others bearing different trade names are extensively used. In calculating the germicidal strength of a disinfectant, carbolic acid is always taken as the unit. For instance, one might read in connection with a disinfectant, "guaranteed coefficient of 16," meaning that such a disinfectant claimed to be sixteen times more active in its germicidal properties than carbolic acid. The present system of standardisation, known as the Rideal-Walker test, is accepted by sanitary authorities in view of the fact that it is the only guide they have in the choice of a disinfectant. A carefully compiled list, giving the germicidal strength of the numerous disinfectants, determined by an independent expert, would be welcomed by many public health officials. At present the test is carried out by the manufacturers themselves, and, while not for a moment doubting the veracity of their figures, it would be better both for sellers and buyers if some independent authority could be mentioned when the coefficient is quoted. But to return to my subject. While not agreeing with everything that is claimed for liquid disinfectants, there is no doubt they are all valuable, if only for the antiseptic properties which they nearly all, if not all, possess.

Of the solid disinfectants, usually sold in powdered form, there is little good to be said. They cannot even claim to be deodorisers, for often they are used merely to blind a smell, security being felt in the fact that the odour from the powder predominates over some vile smell from decomposing matter or the like. Sanitary authorities, who are aware of the misuse of this form of disinfectant, purchase a highly smelling, but cheap, powder for distribution among residents who are ignorant of the snare it really is, and pin their faith to its property of creating a strong, but not unpleasant, odour, which in its intensity blinds all other smells, notwithstanding that they still exist, and will make their presence known when the odour from the disinfectant loses its intensity.

Unlike a disinfectant, an antiseptic does not destroy germ life. It, however, arrests their growth and stops their action and, possessing this property, prevents putrefaction. If an apple is cut in two and left for a short time, it soon becomes a reddish brown. This is due to putrefaction, brought about by germ life. If you cut another apple and smear it with lard you will find that the reddish brown colour does not appear. Lard is an antiseptic, and prevents the action of the germs of putrefaction. In fact, any greasy matter—such as fat, tallow, oil, and the like—possesses antiseptic properties. The reason why an antiseptic prevents putrefaction is due to the fact that one of the necessaries to the germ life has been removed. Let us study their necessities. In order that the germs of putrefaction may thrive and multiply, they must have (1) oxygen, (2) moisture, and (3) warmth. If one of these is absent they are rendered inactive, and cannot thrive. Taking the first—oxygen—for an example, let us consider tinned meat from which all air (oxygen) is excluded. This would keep for an indefinite period so long as the tin remained unopened, whereas, if exposed to the air, putrefaction would render the meat unfit for food in a very few days. The second—moisture. Dried fruit, such as figs, sultanas and currants, remain sound for weeks in dry places, but would soon become unsound if exposed to a humid atmosphere. And the last—warmth. Chilled and frozen meat are examples where the absence of warmth is utilised to prevent putrefaction. Thousands of tons of meat are sent yearly in such state from New Zealand to this country. If raised to an ordinary temperature, putrefaction would soon result in unwholesomeness. In reality, therefore, an antiseptic prevents putrefaction by its property of excluding from that to which it is applied the essentials to germ life.

A deodorant does not destroy germs, neither does it prevent putrefaction. Its function is to remove bad smells, and this is usually brought about by oxidation of decomposing matter from which practically all smells are derived. Oxygen and ozone are rapid deodorants, but the greatest and most reliable of all is soil. Soil absorbs all evil smells, which in reality are gases. These gases are oxidised in the ground, adding to its value for plant production or diffusing into obscurity. To use a highly scented article to blind some evil smell is not only useless, but dangerous. Beyond the deodorants I have mentioned, I know of none that could be recommended with safety.

Town Planning at Huddersfield.—The Housing and Town Planning Committee of the Huddersfield Corporation are inviting competitive designs from architects and surveyors for the laying out of certain areas within the county borough and part of an adjacent suburb prizes of £100, 50 and 25 guineas respectively being offered. The designs, as will be seen from the official advertisement which appears in this issue, are to be sent in by October 31st next, and all particulars as to the competition can be obtained from the borough engineer, Mr. K. F. Campbell, M.INST.C.E. We venture to congratulate the Huddersfield Corporation and its engineer on this latest evidence of the enlightened enterprise which characterises the administration of the city. The result of the competition will be watched with keen interest, and will no doubt have far-reaching effects on future town planning schemes.

IMPROVEMENTS IN ROAD MACHINERY.

At a meeting of the committee appointed by the Local Organising Council of the International Road Congress (London, 1913), to report on machinery used in the construction and maintenance of roads, it was resolved that information relating to improvements effected during the last two years, in sweeping machines, water vans and carts, light and heavy rollers, tar-macadam and concrete mixers, stone driers and heaters, transport engines and wagons, stone crushers, pulsometer pumps, wood block renovators, and any other machinery used for the purpose should be collected.

Manufacturers and others willing to supply particulars are invited to send catalogues to Mr. J. S. Killick, engineering inspector, the Road Board, Queen Anne's Chambers, Westminster, S.W.

£5,000,000 School Building Scheme.—A report providing for the erection of new schools and the enlargement and modernising of existing schools, so as to provide 121,270 additional places, was adopted at a recent meeting of the London County Council. The work will be spread over a period of fifteen years, and the estimated cost is £5,150,000.

Business Announcement.—Messrs. Samuel Deacon & Co., the well-known firm of advertisement agents and contractors, established at Snow Hill over a century ago, who have occupied No. 154 Leadenhall-street for the past fifty-seven years, have removed to No. 7 Leadenhall-street, nearly opposite. We understand their premises have been acquired by a large insurance company for reconstruction.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

WEST MIDLAND DISTRICT MEETING AT STOURBRIDGE.

A West Midland District meeting is to be held at the Town Hall, Stourbridge, to-morrow (Saturday).

Programme.

10.30 a.m.—Assemble at the council chamber, town hall, where members will be received by the chairman of the urban district council.
District business, minutes, &c.
The following papers (which will be taken as read) will be discussed: "Some Municipal Works at Stourbridge," by Mr. F. Woodward, surveyor to the urban district council. "New Boring Operations" for the Stourbridge and District Water Board, by Mr. W. Fiddian, consulting engineer to the board. "Description of Stourbridge Gasworks and Tar Plant," by Mr. C. H. Webb, engineer and manager, Stourbridge gasworks.

12 noon.—Inspect the engineering works of Messrs. Jones & Attwood, and oil gas plant, and tar dehydration plant at Stourbridge gasworks.

1.30 p.m.—Lunch at the Talbot Hotel, by kind invitation of the urban district council.

2.30 p.m (prompt).—A trip on the Kinver light railway, by kind invitation from the Dudley and District Tramway Company (destructor works and sewage pumping station can be seen *en route*).

3.15 p.m.—Start from Stewpony Hotel (by brake) and drive through the sewage farms belonging to the Stourbridge and Upper Stour Valley Boards.

4.30 p.m.—Inspect as many of the following as time will permit: Public baths, Rocmac road, free library, and secondary school buildings, and tar-macadam plant.

5.30 p.m.—Tea at the town hall, by invitation of Mr. Woodward.

H. Richardson, Assoc.M.Inst.C.E.,
Hon. District Secretary.

Council House,
Handsworth,
Birmingham.

THIRTY-NINTH ANNUAL GENERAL MEETING.

The annual meeting of the institution will be held in the Council Chamber, Caxton Hall, Westminster, on Thursday and Friday, July 11th and 12th, and at the County Hall, Aylesbury, on Saturday, July 13th.

Programme.

Thursday, July 11th.

9.30 a.m.—Meeting of the subscribers to the Orphan Fund.

10 a.m.—Council meeting.

10.30 a.m.—Annual general meeting.
Annual report of council.
Presentation of premiums.
Presidential address.

1 p.m.—Adjournment for lunch.

2 p.m.—Discussion on the following papers (to be taken as read):—
(1) "Masonry Dams," by F. C. Uren.
(2) "Bacteria," by W. Ransom.
(3) "Town Planning in Sheffield," by C. F. Wike.
(4) "Town Planning," by W. H. Price (Student).
(5) "Standardisation," by E. J. Elford.
Adjournment.

6.30 p.m. for 7 p.m.—Reception in the Oak Room of the Hotel Cecil, by the president. Annual dinner in the Victoria Hall. Ladies are especially invited to be present.

9.30 p.m.—Concert.

Friday, July 12th.

10 a.m. Discussion on the following papers (to be taken as read):—
(6) "Maintenance of Sewers in Hampstead," by O. E. Winter.
(7) "Bituminous-bound Carriageways," by J. S. Brodie.
(8) "Road Maintenance in County Armagh," by R. H. Dorman.
(9) "Scottish Roads," by Allan Stevenson.
(10) "How the New District Committees may Promote the Progress of the Institution," by A. H. Campbell.

1 p.m.—Adjournment for lunch.

Programme of Visits.

Friday, July 12th.

Party "A"—Norwood.

2.30 p.m.—The party will assemble at Victoria Station (London, Brighton and South Coast Railway). Members will book independently.

2.43 p.m.—Depart for Crystal Palace (change).

3.20 p.m.—Arrive Norwood Junction.
Proceed to inspect reinforced concrete subway, 9 ft. 6 in. diameter, by invitation of Mr. G. F. Carter, who will kindly conduct the party over the work.

Party "B"—Sidcup.

2.40 p.m.—The party will assemble at Charing Cross Station (South-Eastern and Chatham Railway). Members will book independently to New Eltham.

2.50 p.m.—Train leaves for New Eltham, where members will alight on the outward journey.

3.32 p.m.—Inspection of sections of road, of various materials, laid for testing by the Kent County Council, for the Road Board, *en route* to Sidcup.

Party "C"—Hampstead.

2.45 p.m.—The party will assemble at Golder's Green Station. Guides will meet the party to conduct them through the Hampstead Garden City. Members will travel independently.

Party "D"—Westminster.

2.45 p.m.—The party will assemble at Westminster Bridge (south side) at the London County Council County Hall, in course of erection by Mr. Ralph Knott and Mr. W. E. Riley, and proceed to inspect the works, by kind invitation.

Saturday, July 13th.

Visit to Aylesbury, Tring, &c.

9.15 a.m.—The members will assemble at Marylebone (Great Central Railway).

9.25 a.m. Depart for Aylesbury.

10.45 a.m.—Arrive Aylesbury. Proceed to the County Hall. The members will be received by Mr. Tonman Mosley, C.B., chairman of the Buckinghamshire County Council, and Mr. H. L. Nippin, J.P., chairman of the Aylesbury Urban District Council.

Discussion on the following paper (to be taken as read):—

(11) "Municipality Work in Aylesbury," by W. H. Taylor.

Proceed by conveyances along roads bituminously bound, tar-painted, &c., to the Chiltern Hills Spring Water Company's works, near St. Leonards (by kind permission of the chairman and directors), where members will be received by Mr. H. A. Callon, assistant manager.

1.45 p.m.—Leave for Tring.

2 p.m.—Luncheon at the "Rose and Crown" Hotel.

3 p.m.—The Honourable Walter Rothschild will receive the members at his museum, over which he has kindly consented to conduct the party.

It is hoped that arrangements can be made for affording members an opportunity of seeing the grounds of Tring Park.

4 p.m.—Leave for Aylesbury.

4.45 p.m.—Arrive at Aylesbury, where tea will be provided at "The Chantry" by the president.

Ladies are invited to attend the annual meeting and the visits. The permission of the president may in their case be assumed, but due notice must be given on the reply form.

CHAS. JONES, M.INST.C.E.,
Hon. Secretary.

Mr A. D. Greatorex, the president (W.M. Edile Lodge), writing from Grovecrescent, West Bromwich, says:—

"In connection with the annual meeting it has been arranged on the second evening, Friday, July 12th, to hold a meeting of the Ædile Lodge of Freemasons at the Liverpool-street Hotel at 7 o'clock. The lodge is composed of local government officers, including many municipal engineers, and it is felt that it will afford a good opportunity for bringing together those engineers and surveyors who are concerned with the craft."

EXAMINATION.

The October, 1912, examination will be held in Birmingham on the 10th, 11th and 12th of that month.

Members attending the annual meeting are invited to use the Municipal County Club as hon. members.

THOMAS COLE,
11 Victoria-street, S.W. *Secretary.*

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. E. A. STICKLAND, ASSOC.M.INST.C.E., Borough Surveyor, Windsor.

COUNCIL MEETING.

At a meeting of the Council, held on June 22nd, the following applicants were recommended for admission:—

To Membership: Messrs. A. W. Humpherson, borough surveyor, Bewdley, and Levi John, surveyor, Conway and Glen Conway Rural District Council.

To Associate Membership: Messrs. P. W. Smith, Public Works Department, Georgetown, British Guiana, and J. W. Hart, deputy engineer and surveyor, Hindle Urban District Council.

Transfer to Membership: Mr. E. J. Edgar, Public Works Department, New South Wales Government.

Transfer to Associate Membership: Messrs. M. R. Boyce, surveyor's office, Tilbury Urban District Council, and H. A. Scott, surveyor's office, Esher and the Dittons Urban District Council.

(Under the new by-laws these elections will be ratified at the next council meeting if no written objections are lodged within fourteen days.)

NEW MEMBERS, &c.

From the applicants recommended for admission at the last meeting six associate members were elected.

ROYAL SANITARY INSTITUTE CONGRESS.

A delegate was appointed to attend the congress to be held at York in July on behalf of the institution.

N.A.L.G.O.

The following resolution, passed by the Southern District Committee: "That the council be asked to forward to all members of the institution a short statement of the work and objects of the N.A.L.G.O., with a request that members either join the association direct or form themselves into local associations in their respective districts," was considered, and was ultimately referred to the Special Purposes Committee for report.

COUNCIL MEETING.

The next meeting will be held on Wednesday, July 24th, at 6 o'clock.

B. WYAND,
39 Victoria-street, S.W. *Secretary.*
June 24, 1912.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

President—MR. JOHN D. WATSON, M.INST.C.E.

ANNUAL GENERAL SUMMER MEETING.

The annual general summer meeting of the Association of Managers of Sewage Disposal Works will be held at Wolverhampton to-morrow (Saturday).

PROGRAMME.

11 a.m.—Reception by the Mayor (Councillor T. W. Dickinson, J.P.), to be followed by papers:—(1) "Notes on Methods of Differentiating Soils for Sewage Purification." Dr. G. J. Fowler, F.I.C., and Mr. Wm. Clifford, ASSOC.M.INST.C.E.

(2) "Deodorisation Methods in Use at Stratford-on-Avon for the Prevention of Aerial Nuisance from Sewage Containing Brewery Waste." Mr. Herbert D. Bell, manager, Stratford-on-Avon.

1 p.m.—Lunch, Star and Garter Hotel.

2 p.m.—Assemble for conveyance by brakes to sewage works and farm.

2.30 p.m.—Arrive at works. Description by manager (Mr. Wm. Clifford).

3.30 p.m.—Visit farm.

4.30 p.m.—Tea, by invitation of the Sewage Works Committee. Votes of thanks.

ROYAL SANITARY INSTITUTE.

ANNUAL CONGRESS AND EXHIBITION AT YORK.

The annual congress of the Royal Sanitary Institute, which is to take place this year at York, will open on July 29th. The proceedings will commence with a reception of the members and delegates in the Mansion House by the Lord Mayor, a public luncheon following, and in the evening the inaugural address to the congress will be delivered by the Archbishop of York.

On Tuesday, July 30th, a conference of municipal representatives and of engineers and surveyors will be held in the Exhibition Buildings, and on Friday, August 2nd, and the following day, the Engineering and Architecture Section will meet in the Museum. Mr. A. D. Greatorex, M.INST.C.E., borough engineer and surveyor of West Bromwich, will preside at the conference of engineers and surveyors, and the section devoted to engineering and architecture will have as its chairman Mr. J. Walker Smith, M.INST.C.E., chief engineering inspector to the Local Government Board for Scotland.

At the conference of engineers and surveyors discussions will take place on, among others, the subjects of Housing and Town Planning Progress, to be opened by Mr. H. Gilbert Whyatt, ASSOC.M.INST.C.E., borough engineer and surveyor, Grimsby, and Sewage Disposal in Rural Districts, to be opened by Mr. Ascough Rodwell, surveyor to the Skipton Rural District Council. The question of the modification of the Model Building By-laws from the rural point of view will be considered in the Engineering and Architecture Section.

The opening of the Health Exhibition arranged in connection with the congress has been fixed for Saturday, July 27th.

INSTITUTE OF SANITARY ENGINEERS.

President—Mr. A. J. Martin, M.Inst.C.E., F.G.S., F.R.San.I.

SUMMER VISIT TO BIRMINGHAM.

Arrangements have been made for a week-end visit to Birmingham from July 12th to 14th. The Midland Hotel, where a private sitting-room will be set apart for the party, and where the reception dinner, attended by the Lord Mayor, will be held, has been selected for headquarters.

Friday, July 12th.

9.10 a.m.—Train leaves Paddington.
11.10 a.m.—Arrive in Birmingham and proceed to Midland Hotel.
1 p.m.—Reception by the Lord Mayor, Alderman Bowater, at the Council House.
Sessional meeting in the afternoon, discussion on papers.
7 p.m.—Dinner, the president in the chair.

Saturday, July 13th.

10 a.m.—Leave hotel by coaches to visit sewage farm, filter-beds, &c., and return to hotel.
Visits to University and other places of interest.

Members (who may bring friends) intending to join the party are desired to communicate as early as possible with the secretary.

P. N. Hasluck.
Secretary.

120 and 122 Victoria-street, S.W.

ROAD CONGRESS DELEGATES' EXPENSES.

LOCAL COVERNMENT BOARD'S STATEMENT.

The Chairman of the Organising Committee of the International Road Congress, 1913, having written to the Local Government Board stating that the committee were anxious to secure small contributions from the local highway authorities towards the expenses of the congress, and a large attendance of road surveyors at the congress itself, and asking the board to sanction expenditure by the local authorities for this purpose, has received a letter stating that, having regard to the exceptional circumstances, the board will be prepared to entertain applications from county and district councils for sanction to the payment of the reasonable expenses of the attendance of highway surveyors.

The communication intimated also that the board will favourably consider any application from a county council or other important highway authority for sanction to the payment of a small subscription to the expenses of the congress.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

CLERK OF WORKS.—July 8th.—South Stoneham Rural District Council. £3 per week.—Mr. E. T. Westlake, clerk, 20 Portland-street, Southampton.

BOROUGH SURVEYOR AND INSPECTOR OF NUISANCES.—July 8th.—Borough of Southwold. £130 per annum.—Mr. Ernest R. Cooper, town clerk.

SURVEYOR'S ASSISTANT.—July 8th.—Ware Urban District Council. £52 per annum.—Mr. G. H. Gisby, clerk.

BOROUGH ENGINEER'S TEMPORARY JUNIOR ASSISTANT.—July 8th.—Corporation of Leigh. £6 per month.—Mr. W. H. Cowburn, town clerk.

INSPECTOR OF NUISANCES.—July 8th.—Royston Urban District Council. £35 per annum.—Mr. H. F. J. Banham, clerk.

ASSISTANT.—July 9th.—Barnoldswick Urban District Council. £70 per annum.—Mr. Wilkinson Ellis, engineer and surveyor.

INSPECTOR OF NUISANCES.—July 9th.—Corporation of Exeter. £200—£250.—Mr. H. Lloyd Parry, town clerk.

SURVEYOR AND INSPECTOR OF NUISANCES.—July 13th.—Newport Pagnell Rural District Council. £200—£240.—Mr. Charles W. Powell, clerk.

SURVEYOR OF HIGHWAYS.—July 13th.—Whittington and Newbold Urban District Council.—Mr. H. J. Watson, clerk, 32 Gluman-gate, Chesterfield.

INSPECTOR OF NUISANCES.—July 13th.—Corporation of Chester. £90—£110 per annum.—Mr. J. H. Dickson, town clerk.

CITY SURVEYOR.—July 15th.—Corporation of Ripon. £150—£200.—Mr. M. Kirkley, town clerk.

CLERK OF WORKS.—July 16th.—Willesden Urban District Council. £175 per annum.—Mr. S. W. Ball, Municipal Offices, Dyne-road, Kilburn.

SUPERVISING ROAD FOREMAN.—July 19th.—Corporation of Grimsby. £2 15s. per week.—Mr. H. Gilbert Whyatt, borough engineer and surveyor.

HIGHWAY SURVEYOR.—July 26th.—Newbury (Berks) Rural District Council.—£100 per annum.—Mr. S. V. Pinniger, clerk, Market-place, Newbury.

ASSISTANT ENGINEER.—August 31st.—Darjeeling Municipality, India. 150 rupees monthly.—The Chairman.

ASSISTANT ENGINEERS.—Public Works Department of the Government of the Gold Coast. £300—£350.—Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W.

CLERK OF WORKS.—Essex County Council. 3 guineas per week.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

ASSISTANT ENGINEER.—For the Public Works Department, Gold Coast. £300—£350 per annum.—Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

CARDIFF.—August 6th.—Designs and estimates for fire station.—The Town Clerk.

GOOLE.—September 1st.—Competitive designs and estimates for municipal offices, for the urban district council. Two premiums (£30 and £15).—Mr. R. Tyson, clerk.

WARRINGTON.—No date.—A public elementary school, for the Education Committee.—The Clerk.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

Buildings.

ELLESMERE.—July 6th.—For the erection of cemetery chapel and convenience, and laying pipe sewer, for the urban district council.—Mr. T. W. Francis, clerk, Ellesmere Park.

BRIGHOUSE.—July 6th.—For the erection of public baths, for the corporation.—Mr. Jas. H. Rothwell, town clerk.

HUDDERSFIELD.—July 6th.—For taking down and rebuilding boundary wall, for the corporation.—Town Clerk.

EAST SUFFOLK.—July 8th.—For the erection of schools at Stowmarket and Pakefield, for the county council.—Mr. W. E. Watkins, secretary, County Hall, Ipswich.

FAILSWORTH.—July 8th.—For alterations to council offices, for the urban district council.—Mr. W. M. Shimmin, surveyor.

BRIGHTON.—July 8th.—For painting work at a number of schools, for the corporation.—Mr. F. Ingoe, secretary to the Education Committee, 54 Old-steine, Brighton.

GUILDFORD.—July 8th.—For alterations and repairs to schools, for the corporation.—Mr. C. G. Mason, borough surveyor.

BLAYDON.—July 8th—13th.—For the erection of sixteen houses, for the urban district council.—The Surveyor.

ALTRINCHAM.—July 8th.—For the erection of conveniences, for the urban district council.—Mr. H. E. Brown, surveyor.

SHREWSBURY.—July 9th.—For rebuilding wall, laying concrete paving and erecting fence, for the corporation.—Mr. W. Chapple Eddowes, borough surveyor.

HASTINGS.—July 9th.—For the construction of an engine-house, for the corporation.—Mr. P. H. Palmer, borough engineer.

WALTHAMSTOW.—July 9th.—For repairs and painting at various schools, for the Education Committee.—Mr. T. W. Liddiard, secretary, Education Offices, High-street.

WILTS.—July 9th.—For alterations at police stations and cottages, for the Standing Joint Committee of the county council.—Mr. J. G. Powell, county surveyor, Trowbridge.

LANCASHIRE.—July 9th.—For the construction of a bridge and approaches, for the county council.—Mr. W. Compton Hall, county bridgemaster, Preston.

BARKING.—July 9th.—For the erection of twenty-six workmen's houses, for the urban district council.—Mr. H. Hargreaves, clerk.

BRIERLEY.—July 9th.—For the erection of verandahs at the city hospital, for the corporation.—Mr. F. Stevens, town clerk.

LEYTON.—July 9th—23rd.—For the erection of a school for girls and infants, for the urban district council.—Mr. W. Jacques, architect, 2 Fen-court, Fenchurch-street, E.C.

MONMOUTHSHIRE.—July 10th.—For additions to municipal offices, for the county council.—Mr. W. Tanner, county surveyor, Newport (Mon.).

HOLBORN.—July 10th.—For the erection of a public mortuary, for the borough council.—Mr. E. F. Spurrell, borough surveyor.

KENT.—July 10th.—For painting and repairs at police stations, for the Joint Standing Committee.—Mr. C. Turner, clerk, West Borough Chambers, Maidstone.

HAILSHAM.—July 10th.—For the erection of a three-span bridge, for the rural district council.—Mr. Edmund Catt, clerk.

KENSINGTON.—July 10th.—For alterations at branch library, for the borough council.—Mr. W. Chambers Leete, town clerk.

GLOUCESTER.—July 11th.—For the erection of a fire station, for the corporation.—Mr. R. Read, city surveyor.

KIRKCALDY.—July 11th.—For alterations and additions to a school, for the School Board.—Mr. A. Beveridge, clerk.

HACKNEY.—July 11th.—For the erection of a branch library, for the borough council.—Mr. W. A. Williams, town clerk.

MANSFIELD.—July 12th.—For the erection of slipper baths, for the corporation.—Mr. T. P. Collinge, borough surveyor.

GLASTONBURY.—July 12th.—For repairs and painting at town hall, for the corporation.—Borough surveyor.

ASHWELL.—July 12th.—For the construction of waterworks, including the laying of 2¼ miles of 4-in. and 3-in. cast-iron pipes with all appurtenances, the construction of brick service reservoir, and the erection of pumping station, for the rural district council.—Mr. Arthur Sharpe, clerk.

BRIDLINGTON.—July 13th.—For the erection of twenty-five workmen's dwellings, for the corporation.—Mr. E. R. Matthews, borough surveyor.

ESSEX.—July 13th.—For additions to a school, for the Education Committee.—Mr. W. Adams, clerk, 14 Church-street, Saffron Walden.

WALSALL.—July 13th.—For alterations to a school, for the corporation.—Borough Surveyor.

DERBYSHIRE.—July 15th.—For the erection of a school, for the Education Committee.—Mr. G. H. Widdows, architect, St. Mary's Gate, Derby.

BARROW-IN-FURNESS.—July 15th.—For the extension of the electricity works, for the corporation.—Borough Engineer and Surveyor.

FINCHLEY.—July 15th.—For the construction of an underground convenience, for the urban district council.—Mr. E. H. Lister, clerk.

DEWSBURY.—July 15th.—For the erection of a fire station, for the corporation.—Borough Surveyor.

WOOLWICH.—July 15th.—For the erection of a waiting-room and sanitary convenience, for the borough council.—Mr. Arthur B. Bryceson, town clerk.

KENT.—July 15th.—For extensions to technical institute, for the Education Committee.—Dr. J. Lister, Technical Institute, Tunbridge Wells.

WOOD GREEN.—July 16th.—For additions and repairs to schools, for the Education Committee.—Mr. W. P. Harding, clerk, Town Hall.

RUNCORN.—July 19th.—For the construction of an underground reservoir, for the rural district council.—Mr. G. F. Ashton, clerk.

NORTHAMPTON.—July 22nd.—For the masonry and other works required in the widening of the South Bridge over the river Nene in three arched spans, for the corporation.—Mr. Herbert Hankinson, town clerk.

BECKENHAM.—July 22nd.—For the erection of caretaker's lodge and public conveniences, for the urban district council.—Mr. J. A. Angell, surveyor.

DERBYSHIRE.—July 24th.—For the erection of a lock-up, courthouse and residence, for the Standing Joint Committee.—Mr. N. J. Hughes-Hallett, clerk, County Offices, Derby.

BEDFORD.—July 25th.—For repairs to council schools, for the County Education Committee.—County Surveyor, Shire Hall, Bedford.

CARDIGAN.—For the erection of a new school, and improvements at existing school, for the Education Committee.—Mr. Geo. Dickens-Lewis, county architect, Aberystwyth.

KENT.—For the erection of new offices, sanitary works and painting at a school, for the Education Committee.—Mr. W. H. Robinson, architect, Caxton House, Westminster, S.W.

Iron and Steel.

ASHTON-UPON-MERSEY.—July 9th.—For the supply of 900 yds. of unclimbable iron fencing, for the urban district council.—Mr. F. Hutton, surveyor.

BELFAST.—July 10th.—For the supply of steel-wire heavy-purchase rope for 100-ton steam crane, for the Harbour Commissioners.—Mr. W. A. Currie, secretary.

SWINDON.—July 13th.—For the supply of unclimbable wrought-iron fencing, gate and posts, for the corporation.—Mr. H. J. Hamp, borough surveyor.

BOURNE.—July 15th.—For the supply of cast-iron pipes and valves, for the rural district council.—Mr. T. Lake, district surveyor.

ISLINGTON.—July 24th.—For the supply of 3,000-kw. steam turbine alternator, exciter, condensing plant, switch gear, and circulating and steam piping, for the borough council.—Mr. W. F. Dewey, town clerk.

Roads.

EASTBOURNE.—July 6th.—For carrying out improvement works, for the corporation.—Mr. A. Ernest Prescott, borough surveyor.

ELLESMERE PORT.—July 6th.—For making up certain streets, for the urban district council.—Mr. T. W. Francis, clerk.

WESTMORLAND.—July 6th—10th.—For widening certain roads, for the county council.—Mr. J. Bintley, county surveyor, Kendal.

ASHTON-IN-MAKERFIELD.—July 6th.—For making up thirty-one streets, for the urban district council.—Mr. T. Burgess, surveyor.

DEWSBURY.—July 6th.—For paving and flagging, for the corporation.—Borough Surveyor.

WILLINGTON.—July 6th.—For making up side streets, for the urban district council.—Mr. J. H. Gardner, surveyor.

JARROW.—July 6th.—For laying tar-macadam, for the corporation.—Mr. J. S. Weir, borough engineer.

ROMSEY.—July 6th.—For removing old bridge and building new concrete bridge, for the rural district council.—Mr. A. J. Harrington, clerk.

WANDSWORTH.—July 8th.—For the making up and paving of Gatwick-road, Southfield, and part of Seeley-road, Tooting, for the borough council.—Mr. D. A. Nicholl, town clerk.

KIRKCALDY.—July 8th.—For making up portion of a new street, and laying granolithic pavement, for the corporation.—Mr. W. L. Macindoe, town clerk.

FAREHAM.—July 8th.—For steam rolling and scarifying, for the rural district council.—Mr. A. Laker, clerk.

SKIPTON.—July 8th.—For making up several streets, for the urban district council.—Engineer and Surveyor.

WANDSWORTH.—July 8th.—For making up and paving part of Beechcroft-road, Balham, for the borough council.—Mr. D. A. Nicholl, town clerk.

LEEDS.—July 8th.—For flagging Ivy-avenue, for the corporation.—Town Clerk.

CASTLEFORD.—July 8th.—For street widening and laying rock asphalt road surface, for the urban district council.—Mr. W. Green, surveyor.

SOUTHAMPTON.—July 9th.—For carrying out private street works, for the corporation.—Mr. R. R. Linthorne, town clerk.

GUISBOROUGH.—July 9th—11th.—For work of paving and macadamising, for the urban district council.—Mr. W. Richardson, clerk.

MOUNTAIN ASH.—July 9th.—For private street works, for the urban district council.—Mr. W. G. Thomas, surveyor.

HULL.—July 10th.—For the construction of a road, for the corporation.—Mr. A. E. White, city engineer.

LANCHESTER.—July 10th.—For carrying out street work, for the rural district council.—Mr. W. H. Ritson, clerk.

GOSPORT.—July 11th.—For making up several streets, for the urban district council.—The Surveyor.

PENGE.—July 12th.—For soft wood paving and concrete foundation, for the urban district council.—Mr. H. W. Longdin, surveyor.

STOCKPORT.—July 13th.—For street-making work, for the corporation.—Mr. J. Atkinson, borough surveyor.

FLINT.—July 15th.—For making up certain streets, for the corporation.—Mr. Hugh Owen, borough surveyor.

CHESHUNT.—July 15th.—For providing and laying about 1,800 super. yds. of artificial paving slabs, for the urban district council.—Mr. J. E. Sharpe, engineer and surveyor.

WEST HAMPNETT.—July 15th.—For steam rolling work, for the rural district council.—Mr. W. O. Rasell, acting clerk, Council Offices, South-street, Chichester.

GOOLE.—July 15th.—Making up a street, for the urban district council.—Mr. Robert Tyson, clerk.

STANLEY.—July 15th.—For works of making up, for the urban district council.—Mr. A. Routledge, surveyor.

TAMWORTH.—July 17th.—For works of paving, kerbing and channelling, for the corporation.—Mr. F. E. G. Bradshaw, borough surveyor.

BACUP.—July 19th.—For granite paving work, for the corporation.—Mr. W. H. Elce, borough engineer.

CHELTENHAM.—July 20th.—For providing and laying 5,000 sq. yds. of creosoted deal block pavements, for the corporation.—Mr. J. S. Pickering, borough engineer.

BECKENHAM.—July 22nd.—For the supply of binding materials for Wickham-road, Hayes-road and Thesiger-road, for the urban district council.—Mr. F. Stevens, clerk.

NEATH.—July 23rd.—For supplies of granite or syenite and limestone metalling, for the corporation.—Mr. D. M. Jenkins, borough engineer.

WITHAM.—July 29th.—For the use per day of steam roller and scarifier, for the urban district council.—Mr. W. P. Perkins, surveyor.

CHESTER-LE-STREET.—July 29th.—For the construction of a new road, for the rural and urban councils.—Mr. W. Ayton, highway surveyor.

SAN SALVADOR (Central America).—November 15th.—For asphalt paving works and the provision of a complete system of drainage, for the Board of Works. —Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

Sanitary.

DENTON.—July 6th.—For the erection of a gas engine, suction-gas plant, air compressor, ejectors, lime and sludge mixers, sludge presses, pipes and valves, for the urban district council.—Mr. W. Richards, clerk.

NEWPORT PAGNELL.—July 6th.—For the construction of sewage disposal works, for the rural district council.—Mr. C. W. Powell, clerk.

CHERTSEY.—July 8th.—For laying 3¼ miles of stoneware pipes, concrete tubes, concrete manholes, catchpits and stoneware gullies, and incidental works, for the rural district council.—The Surveyor, High-street, Chobham, near Woking.

WALSINGHAM.—July 9th.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. R. S. Butcher, clerk.

BLAYDON-ON-TYNE.—July 9th.—For the removal of the contents of ashpits, for the urban district council.—Mr. H. Dalton, clerk.

LONDON.—July 9th.—For the construction of egg-shaped sewer and cast-iron pipe sewer, for the county council.—Sir Maurice Fitzmaurice, chief engineer.

SOUTH MIMMS.—July 10th.—For the construction of a sewage tank, percolating filters, sand filters, and detritus chambers, for the rural district council.—Mr. G. D. Byfield, clerk.

SEISDON.—July 10th.—For the construction of sedimentation tanks, filters, and other works at the sewage outfall site, for the rural district council.—Mr. H. Taylor, clerk.

BRIERLEY HILL.—July 12th.—For the construction of 2,576 yds. of stoneware-pipe sewers, and 6,425 yds. of branch drains in house connections, manholes, and lampholes, for the urban district council.—Mr. William Waldron, clerk.

LUTON.—July 13th.—For the removal of household refuse, for the rural district council.—Mr. W. Austin, clerk.

FINCHLEY.—July 15th.—For the construction of four clinker sewage filters, for the urban district council.—Mr. E. H. Lister, clerk.

CHURCH.—July 15th.—For the construction of a main sewer, for the urban district council.—Mr. W. E. Wood, surveyor.

KEIGHLEY.—July 15th.—For surface-water drainage, channelling, and sewers extension, for the rural district council.—Mr. J. N. Clarkson, clerk.

HAYES (Middlesex).—July 16th.—For laying 1,400 yds. of cast-iron rising main, and steel tube compressed-air main, for the urban district council.—Mr. D. C. Fidler, engineer.

TIPTON.—July 16th.—For the construction of sewerage, for the urban district council.—Mr. W. H. Jukes, engineer and surveyor.

TEWKESBURY.—July 18th.—For the supply of two 6-in. iron ventilation shafts, for the corporation.—Borough Surveyor.

UPTON-ON-SEVERN.—July 20th.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. G. H. T. Foster, clerk.

ST. LEONARDS.—July 22nd.—For laying stoneware pipe sewer, for the corporation.—Mr. P. H. Palmer, borough engineer.

SWINTON.—July 24th.—For supplying six sprinklers for percolating filters, and media, for the urban district council.—Mr. H. Entwisle, surveyor.

GOOLE.—July 29th.—For the construction of 4 miles of sewers formed with stoneware and cast-iron pipes, concrete tubes and brickwork, pumping station, screen and suction tanks, engine-house, pumping machinery, cast-iron main, and other works, for the urban district council.—Mr. Robert Tyson, clerk.

NOTTINGHAM.—July 29th.—For the supply of sanitary fittings at schools, for the corporation.—Mr. F. B. Lewis, city architect, Guildhall.

MIDSOMER NORTON.—July 31st.—For the construction of stoneware pipe sewers, for the urban district council.—Mr. C. H. Sunderland, surveyor.

Stores.

ROTHERHAM.—July 8th.—For the supply of materials for the tramway department.—Tramways Manager.

WARRINGTON.—July 8th.—For the supply of necessaries, for the Gas Committee.—Mr. W. S. Haddock, gas engineer.

KING'S LYNN.—July 15th.—For the supply of 500 tons of coal (hand-picked hards), for the corporation. —Borough Surveyor and Waterworks Engineer.

Miscellaneous.

LONDON.—July 9th.—For the supply of 240 lengths of rubber-lined fire hose, for the county council.—The Clerk.

LEEDS (Roundhay and Scarcroft).—July 16th.—For the supply of 1,600 cub. yds. of broken steel slag, suitable as filtering medium, for the rural district council.—Mr. J. H. Ford, clerk.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.

ALNWICK.—For laying cast-iron socket pipes and fittings, for the rural district council.—Mr. M. G. Wilson, inspector and surveyor:—

M. W. S. France, Redcar	£739
Gas and Chemical Plant Co., Thornaby-on-Tees	741
Reavell Bros., Alnwick*	712
A. Davison, Alnwick	674
C. Armstrong, Whitley Bay	660
A. E. Green, Amble, Acklington‡	619

‡Excluding surface damages.

Surveyor's estimate, £619.

ASHTON-UPON-MERSEY. For carrying out privy conversions, for the urban district council.—Mr. F. Hutton, surveyor.

A. Kelsall, Ashton-upon Mersey.*
E. E. Coleman, Sale.
J. E. Wright, Ashton-upon-Mersey.
J. Gayter, Ashton-upon-Mersey.
J. W. Foster, Ashton-upon-Mersey.

BETHNAL-GREEN.—For minor improvements at Wolverley-street School, for the London County Council.

T. D. Leng, Deptford	£1,905
H. L. Holloway, Deptford	1,875
Rowley Bros., Wood Green	1,852
Brand, Pettit & Co., South Tottenham	1,778
W. Shurmur & Sons, Limited, Upper Clapton	1,732
A. E. Symes, Stratford	1,727
J. Grover & Son, Islington	1,717
McCormick & Sons, Limited, Northampton-street†	1,435

Architect's estimate, £1,566.

BEXHILL.—For the construction of new road to Sidley, for the corporation.—Mr. G. Ball, borough engineer and surveyor:—

W. L. Wallis & Co., Eastbourne	£2,196
Peerless, Dennis & Co., Limited, Eastbourne	1,836
F. Murray & Co., Limited, St. Leonards	1,780
J. Vine, Eastbourne	1,694
Road Maintenance, &c., Co., Limited, Gravesend	1,499
H. Woodhams & Son, Catford	1,486
S. Carey, Bexhill*	1,465

BILSTON.—For laying pipe sewers and manholes, and making up and sewering, for the urban district council.—Mr. V. Turner, surveyor.

MAKING UP ELM STREET.

J. Owens, Wolverhampton	£846
G. P. Trentham, Smethwick	821
Curral, Lewis & Martin, Birmingham	797
M. A. Boswell, Wolverhampton	788
G. Law, Kidderminster	780
A. Holloway, Wolverhampton	709
Martin & Element, Smethwick*	658

NEW SEWERS, &c.

Curral, Lewis & Martin, Birmingham	£2,368
G. Law, Kidderminster	2,220
J. Owens, Wolverhampton	2,177
G. P. Trentham, Handsworth	2,101
M. A. Boswell, Wolverhampton	2,046
Martin & Element, Smethwick	2,044
A. Holloway, Wolverhampton*	1,950

BISHOP'S STORTFORD.—For the supply of 145 tons of cast iron pipes and special castings, for the urban district council.—Mr. R. S. Scott, Engineer and Surveyor.

	7in. & 6in. Pipes. £ s. d.	Special. £ s. d.
Jordans, Limited, Newport, Monmouth	6 11 0	10 18 6
Clay Cross Co., Chesterfield	6 11 0	10 18 6
Holwell Iron Co., Melton Mowbray	6 11 0	10 18 6
Sheepbridge Coal and Iron Co., Chesterfield	6 10 9	10 18 9
J. Oakes & Co., London	6 10 6	10 18 0
Staveley Coal and Iron Co., Chesterfield	6 7 6	10 15 0
D. Y. Stewart & Co., Glasgow	6 5 0	11 0 0
A. G. Cloake, London	6 2 0	10 10 0
Cochrane & Co., Dudley*	6 1 0	10 8 6

EARSDON.—For carrying out street work, for the urban district council.—Mr. J. R. MacMillen, surveyor.

Devon Construction, London	£792
T. Usher & Sons, Newcastle	331
G. Simpson, Newcastle	287
G. Armstrong, Whitley Bay	265
M. D. Young, Hexham	262
J. & B. Robson, Gosforth	254

Surveyor's estimate, £257.

EDMONTON.—For repairs and painting works at the town hall, for the urban district council.—Mr. H. W. Dobb, architect.

For repairs and painting.—A. Monk, Edmonton.†
For supplementary heating at the town hall.—T. H. Garrett, Streatham.†

HOXTON.—For heating work at the Redvers-street School, Hoxton, for the London County Council.

B. Harlow & Son, Macclesfield	£657
G. Davis, Kensington	636
Cannon & Helford, Peckham	597
W. G. Cannon & Sons, Limited, London-road	592
Tilley Brothers, Kingsland-road	549
Brightside Foundry and Engineering Company, Limited, Westminster	549
J. Yeaton & Co., Limited, Limehouse	539
Palowker & Sons, Queen-street	534
H. J. Cash & Co., Limited, Westminster	531
G. & E. Bradley, Lever-street*	527

Architect's estimate, £575.

KINGSTON (Surrey).—The following tenders for supplies for the year ending June 30th, 1913, have been accepted:

Bricks.—Sussex Brick & Estates Co.
Cement.—J. W. Sergeant.
Lime.—George Bristow, Limited.
Coals.—Cockerell & Co.
Coke.—H. Hanks.
Drain pipes, &c.—Doulton & Co., Limited.
Ironmongery goods.—Ide & Sons.
Oilman's goods.—Middleton Brothers.
Scavengers' brooms, &c.—J. Jonas.

LAURENCEKIRK.—For the construction of sewage purification works, for the corporation:—

Wellwood & Lunan, Bowhill, Cardenden, £1,344.

LEWISHAM.—For the reconstruction of drains, for the borough council.—Mr. E. van Putten, borough surveyor:—

	Morena-street. £	Oxford-terrace, Malham-road. £	Adelaide-road. £
S. T. Stevens	—	—	330
J. H. Fletcher	—	—	260
A. J. Hewens	—	—	250
F. G. Rose	—	37	—
T. R. Roberts & Co.	—	34	—
C. G. Jones	.	25*	—
J. T. Gloag	89	—	178*
W. C. Harper	46	35	—
J. Dennett & Co.	42*	—	—

LEWISHAM.—For executing the necessary works in laying granite paving in Stanstead-road from Catford-hill to St. Dunstan's College.—Mr. E. van Putten, borough surveyor:—

	340 yards super. of Norwegian or Swedish granite paving on 9 in. concrete and special grouting, at per yard super. s. d.	50 yards super. of Aberdeen granite paving on existing concrete and special grouting, at per yard super. s. d.
Kirk & Randall	28 8	23 7
G. J. Anderson	24 0	20 0
W. Griffiths & Co., Limited	23 4	20 6
Fry Brothers	23 0	19 6
W. Pearce	22 9	20 0
J. Mowlem & Co., Limited	21 6*	18 6*

MIDDLESBROUGH.—For making-up a back-street, for the corporation.—Mr. S. E. Burgess, borough engineer:—

G. E. Simpson, Newcastle-on-Tyne	£121
H. Ellison, Limited, Redcar	93
E. Newhouse, Middlesbrough	89
J. Crombie & Son, Limited, Middlesbrough	86
J. Pearson, Limited, Stainton-in-Cleveland	82
Goodhall Brothers, Middlesbrough*	81

PECKHAM.—For the enlargement of the county secondary school, Peckham, for the London County Council.

Triggs & Company, Clapham	£5,380
J. Garrett & Son, Balham-hill	5,301
G. Parker & Sons, Peckham	5,284
W. King & Son, Vauxhall-bridge-road	5,068
W. F. Bhay, Limited, Cannon-street	4,994
K. Kent, Hither-green	4,974
W. J. Dickens, Ealing	4,836
W. Smith & Son, Harleyford-road†	4,725

Architect's estimate, £4,740.

ROMFORD.—For the supply of Norwegian kerb, for the rural district council.—Mr. G. Lapwood, highway surveyor:—

E. Free & Sons, Maidenhead	£397
Devon Constructing Company, London	374
W. J. Jackson, Plaistow	355
J. Jackson, Forest Gate	327
W. Griffiths & Company, London	319
T. W. Moss, Romford	319
A. W. Porter, Leyton*	308

ROTHERHITHE.—For minor improvements at Silwood-street school, Rotherhithe, for the London County Council:—

J. Garrett & Son, Balham-hill	£2,588
Thomas & Edge, Woolwich	2,485
H. Groves, Greenwich	2,470
H. L. Holloway, Deptford	2,390
Lole & Co., Chelsea	2,388
G. Parker & Sons, Peckham†	2,105

Architect's estimate, £2,225.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JULY.

6.—Institution of Municipal and County Engineers: Meeting at Stourbridge.
6. Association of Managers of Sewage Disposal Works: Annual General Summer Meeting at Wolverhampton.
11-13. Institution of Municipal and County Engineers: Annual Meeting, London.
12-14.—Institute of Sanitary Engineers: Summer Visit to Birmingham.
13.—Institution of Municipal Engineers: North-Western District Meeting at Chtheroe.
24.—Institution of Municipal Engineers: Council Meeting, 6 p.m.
25-28.—Royal Institution of Public Health: Congress in Berlin.
29.—Royal Sanitary Institute: Congress at York opens.

APPOINTMENTS OPEN.

ESSEX COUNTY COUNCIL.

Wanted, about the middle of July, a Clerk of Works for three months, competent to supervise the construction of a Ferro-Concrete Bridge (Hennebique system) at Ongar, Essex. Only applications from those having previous experience in ferro-concrete will be considered. Salary Three Guineas per week. Applications, with two recent testimonials (copies only) to be sent to

PERCY J. SHELDON, M.INST.C.E.,
County Surveyor,
Chelmsford.

July 1, 1912.

NEWPORT PAGNELL RURAL DISTRICT COUNCIL.

INSPECTOR OF NUISANCES AND SURVEYOR, &c.

The above Council invite applications for the appointment of Inspector of Nuisances, Surveyor under the Public Health Acts, &c., for their Bradwell District, which contains 22 Parishes, an acreage of 27,437, and a population of 9,995. The annual salary of Inspector and Surveyor will be £158, with special payments for the additional duties, estimated at £42 per annum. The salary to include the provision and maintenance of a motor cycle. The salary will be increased by annual increments of £5, until a maximum of £240 per annum, inclusive, is reached.

The Officer will be required to reside at Bradwell, where an office is provided by the Council.

Forms of application and full particulars as to duties, &c., can be obtained from the undersigned by forwarding a stamped addressed foolscap envelope, and the application must be returned to me by Saturday, 13th July.

The Officer will be required to commence his duties on 1st September, 1912.

(By order)

CHARLES W. POWELL,
Clerk to the Rural District Council.

Council Offices,
Newport Pagnell.
June 26, 1912.

DARJEELING MUNICIPALITY, INDIA.

APPOINTMENT OF ASSISTANT ENGINEER.

The Commissioners of Darjeeling Municipality require the services of an Assistant Engineer.

Candidate must have some practical knowledge of sewage works, modern sanitary arrangements, waterworks, the construction and repairs of buildings and roads, and should be able to prepare estimates and reports.

The person appointed will be required to devote the whole of his time to these duties. He will be provided with free quarters and a pony, and will be allowed one Chuprassee.

The salary will commence at Rs.150/- or Rs.200/- monthly, according to qualification, and an increment of Rs.25/- a month will begin in each of the next two succeeding years.

Applications, which should be accompanied by copies of recent testimonials, will be received up to 31st August, 1912.

The Candidate selected will be required to pay his own passage money or train fare, but no security will be required.

Apply to Vice-Chairman

CITY OF RIPON.

ELECTION OF CITY SURVEYOR.

The Corporation require the services of a thoroughly competent Surveyor. For full particulars of duties apply to the undersigned.

The salary will commence at £150, and rise by annual increments of £10 to £200.

Preference will be given to Associate Members of the Institution of Civil Engineers, and to persons holding the "testamur" of the Institution of Municipal and County Engineers.

Applications must be sent in to me on or before the 15th July next. Canvassing, directly or indirectly, will be considered a disqualification.

(Signed) M. KIRKLEY,
Town Clerk.

Town Hall,
Ripon.
June 26, 1912.

BOROUGH OF LEIGH.

The Corporation are requiring a temporary junior Assistant in the Borough Engineer's Office for a period of one year, dating from August 1st next.

Candidates must have been trained in a Borough Engineer's Office. Salary £6 per month.

Applications, stating age and qualifications, together with 3 testimonials, will be received by the undersigned not later than 8th July.

W. H. COWBURN,
Town Clerk.

Town Hall, Leigh.
July 1, 1912.

BARNOLDSWICK URBAN DISTRICT COUNCIL.

The Council invite applications for the position of Assistant in the Surveyor's Office, at a salary of £70 per annum.

Applicants must be neat and expeditious Draughtsmen, accurate Surveyors and Levellers, and possess a good general knowledge of the routine work of a Municipal Surveyor's Office.

Applications, stating age and experience, accompanied by copies only of not more than three recent testimonials, and endorsed "Assistant," must be sent to the undersigned on or before the 9th day of July, 1912.

WILKINSON ELLIS,
Engineer and Surveyor.

Town Hall,
Barnoldswick.
June 28, 1912.

COUNTY BOROUGH OF GRIMSBY.

SUPERVISING ROAD FOREMAN.

The Highways Committee is prepared to consider applications for the position of Supervising Foreman, at a commencing wage of £2 15s. per week.

The town is divided into four districts, each in charge of a foreman, and Candidates for the appointment now vacant must have had experience in the maintenance of roads, and be thoroughly competent organisers. Age not more than 42.

Form of application and outline of duties may be obtained from the undersigned on receipt of a stamped addressed foolscap envelope.

Applications to be sent in not later than noon on Friday, the 19th instant, endorsed "Superintendent Foreman," and addressed to the undersigned.

H. GILBERT WHYATT, A.M.INST.C.E.,
Borough Engineer and Surveyor.

Municipal Buildings,
170 Victoria-street,
Grimsby.
July 2, 1912.

ADVERTISER (Box 1165) desires to thank the numerous applicants for the position of Assistant in a County Surveyor's Office, and to inform them that the vacancy has been filled.

COMPETITIONS OPEN.

COUNTY BOROUGH OF HUDDERSFIELD.

TOWN PLANNING.

The Housing and Town Planning Committee of the Huddersfield Corporation invite Competitive Designs from Architects and Surveyors for the Laying Out of certain areas within the County Borough and part of an adjacent suburb.

The following prizes will be offered—*viz.*:—

1st prize, 100 guineas.
2nd prize, 50 ..
3rd prize, 25 ..

Copies of the Conditions of Competition, and other particulars, may be obtained on application to the Borough Engineer (Mr. K. F. Campbell, M.INST.C.E.) upon depositing Two Guineas. The deposit will be returned on the receipt of *bonâ-fide* designs, together with all documents issued by the Borough Engineer to the Competitor.

The designs, endorsed "Town Planning," must be delivered at the Borough Engineer's Office, 1 Peel-street, Huddersfield, not later than 31st day of October, 1912.

J. HENRY FIELD,
Town Clerk.

Huddersfield.
June 26, 1912.

APPOINTMENTS WANTED.

YOUTH (20) desires appointment; completed 3 years' articles, and Assistant for 6 months with Borough Engineer and Surveyor, M.I.C.E.I., obtaining varied experience; leveller, draughtsman, and typist; experience in water supply, road making and maintenance, sewerage, inspection of new buildings and dwellings under H. and T.P. Act, 1909; office routine and supervision of workmen; testimonials.—"Municipal," office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

MR. R. J. THOMAS, M.INST.C.E.,

County Surveyor, Buckinghamshire.

President of the Institution of Municipal and County Engineers, 1912-13.

The Surveyor

And Municipal and County Engineer.

Vol. XLII. JULY 12, 1912. No. 1,069.

Minutes of Proceedings.

Institution of Municipal and County Engineers: The Annual Meeting.

The thirty-ninth annual general meeting of the Institution of Municipal and County Engineers opened yesterday at Caxton Hall, and it will be continued to-day at the same place (the afternoon, however, being devoted to visits), and to-morrow at Aylesbury and Tring. It is not possible for us to deal in our present issue with the various papers which are being submitted for discussion. We may, however, offer to the Institution and to Mr. R. J. Thomas, M.INST.C.E., the county surveyor of Buckinghamshire, our cordial congratulations upon the inauguration of the latter's year of office as president. Mr. Thomas's address, which was a model of compactness, nevertheless contained very pertinent references to many subjects which are of interest and importance to every municipal engineer. There is probably no profession in which it is of greater importance that the members should keep themselves well abreast of the times than in that of engineering. This applies in a peculiar degree to the local government engineer, whose duties and responsibilities do not grow less as time goes on, and Mr. Thomas rightly insisted on the value of the meetings of the Institution in this connection and on the increased facilities which should be available under the new constitution. Another feature of the work of the Institution which is of the greatest possible value in maintaining a high standard of professional qualification is the system of voluntary examinations. We cordially agree with the new president that the younger members of the profession would do well to obtain the testamur of the Institution at an early stage in their career. We go further and say that it is incumbent upon any engineer who undertakes the responsibility of the professional education of a pupil to point out clearly the serious handicap which will be entailed in the future on any man who does not possess reasonable educational certificates and the diplomas of one or more of the recognised professional examining bodies.

Mr. Thomas of course referred to the important questions of superannuation and security of tenure, and pointed out that, although these desirable objects were still unattained, the only ways in which to secure the desired end are to insist on the anomalies and injustices of the present system on every possible occasion, and to support the practical efforts that are being put forward by the National Association of Local Government Officers to secure Parliamentary sanction for an adequate scheme. The subject of security of tenure naturally led to a reference to the case of Mr. W. Jones, of Colwyn Bay. The facts of this case are now well known, and it is to be hoped that—inasmuch as the funds of the Institution cannot legally be applied to such a purpose—members will voluntarily help to meet the very large expense to which Mr. Jones was put in the vindication of his character against unjust and wholly false aspersions. Even in this matter some good appears to be emerging from an apparent evil, as steps have been taken for the formulation of a scheme for raising a mutual defence fund. Among the other topics to which Mr. Thomas made reference were the work of the Road Board, the Third International Road Congress to be held in London next year, and the advent of the trackless trolley car—all matters of considerable moment to engineers and of great public interest. Mr. Thomas is to be congratulated on his address, which was very well received by the members present at the meeting.

The annual report of the council of the Institution for 1911-12 provides a record of a year's very useful work accomplished on behalf of the members. The achievements are of a very satisfactory character, particularly in regard to the settlement of questions upon which much difference of opinion has existed. The new constitution is now *un fait accompli*, and will no doubt be worked in the interests of the members of every class without regard to past controversies. Among the notable events of the past year must be mentioned the very interesting visit to Paris which took place at Whitsuntide. The members were very cordially and hospitably received, and it is pleasing to note that the council have elected six eminent French engineers as honorary members of the Institution. Looking to the future, it is evident that one of the questions pressing for immediate solution is that of the provision of more adequate and suitable premises for the increasing work of the Institution and for the holding of the numerous council, committee and other meetings. This is one of the matters to which the new council will doubtless address themselves without delay. With an increased membership and every sign of a continued prosperity, there appears to be no reason why the ensuing year should not be one of the most successful in the history of the Institution.

* * *

The Orphan Fund.

It is perhaps appropriate that the very first of the gatherings held in connection with the annual meeting of the Institution is intended specially for the subscribers to the Orphan Fund. We have always felt that the administration of this fund is among the most important features of the Institution's work, and is deserving of far wider support than it has hitherto received. We purposely say "wider' support, because the chief desideratum is not a small number of large subscriptions (welcome as these would be), but rather the necessarily humbler gifts which, if sent in sufficient number, not only serve to swell the funds

available for distribution, but also to encourage the organisers with the knowledge that the excellent work to which they have put their hands has the sympathy and support of the general body of the members of the Institution. That this sympathy exists we have never for one moment doubted. All that is lacking is the thoughtfulness which is required to turn this sympathy into practical action. It is a little discouraging to find that during the past year there has been a slight diminution both in the number of subscribers and in the amount raised. The nature and extent of the work accomplished is shown by the fact that during the period in question a sum of over £108 has been granted to assist in the maintenance and education of thirteen children. We commend the fund to every member of the Institution in the hope that during the current year there may be a large increase in the number of subscribers.

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The Institution: A Retrospect.

In connection with the annual meeting of the Institution of Municipal and County Engineers the brief retrospect of the birth and growth of that body may be read with interest, more especially by those who have only been associated with it in recent years. Its forty years of existence is not a long span in the bridge of time; but it is sad to recall that the *doyen* of municipal engineering—Mr. Jones, of Ealing—is almost the only surviving link with the period of its birth. Mr. Lewis Angell, the father of the Institution, we could last year have coupled with Mr. Jones, as it was only quite recently that we had to record his passing away. In a less personal sense it is also matter for keen regret that the main object for which the unity of municipal engineers and surveyors was brought about in 1870 is still unattained, and the gross injustice of their not being entitled to some security of tenure of office still remains as glaringly unfair as it was then, though since that year protection has been accorded to practically all other sections of local government officials. Still the good work done by the institution in other directions has been invaluable to the profession as a whole and to individual members of it, and there is in our short retrospect nothing but encouragement to the president and council and to their permanent officials to speed the plough with united and renewed energy.

* * *

Staffordshire Roads.

A report on Staffordshire roads by Mr. James Moncur, Assoc.M. Inst.C.E., county surveyor, some extracts from which appeared in our issue of June 7th, is more than a contribution of passing interest, and may be regarded as a permanent addition to those practical notes on road maintenance which are stored on the shelves containing the back numbers of The Surveyor. A point which must be grasped by all who would understand clearly the significance of Mr. Moncur's remarks is the fact that the climate of a part of the North Midlands including the county of Stafford, differs in a marked degree from most of the other climates of the British Isles. Distance from the sea, elevation, topography, and the manner in which different subsoils are distributed throughout the area all these give to Staffordshire and portions of some of the adjoining counties a character which imparts special interest to reports which are based on long continued observations of, and experience with, its roads. This consideration applies particularly to the effects produced by mechanically propelled vehicles. "Ruts or grooves," writes Mr. Moncur, "were quite unknown in Staffordshire until the advent of mechanically propelled vehicles, but it has now become a very serious question as to how to get rid of the trouble." Compare that remark with the following: "In Staffordshire, notwithstanding the long and continued drought of last year, comparatively little disintegration of the surface taking the road as a whole took place, and I cannot help thinking that this was largely due to at least three causes: (*a*) The soundness of the foundations, (*b*) the extended use of the best material for the upper or surface crust consolidated by steam rollers, and (*c*) the changed nature of the traffic from horse to mechanically propelled vehicles." Thus we have the observation that certain damage is largely due, or wholly due, to motor vehicles, and at the same time the opinion that the change from horse to motor vehicles was actually of advantage during the drought of last summer, when in most parts of the British Isles, and especially in the Southern and Eastern counties, excessive wear of roads by fretting under motor traffic was one of the most serious of the difficulties with which surveyors had to contend. Another point of special interest consists in this: that Mr. Moncur finds it advisable to leave snow upon the roads rather than to remove it and so expose the road crust to the action of frost and subsequent thaw. The advantages of leaving a temporary crust of snow to protect the stone crust beneath it were pointed out in our own pages some five years ago, as the result, it is interesting to note, of observations made on Staffordshire roads. The statement that frost heaves and lifts the whole body of the road indicates climatic conditions very different from those of at least a half of England and Wales, where such action is comparatively infrequent. Whether the crushing of stone in frost is really due to the action of the frost upon the stone itself, or is the result of the hardness of the road crust beneath loose stones when subjected to heavy wheel loads, is a moot point. Possibly some of the damage done may be attributed to each cause.

It is interesting to note that, as regards the effect of tarring in prolonging the life of a road, Mr. Moncur prefers at present "to say nothing that would raise false hopes." And here again effects which must be attributed to local conditions are strikingly in evidence in the statement that "during the exceptionally dry weather of the past summer the surfaces adjoining the tarred part kept as sound as the latter." In some cases the surface adjoining a tarred part is kept sound during a period of very small rainfall by the fact that the rain water from small showers is shed by the tarred portion in the middle on to the untarred portion at each side, with the result that a little rain goes a long way in maintaining the crust at a suitable dampness. This consideration cannot, however, be regarded as applying to the long drought of last summer. As regards tarred patching material, we are not surprised to read that the result of using such material prepared beforehand was not satisfactory. Generally, we think the patch should be similar in its nature to the rest of the road crust, though there may be cases when the conditions do not permit of leaving the patch sufficiently long to consolidate properly before it is subjected to heavy traffic, and what is definitely a patch, and may have to be more or less on the "new cloth in an old garment" principle, must be used. But whenever possible the repair should be of the nature of a darn rather than that of a patch, for the significance of which remark any good housewife may be consulted. We entirely agree with the contention that legislation compelling traffic to keep to the near side of the road would be a mistake, not only for the reasons put forward by Mr Moncur, but also from the general consideration that in order to make the best use of the roads the amount of liberty permitted to the drivers of vehicles should be just about what it is now as controlled by custom and by common law.

Water Purification: An Efficient English System.

Steady progress is constantly being made in the development of practical means whereby water for public use is rendered sterile. When this condition of sterility is fully realised the terror of water borne diseases are reduced to the smallest practicable limits as far as the water supply is concerned. But there yet

remain the risks incidental to dust, flies, and the personal element of the consumer himself as to cleanliness and general habits, particularly in the handling of articles of food and drink. These, however, are variable factors often beyond the immediate control of the water consumer or of the water engineer, and if the water supply is pure, statistics show that the chief source of typhoid is removed. The water specialist is now able to do much towards ensuring the safety of a public water-supply, and his efforts are mainly directed towards—(*a*) the destruction of water-borne pathogenic bacteria, such as the cholera vibrio, the bacillus typhosus, and the disease germ indicator, the B. coli communis; (*b*) the removal of organic and other impurities in solution and suspension; (*c*) the removal of iron and plumbo-solvent characteristics; and (*d*) the removal of colour, taste and smell.

Slow sand filtration, especially when combined with adequate preliminary quiescent sedimentation, has done valuable service for many years past, but recent biological research shows that it does not accomplish all that is essential. Dr. A. C. Houston, the eminent bacteriologist of the Metropolitan Water Board, has stated that "sand filtration, although it reduces the total number of bacteria, allows excremental microbes like the B. coli to pass through the filters in much the same proportion as the ordinary water bacteria. Dr. G. J. Fowler, of Manchester, has also pointed out that "it is well known that, unless they are kept under very close scientific supervision, slow sand filters are by no means an absolute safeguard against bacterial pollution." This statement has, during recent years, been corroborated at many places. At Truro, where, notwithstanding the most careful filtration by sand beds of the best type, the B. coli persistently appeared in the water delivered for consumption, an economical and efficient remedy has been found in the introduction of the now well-known "De-Clor" filtration plant, of wholly English design and make. At Reading, where the same system has been in use for some time, it is officially reported that "the B. coli has with one exception always been present in very small quantities of the river (Kennet) water—*i.e.*, in from ·1 to 1 c.c.; while its presence has never been detected in 100 c.c.'s of the filtered water." No extra labour at either of these works has been employed to operate the plants in question, and the only working cost is that of the bleaching powder used, which amounts to about 2s. 3d. per million gallons treated. At Truro the capital cost amounted to about £2,000, as compared with an expenditure of £12,000 which would have been involved had the slow sand filtration principle been extended with a view of meeting the requirements. Equally satisfactory results as to bacteriological efficiency, and also as to initial and working costs, have been experienced at other towns, including Harrogate, where surface moorland water is dealt with on a considerable scale. In view of the general experience in America, to which we have frequently drawn attention, and to the experience gained at home, of which the results quoted above are typical, it is gratifying to find that water authorities in this country are at last turning their attention to the advantages of the "De-Clor" process. The good results produced by the Continental ozone and the ultra-violet rays methods should not be ignored, but in this country we have yet to look for the practical proofs of economical efficiency which are to hand in connection with the "De-Clor" process, a thoroughly efficient English system of proved worth.

* * *

Aerial Nuisance from Sewage Works.

It is not overstating the case to say that whenever an unpleasant smell is noticed by the public it is usually attributed to the drains if near a house, to the sewers if in the street, or to sewage disposal works if there are any within a mile or so. Frequently the blame is wrongly apportioned, as in the case of a sewage farm just on the borders of the London County Council area, where, to our personal knowledge, the sewage works have been blamed for offensive odours arising from a soap works in the next field. On the other hand, it must be admitted that offensive smells are occasionally caused by sewage treatment, and although we may follow the example of the experts, and use the term *aerial nuisance*, "a rose by any other name would smell as sweet." Sometimes it is caused by bad management, at other times by badly designed works. At other places the exceptional local conditions are such that neither good management nor well-designed works of the ordinary type are sufficient to prevent a nuisance. An example of this kind is to be found at Stratford-on-Avon, and the interesting paper read at the annual summer meeting of the Association of Managers of Sewage Disposal Works last Saturday by Mr. Herbert D. Bell, the manager and chemist of these works, shows clearly the enormous difficulties which those in charge of such works are occasionally called upon to meet and overcome. The sewage contains 10 per cent. of brewery wastes, and is delivered to the works through a pumping main which holds about one-sixth of the average daily dry-weather flow. As this rising main must of necessity stand full for a number of hours each day when the pumps are not working, it is obvious that its contents will become septicised even before they reach the tanks provided for preliminary treatment, and thus add to the possibilities of offensive odours arising at the works. But this is not all. As will be seen from Mr. Bell's paper, which we print on another page, the sewage itself is strong, and it receives other exceptional waste liquids besides the brewery wastes which still further increase the difficulties of treatment. The nett result of the experimental work carried out by Mr. Bell is that the adoption of chemical precipitation with lime, in place of the originally designed septic tank treatment, is not in itself sufficient to prevent the creation of offensive odours at all times, and when these are given off from the tank effluent a hypochlorite solution prepared from bleaching powder is added to it in sufficient strength and quantity to oxidise the offending gas and thus remove the cause of the nuisance. We hope there are not many managers of sewage disposal works in the position of Mr. Bell when he took charge of the works at Stratford-on-Avon, but those who have that unenviable distinction will appreciate the immense difficulties which he had to overcome, and will, we are sure, be grateful to him for so freely and so ably putting on record the results of his work for their benefit.

* * *

Gyratory Traffic Regulations.

The recent appearance in a London evening paper of a short note on the gyratory system of traffic regulation as applied to busy road junctions suggests that our readers may like to be reminded that an article on this subject by the same writer, Mr. W. Noble Twelvetrees, M.I.MECH.E., appeared in our issue of October 4, 1907, and was followed by a criticism in our issue of November 29th by Mr. Reginald Ryves, ASSOC. M.INST.C.E. In his SURVEYOR article Mr. Twelvetrees pointed out that this method of regulating traffic was first proposed by Mr. Holroyd Smith, who suggested that Ludgate-circus would be a good place to try it. Mr. Twelvetrees himself argued out the case in a lucid manner, and an important point which he made, and now repeats, is that no physical alterations are necessary in order to make a test—all that is required being that an order should be given to the police to regulate the traffic in the necessary manner. On this point Mr. Ryves took the same view, but argued that the method displays many weaknesses compared with the holding-up system. We need not repeat the arguments for and against, but may refer our readers to the two articles already mentioned, as well as to our own remarks on the same subject in our issue of February 9, 1912.

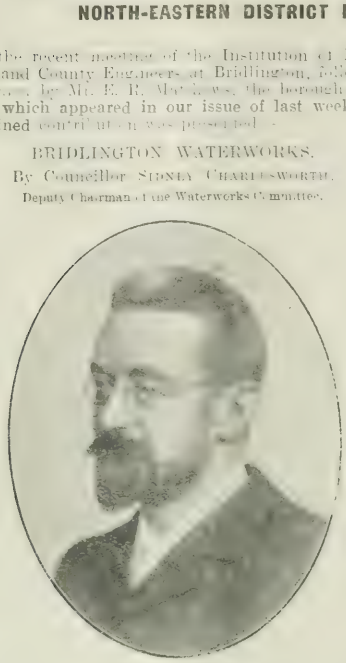
Institution of Municipal and County Engineers.

NORTH-EASTERN DISTRICT MEETING AT BRIDLINGTON.—(*Conclusion.*)

At the recent meeting of the Institution of Municipal and County Engineers at Bridlington, following the paper by Mr. E. R. Matthews, the borough engineer, which appeared in our issue of last week, the subjoined contribution was presented:—

BRIDLINGTON WATERWORKS.

By Councillor Sidney Charlesworth, Deputy Chairman of the Waterworks Committee.



The first record of a public water supply in Bridlington refers to the discovery in 1811 of an ebbing and flowing spring in the harbour, at a depth of 43 ft., by Mr. Benjamin Milne, collector of customs. Mr. Milne had a reservoir made and a pump fixed at his own expense. This supply is still used by the shipping frequenting the port, and by the local fishermen. Some time after the work had been finished, Mr. Milne wrote to the lords feoffees (the lords of the manor) asking them to make him a grant towards the expense he had incurred for the public good, and he seems to have found them very unwilling to help him. In passing, the author would like to mention that exactly a century ago—viz., 1812 John Rennie was consulted, and he reported on a new harbour for Bridlington. Copies of his report are occasionally to be met with in the town.

In 1865 a number of local gentlemen formed themselves into a company under the title of the Bridlington and Quay Water Company, Limited, with a capital of £20,000. They supplied the town without obtaining an Act of Parliament for ten years; then they, with the assistance of the urban district council, obtained an Act with clauses facilitating the purchase of the undertaking by the local authority, and increasing the authorised capital to £40,000. In 1899 the waterworks undertaking was acquired by the town council, the amount paid for it being £70,000. The loan period was fixed at fifty years, and the money was borrowed at 3 per cent. The [illegible] tion—viz., £2,000—was shortly afterwards repaid out of the waterworks revenue. The author was elected on the council on November 1, 1905. He immediately raised the question of the inefficiency of the pumping machinery to meet the needs of a growing town like Bridlington. On January 23, 1906, the Waterworks Committee were empowered to call in expert advice, and Mr. F. J. Bancroft, B.Sc., M.Inst.C.E., waterworks engineer, was asked to report [illegible]

In his report Mr. Bancroft fully endorsed the author's opinion as to the [illegible] plant was old and wasteful in coal consumption, and dangerously inadequate for the work required. He strongly recommended the immediate [illegible] modern pumping engine in duplicate. This the council decided to do, and prepared to apply to the Local Government Board for permission to borrow the money. It was then discovered that, although the Bridlington Water Company's Act gave to the council power to purchase the undertaking from the company and to borrow the money for that purpose, once it became their property they had no power to raise loans for any further developments. It was necessary therefore to amend the Act, and this was done by a Provisional Order obtained in 1908.

The old works consisted of two stations, the upper and the lower. The latter was erected in 1865, at the junction of Long-lane and Marton-road, at a height of 100 ft. above ordnance datum. The area of the site is 1¼ acre; the works consist of engine and boiler house, fitting shop, manager's house, and office, and a disused reservoir. There is a well 6 ft. in diameter and 100 ft. deep. This station has been abandoned for purposes of obtaining a water supply, and the machinery has been broken up and sold.

Owing to the insufficient height of the lower station, the company found they could not give a satisfactory supply, and in 1872 they erected a new station on the site of the present works. It was decided to use a set of wind-driven pumps, and a very substantial windmill tower with heavy head gear was erected. It was soon found, however, that this was not a reliable method, so another pump was obtained, and coupled in a very roundabout manner to a steam engine, which had been designed for driving a saw-mill, and was supplied with steam from a Lancashire boiler. It was afterwards arranged to do away with the windmill, and couple both sets of pumps to the steam engine, which naturally involved further difficulties in gearing. As the engine had no steam-saving device, except a very inefficient feed-water heater, and was coupled to the pumps in a most complicated manner, it was found to be most wasteful in fuel.

The portions of the old works which have been retained are the well, the boiler-house (now used for storing coal), the engine-house, which will be converted into a store-room and workshop, and the reservoir. The old engine and pumps have been broken up and sold, and the boiler converted into a soft-water feed-tank. This we find a most useful adjunct, as it allows soft water to be used for make-up instead of using hard well water. For several years it had been the custom to run both stations continuously night and day, seven days per week, to supply the town during the height of the season. Any one conversant with water supply will realise the enormous risk we were running in so doing. It was most difficult, however, to convince some of the members of the council and ratepayers of the absolute necessity for a new plant, but fortunately we were able to get the new machinery working from the deepened well before the record dry season of 1911 set in; otherwise the results to Bridlington as a health resort would have been disastrous. Owing to the fact that the new engines had to be fixed over the existing well, and that the lower station could not alone supply the town, the difficulty of installing the first set was considerably increased. The new boiler and engine-house having been erected, and the windmill tower pulled down, one half of the well kerbing was removed along with one set of pumps and gearing, the remaining half being then securely strutted and braced to the new dividing wall. The delivery pipe from the remaining pump which had to be used was diverted, to allow the first set of foundations to be put in and its engine erected thereon. Mr. Gibson (our works manager) deserves credit for devising and carrying out this difficult piece of work.

The original specification prepared by Mr. Bancroft called for a duplicate steam-driven plant, capable of easily pumping 1,000 gallons of water per minute at normal speed (speed of pump not more than 120 r.p.m. per minute, and capable of working smoothly and regularly at half-speed, and also at 30 per cent above normal; the engines to be designed to work most economically from a depth of 180 ft., and capable of pumping from a depth of 200 ft. The same conditions were specified for the suction-gas and electricity tenders. The average of the tenders for steam and suction-gas plants worked out at about £8,500. The tenders for the electrically driven plant averaged about £8,000 in each case, with travelling crane and all accessories.

The merits of the three systems were thoroughly discussed by the Waterworks Committee, and it was eventually decided to adopt a steam-driven plant, on account of its flexibility and reliability, especially

when used for well sinking and drifting, which had to be done with the new machinery as soon as it could be installed. The contract for the complete plant was placed with Messrs. Hathorn, Davey & Co., of Leeds, as follows—*viz.*: Two complete compound horizontal differential surface-condensing pumping engines (cylinders 18 in. and 36 in. diameter respectively), each with two pump buckets 17½ in. diameter, with a common stroke for engine and pumps of 4 ft. Two Cornish boilers, 6 ft. diameter by 24 ft. long, with a grate area of 18 sq. ft. each, working pressure 100 lb. per square inch. Two McPhail & Simpson superheaters, each with 350 sq. ft. of heating surface. One Green's economiser, with forty-eight pipes. Small engine for driving scrapers. Two feed pumps. One 10-ton overhead travelling crane. The makers guaranteed that each engine, with its boiler and accessories, when pumping at the rate of 1,000 gallons per minute, against an average head of 180 ft., the amount of best Yorkshire screened steam coal used, having an evaporative capacity of not less than 9 lb. of water per 1 lb. of coal, from and at 210 deg. Fahr., with superheated steam at 100 lb. boiler pressure, and a vacuum of not less than 27 in., shall not exceed 186 lb. per hour; and when pumping a similar quantity under the same conditions, against a total head of 160 ft., the fuel consumption shall not exceed 172 lb. per hour.

BRIDLINGTON WATERWORKS.

Official Trials at Higher Pumping Station.

Contractors: Hathorn Davey & Co., Engineers, Ltd., Leeds.

Consulting Engineer to Corporation: F. J. Bancroft, B.SC., M.I.C.E.

PARTICULARS OF TRIAL.

		Engine No. 1.	Engine No. 2
Date of trial		12/7/11	13/7/11
Duration of trial	hours	10	10
Steam gauge at engine	lb. per sq. in.	95·3	94·4
Temperature at stop valve	° Fah.	399	428
Superheat at stop valve	Fah.	65	94
Cut-off in H.P. cylinder		0·275	0·225
Cut-off in L.P. cylinder		0·4	0·4
Vacuum in condenser	inches	28·1	028·75
Temperature in exhaust pipe	° Fah.	118	116
Temperature corresponding to pressure in condenser	Fah.	99·6	86·1
Double strokes by counter in 10 hours		7,793	8,314
Double strokes per minute		13	13·85
Indicated horse-power of H.P. cylinder		33·95	28·8
Indicated horse-power of L.P. cylinder		26·57	35·75
Total indicated horse-power of engine		60·52	64·55
Mean lift by well gauge	feet	167·7	170
Mean discharge per minute by notch	gals.	1045·5	1078·5
Pump horse-power in water lifted (actual)		53·13	55·55
Efficiency			
Actual P.H.P. in water lifted / I.H.P.	per cent	87·8	86
Boiler gauge	lb. sq. in.	103·7	103·7
Temperature at economiser inlet	° Fah.	91	82
Temperature at economiser outlet	Fah.	166	163·5
Temperature at superheater inlet	Fah.	339	338
Temperature at superheater outlet	Fah.	453	480
Air-pump discharge in 10 hours	lb.	—	13,040
Temperature of discharge	Fah.		90
Jacket drains in 10 hours	lb.		774
Temperature of jacket drains	Fah.	—	188
Make-up feed	lb.	—	1,784
Temperature of make-up feed	Fah.	—	67
Total feed supplied in 10 hours	lb.	14,380	15,598
Mean temperature of feed	lb.	72	67
Drains from steam range	lb.	40	67·5
Feed water supplied per hour	lb.	1,438	1,559·8
Coal used in 10 hours	lb.	1,800	1,908
Coal used per hour	lb.	180	190·8
Water evaporated per lb. of coal (actual)	lb.	7·99	8·17
Temperature of feed water	Fah.	72	67
Temperature of saturated steam at boiler pressure	Fah.	340·1	340·1
Temperature at superheater outlet	° Fah.	453	480
Superheat at superheater outlet	° Fah.	113	140
Thermal units required to convert 1 lb. of feed water into steam at boiler pressure and superheated as above		1199·9	1217·87
Thermal units utilised from each lb. of coal (calorific value not known)		9587·2	9949·9
Equivalent evaporation per lb. of coal from and at 212° Fah.		9·92	10·3
Steam used per I.H.P. per hour	lb.	23·76	24
Steam used per P.H.P. per hour	lb.	27	28
Coal used per I.H.P. per hour	lb.	2·97	2·95
Coal used per P.H.P. per hour	lb.	3·38	3·43
Equivalent coal consumption per hour when pumping at the rate of 1,000 gallons per minute against an average head of 160 feet	lb.	167	170·4

This guarantee was fulfilled by both engines at the trial, and we have every reason to believe that the consumption under ordinary every-day working conditions has not greatly exceeded the guaranteed amount. The advantages of this type of engine are: Long stroke, slow running, high combined mechanical efficiency of engine and pump, and, for the size of the engine, economical steam consumption. A further advantage is, the top of the well is comparatively clear for withdrawing the buckets and lifting heavy parts in the well. In order to avoid troubles due to high superheat, the steam from the heater is first taken through the low-pressure receiver, and thence round the high-pressure cylinder jacket before it enters the high-pressure steam chest.

In running the plant, it has been found that the Baker's oil separators work very much better with cold-water jets fitted. The delivery mains discharge into a cast-iron tank, placed outside on the edge of the reservoir, with three V notches, and a chute discharging into the reservoir. A fixed scale with a movable pointer gives a ready means of gauging the output of the engines at all times. This tank acts as a balancer when pumping direct into the town mains.

In addition to the main engines there are two steam winches, with double oscillating cylinders and worm gearing, supplied by Messrs. S. A. Ward & Co., of Sheffield, and fitted with their patent reversing gear, a most interesting and simple method of steam distribution for this class of engine. Owing to a rather serious accident, which happened during the erection of the main engine, the Waterworks Committee decided that the hoisting engines, both for material and men, should be so arranged that there was no possibility of throwing the drums out of gear and allowing the weight at the end of the rope to be lowered by the brake only; hence the use of worm gearing on these winches.

As soon as both main engines were completed, and had worked long enough to see that all was in order, then the well sinking and adit driving was undertaken. The original depth of the well was 160 ft. This was lowered to 193 ft., and two adits were driven, each being 50 ft. long. The contract for this work was given to Messrs. B. Robinson & Son, Hull. The prices were 10 guineas per foot for sinking and £2 14s. per foot for drifting. Brickwork in cement, including additional excavation, £3 15s. per cube foot. This work took four months to complete, working double shifts. The town had to be supplied with water partly from this well. The surplus water was discharged into the sewers in various parts of the town.

The Local Government Board have only allowed us fifteen years in which to repay our loan on the new pumping engines. One of the old engines (which was not specially designed for pumping) actually ran, and the boiler was in use, for over forty-five years. The cost of coal saved by putting in new engines is equal to the amount of principal we have to repay annually, the interest being paid out of revenue. The coal used by the new plant is one-third of that required by the old. Our water consumption works out at 43 gallons per head per day for all purposes; in the height of the summer season this is considerably increased.

The metered supply is about 10 per cent of the total; the gas company supply, however, is not metered.

COPY OF ANALYST'S REPORT ON WATER FROM HIGHER WORKS.

Report on water received from Bridlington Corporation, August 2, 1911:—

Locality: Bridlington. Source: Well 192 feet deep. Soil or strata, depth and nature of: chalk.

Colour of water, two feet depth in Lovibond's units = 1·2 blue + 0.5 yellow. Smell at 100° Fahrenheit: faint earthy.

The Sample Contains in Grains per Gallon (parts per 70,000):—

Chlorides equivalent to common salt, 3·23, containing chlorine, 1·97.

Nitrates equivalent to calcium nitrate, none; containing nitric acid, none.

Nitrites, none.

Phosphates, none.

Calcium magnesium carbonates, 15·57 — containing lead, none; hardness, 15·2°

Calcium sulphate, 1·60 — hardness after boiling, 2·1°

Volatile and organic matter (lost by careful ignition), 0·29 — containing ammonia, 0·006; containing alb. ammonia, 0·004; containing proteid ammonia, none; absorbing oxygen in 15 minutes, none; absorbing oxygen in 4 hrs., 0·003

Total Dissolved Solids, 20·69

Sediment: very minute. Microscopic examination does not show the presence of animalculæ.

Micro organisms per 1 cubic centimetre examined by plate culture gives three colonies.

The colonies consisted of the bacillus fluorescens liquefaciens, a non-pathogenic organism.

The chemical analysis and bacteriological examination show this to be a water of excellent quality for drinking and domestic use.

It is a hard water, but the hardness is not sufficient to render it objectionable.

Thomas Fairley,

August 19, 1911. *City and County Analyst.*

It will be seen that our water is very pure, but rather hard; this, however, can be overcome by boiling the water used for drinking, when the temporary hardness of 15·2 deg. is reduced to 2·1 deg. permanent hardness. Bridlington water, after being boiled and then allowed to cool, does not taste flat or insipid. Our water charges are 1s. in the £ on the rateable value; one water-closet, 10s.; extra water-closets, 5s. each; bath, 5s.; water by meter, 1s. per 1,000. It is the intention of the Waterworks Committee to reduce materially the charges on water-closets and baths at the end of the present financial year. The income from the waterworks has increased by about 25 per cent since the corporation acquired the undertaking. Last year the equivalent of a 2d. rate was handed over from the profits towards the reduction of the district rate.

When taking over an existing undertaking from a company by a small local authority, as was done in this case, a council might assume that the existing conditions and machinery were fully equal to the town's immediate future needs, and forget that the selling company have probably been trying to keep capital expenses down, and preparing for some years for a forced sale. The responsible officials and directors have always the demand of the shareholders for dividends to face; hence, they do not prepare so far ahead as municipal officials. It was for these reasons that the Bridlington Council had to undertake the complete renewal of the machinery soon after it had been purchased from the water company.

DISCUSSION OF PAPERS.

Mr. J. S. Brodie (Blackpool) wrote: I have read the advance copy of your paper with very great interest. Both historically as a seaport and in modern times as one of the chief marine resorts in this country, Bridlington stands prominently before us as a monument to the energy and go-aheadness of its municipality, and of the ability and foresight of its engineer. Although unable to be present in person, I hope the meeting will allow me to associate myself with a vote of thanks to the author of the paper for the very valuable and accurate data which has been furnished in the paper, and which will be of very great service to all who are engaged in public engineering works. You will, I am sure, excuse a little criticism on some of the details of your paper. These I make with some diffidence, as I have never had the pleasure of a personal visit to your popular East Coast health resort. I notice that there are still some 20 per cent of your houses within the borough which have no water-closets. I hope this will be a steadily diminishing quantity, until the whole borough is, as we are here at Blackpool, entirely a water-closet town. It would have been of interest if you had supplied us with a little fuller information in regard to your screening arrangements for the sewage before it is discharged into the sea. This is a subject coming now very much to the front, and any information which we sea-coast town engineers can obtain on this subject is very welcome. Also in regard to your waterworks, it would be interesting to be told how you stand in regard to the scale of hardness, as I take it the whole of your supply is from deep wells. You are doing obviously first-rate work in regard to your streets and roads, and one would be grateful to have a few particulars with regard to the intensity of traffic on your 2-in. Scotch granite, bituminous-bound roads. I observe also that your asphalted footpaths are formed with tarred limestone, and I have no doubt that you find these more successful than the use of the primary rocks for this kind of work. Your statistics of wages are certainly very interesting. Your rates of wages are considerably lower—at least to the extent of from 10 to 15 per cent—than what we pay here, none of the permanent labourers in my department being paid below the rate of 6d. per hour. In regard to the cost of your private street works, it would also be interesting if you would state the cost per foot frontage, including all road making, but exclusive of sewers, as the price given (4s. 6d.) seems incredibly low. Your remarks in regard to the sea defence works and sea front improvement works are really very interesting, and you are to be congratulated upon the great success which you have achieved at Bridlington in regard to these works. I note your remarks in regard to the new sea-wall. You will, I hope, excuse me if I differ with you in regard to the form of construction in the shape of steps which you seem to prefer. My criticism of this, which I am sure you will take in good part, is strengthened by a paragraph in your paper in which I am entirely with you when you state: "Undoubtedly the most suitable stone to face a sea-wall with is granite or basalt, especially where the foreshore is chiefly shingle and H.W.O.S.T. rises several feet up the wall." Concrete blocks in such a case are hopelessly inefficient, and I very much fear that even your Bramley Fall rock-faced stone may give trouble in the future, as nothing short of the hardest possible material will withstand the eroding action of the sea on an exposed coast. It appears to me that the stepped face, *pace* the forty years' experience of the Prince's Parade wall, must tend to wear smooth under the eroding action of the sea, whether it be a curved face or a straight face, and therefore that a face more or less smooth to begin with is really the best form of construction; and as regards the scour at the base of the wall, this, after all, is entirely a matter of the cross-section of such face, and if such a wall is properly designed the scour at the base is a negligible quantity. I note your remarks in regard to groynes. My considered judgment in regard to groynes upon a foreshore in front of a marine watering-place is that at best they are a necessary nuisance. They certainly detract very much from the appearance and use by the public of the foreshore of a popular health resort, and here at Blackpool I have made up my mind to do without them altogether and to spend my money on the sea defence works themselves. I think this is a conclusion I have arrived at that will commend itself to engineers responsible for the amenities of their foreshore in popular marine watering-places in the future. In regard to the tree-planting in streets, you are certainly to be congratulated upon the low cost you can plant trees for, as I cannot do anything like it. One would also like to hear if you find any trouble in inducing trees to take root and grow satisfactorily, as here at Blackpool, owing to the exposed nature of the place, it is very difficult to get trees to grow at all.

Mr. E. Massie (Wakefield) said he would like to take the earliest opportunity he had of thanking the members of the North-Eastern District for doing him the honour of electing him as their first chairman of that important district. One did feel that the position they had elected him to was one of which he could be reasonably proud, at the same time he could not help feeling there was a certain amount of responsibility in occupying that position, and it would only be with their cordial co-operation and their great forbearance that he would be able to do justice to

the position they had elected him to. He had no promises to make to them, except this—that it should not be three years from that meeting before they had another meeting in that district. The president had told him it was the desire of the council that meetings should be frequent, and, if possible, they should be quarterly in each district. It would be part of his duty to see that that desire of the council was carried out, and to see that some suitable subject was brought forward at each meeting in order to enhance the interest of the members who attended. After all, they existed as an institution for the benefit of interchanging views on matters which concered their daily task in life, and therefore it would be, as he had already said, his duty to see that some matters were brought forward at each meeting at which members could interchange their views for their mutual benefit, and, indirectly, for the benefit of the authorities they each served. There was one matter which they would have brought forward at their next meeting, and that was to elect an executive committee. The duties of that executive committee were not yet defined by the council of the institution, but he was pressed by Mr. Greatorex to see that there was no long delay in seeing that the duties were set forth, and he impressed upon the president that one power which should be given to the executive was the considering of the qualification of membership for candidates for the institution. He thought they ought to be able to advise the institution with discretion as to the character and capabilities of every candidate who came forward for election. This was done in the Surveyors' Institution. The provincial committees were given that power, and it was one of the things which the council of the Surveyors' Institution thoroughly appreciated. With regard to the papers, there was a good deal of matter in them, and they were very grateful to Mr Charlesworth and to Mr. Matthews, one of their own members, and the very capable engineer of Bridlington, for the kindness and consideration and care they had taken in preparing these papers for their consideration. He had not a great deal to say in criticism of them. He could only agree with what the president had already said, that they were all delighted to see the prosperity of a town like Bridlington. They were also delighted to hear that their rates were so very low. Long might that continue; that was the most sincere wish he could give to the ratepayers of Bridlington. Incidentally it was mentioned that there were such neighbouring seaside resorts as Filey, Whitby and Scarborough, but the comparisons were not given. That day they were there to show their appreciation of the good work done by Bridlington in catering for the amusement and health of the great industrial centres of the West Riding of Yorkshire. One thing which had struck him very forcibly was that the number of empty houses in their district was very small. They who came from the towns in the West Riding wished they could give a similarly small percentage of empty houses. Forty houses, or 1 per cent, seemed a very small number in a town like Bridlington. He remembered not long ago being at an extension enquiry for a large city in Yorkshire where for days and days—nine days—they pleaded with the authorities to bring forward a statement of the number of houses that were empty. For obvious reasons it was not convenient to get that information for them. They could hope that some day those large centres of population would be able to say there was only 1 per cent of houses to let in their districts. Evidently they had not overbuilt in Bridlington, and probably some of them when they went away would be able to persuade some builders to come there and place their capital at Bridlington. Mr. Matthews said there were a number of private streets not in such a good condition as they should be. He hoped before their next visit the corporation would have taken those streets into consideration, and put them into good order. Nowadays they expected everything to look very smart, and the way in which private streets could be made up without any great increased cost to make them more attractive was important. Another matter he would like to ask Mr. Matthews about was the screening of the sewage before it entered the sea. He knew this was something of a delicate topic for a seaside place like Bridlington, but they would be glad to hear something about it. The only other matter he wished to speak about on Mr. Matthews' paper was the town hall. That was a very nice room, bright and cheerful, but not very long ago he had to meet Mr. Matthews, and he was not equally struck with the accommodation he had in his department. No doubt that would be taken into consideration, and they would see that not only the rates were low, and the workpeople were properly housed, but the officials had proper accommodation provided for them. With regard to Mr. Charlesworth's paper, he would like to suggest to the corporation that the extra charges for water-closets and baths should be crossed off as quickly as possible. How could they in a town like Bridlington, whose prosperity depended entirely upon its good name for perfect sanitation, cripple the provision of water-closets and baths by making an extra charge? He was glad to hear that it was the intention to reduce the charge materially, though he would rather hear that it was the intention to cut the charge off entirely. He had great pleasure in moving a hearty vote of thanks to the authors of the papers.

Mr. H. W. SMITH (Scarborough), in seconding the vote of thanks, remarked that he knew Bridlington fairly well. Mr. Matthews was running what in a sense was a rival "show," and it was his (the speaker's) desire to keep ahead of him, if possible. (Laughter.) The small number of empty houses in Bridlington must be matter of congratulation to the corporation, and he had no doubt that the progressive spirit shown by the corporation, backed up by the energy of Mr. Matthews, had a great deal to do with that happy condition of things. Proceeding, Mr. Smith said he wished to congratulate Mr. Massie and Mr. Wakeford on their election to the important positions they now filled. To Mr. Wakeford he would only say he hoped that he would be a great deal more successful in getting members to have meetings in their districts than he (the speaker) had been. No one regretted the lack of success that rewarded his efforts more than himself, and he thought it was good for the society to have a change. The members seemed to have a happy way of promising to arrange for a meeting "next year," but that "next year" never came. If in a year or two Mr. Wakeford asked Scarborough to receive them again, he thought they would be quite prepared to do so. Referring to Mr. Charlesworth's paper, Mr. Smith added that it was very gratifying indeed to have a member of a public body contributing as he had done to one of their meetings, and their thanks were specially due to Councillor Charlesworth in that respect.

Mr. J. H. DREW (Wath-upon-Dearne) said he considered Bridlington was very fortunate in being able to get loans for periods of twenty-seven and thirty years in connection with ferro-concrete work. He was interested in a sewage disposal scheme in which they had to lift the filters, the floors being designed to carry a load of 6 cwt. to the foot, and they had been offered a loan for a period of ten years, but if they were unable to obtain better terms that that he thought it was likely they would scrap the scheme altogether. He saw they had been making an application to the county council to purchase for them a tar-spraying machine, and he should like to know the result of that. With respect to tar-macadam, he also wished to ask whether they used their own gasworks tar or some special preparation; further, perhaps Mr. Matthews would give some information as to the price paid for the material. Like the president, he often went to Bridlington for his holidays, and he could support him in his statement as to the rapid progress which the town had made during the past few years—a great deal of which progress, he agreed, lay to the credit of the borough engineer.

Councillor S. DYER (Bridlington) said he had had the pleasure of being a member of the institution since 1883 or 1884. At one time he was able to attend the meetings more or less regularly, but it had not been possible often since, though he found pleasure in going through the volumes of "Proceedings" which he received. He rose that morning to speak on the subject of housing. During recent years they had demolished a large number of houses of a small type, and it was that class of dwelling that now seemed to be needed in the district. It was not the large house that was required, but the very small ones, which he was afraid were not very remunerative to the owners. The council had just had under consideration a number of small houses for the working classes of the district, but the great bone of contention had been the matter of the site. The committee over which he presided advertised for sites, and they had a large number offered to them. The committee felt that one particular site was more suitable than others, but unfortunately it did not meet the ideas of everyone, and in the council chamber, owing to equal voting, the

matter was referred back to the committee. But on the previous Wednesday the subject came up again and went through, and it was hoped in a short time now to make a beginning with dwellings in which their working classes would be able to live in comfort. The plans of the houses, as they were aware, had been prepared by the borough engineer. They must remember that what they had aimed at all the way through had been to provide a substantial building at a minimum cost, and while the specification had been one that would bear examination, there was nothing of a superfluous nature in it. They were now advertising for tenders for the erection of the houses, and when those were received it was the intention of the council to apply for a loan for the carrying out of the work. They were glad to have a gentleman like Mr. Matthews for their surveyor. He (the speaker) knew something of the duties, for he was for a number of years the surveyor there, and he knew something of the anxieties that fell upon the shoulders of those who held positions of engineers to public bodies. Few people realised what a load that was, and he was delighted to feel there existed a brotherliness between the engineers of the different authorities, so that when they were unfamiliar with particular matters they were able to appeal to others who were and obtain the necessary assistance.

Mr. E. J. Silcock (Westminster and Leeds) said he had some knowledge of Bridlington from the pleasure point of view, and he had also the advantage of knowing something of it from the business point of view. So he claimed a special interest in Bridlington, and he was delighted to see the houses so fully occupied, and to see that the rates were kept so low. He must really congratulate the town upon having produced such excellent results without placing any undue burden upon their inhabitants. These two things reacted one upon the other; the fact that the houses were occupied caused the rates to be low, and the lowness of the rates caused people to come there. The sewerage arrangements there were, he thought, of a favourable character, due to the fact that the town was situate upon rising ground. That was a very great advantage to seaside places, and it was an advantage which all towns did not possess. There were many places, like Southport and other places on the flat coast of Lancashire, where the towns were situate very little above high water level of the sea, with the consequence that they had difficulty with their drainage, and had either to pump or store their sewage, and in some places had to have some kind of treatment before discharge into the sea. There, owing to the greater elevation, it was possible to discharge by gravity at any state of the tide. As to whether or not it was a desirable thing to do was a matter which, if one might be allowed to say so, was one which the corporation would have to carefully watch. The prosperity of a place like Bridlington was so bound up with good sanitation that if there was any fear that the foreshore would be fouled it would have a most disastrous effect upon the town. It did seem to him, without being at all an alarmist, it was a matter which the officials must very carefully watch, and if any ill-effect was seen, deal with it before it was noticed by the general public. As to the sea-wall and foreshore protection works, he thought the excellence of the work was testified to by the fact that they had stood the test of time and the ravages of the sea without showing any signs of deterioration. There were some sea defence works which were not carried out by the council which had not been altogether so successful, but he thought, so far as the works carried out by the corporation were concerned, they had stood most effectively, not only the sea-wall, but the groynes on the foreshore. The stretch of beach was an excellent playground for children, and one of the chief assets of the town, and therefore it was most important that it should be retained at a good level above low water. As to the position of the sea-walls, he quite agreed that the stepped face of the wall was better than the smooth face, whether that face was curved or straight. To his mind the stepped face was less liable to damage through the receding action of the waves than a flat-faced wall. Then he noticed, too, that the walls had been very successful in avoiding the splashing of the water of the advancing waves over the back of the wall. Some walls which were curved had a nasty way of drenching people with water when they walked along the parade, which was very objectionable, besides being a danger to the wall. As to the water-work, one could not help realising that when purchased by the corporation they were not in an altogether satisfactory condition, and the corporation were doing nothing more than their obvious duty in renovating the works and putting in satisfactory machinery. They seemed to have been successful in doing that, and, judging by the results of the official trial, the machinery seemed to be highly efficient and of excellent design. It would be interesting if the author would add some information with regard to the purchase from the company; if he could tell them what the maintainable revenue of the company was before the corporation purchased, and whether the amount of compensation paid included any extra payment for back dividends, or overspent capital, or anything of that kind. If they had those figures before them it would be of value. Some reference had been made to the charge for baths and water-closets, and he agreed it was most desirable that the charge should be reduced or withdrawn altogether; but one could not help seeing that the corporation had been most successful, from the financial point of view, in the conduct of these works, because to be able to carry on the waterworks for a charge of only 5 per cent on the rateable value, and to hand over to the relief of the rates a sum equivalent to 2d. in the £, showed that the works were well constructed and economically managed. Although that charge was put on the domestic economy of the house, still the total charge to the ratepayer was not a high one, and that must be so when one bore in mind that the great majority of the houses in Bridlington were houses which were let for apartments and boarding-houses, and therefore the water was used by the floating population as well as the resident population.

Dr. H. T. Calvert (West Riding Rivers Board) observed that the water supply of Bridlington appeared to be derived from a well in the chalk and to be rather hard, and he would like to know whether the corporation had taken into consideration the question of softening the water. He had figured out what it would mean in the matter of the saving of soap. The removal of every degree of hardness corresponded, roughly, to a saving of soap of about 1 lb. per 1,000 gallons. The present figure was about 15 deg., which could be reduced to 2 deg. by treatment with lime. That would mean a considerable saving in soap. He would like to know whether any difficulties had been experienced as a result of growths or corrosion in the pipes. That was a matter which was receiving more attention now than it did a few years ago. Everything previously had been lumped under the heading of corrosion, but much of the trouble met with had been shown to be due to growths. The question, he noticed, had recently had the attention of the Institution of Water Engineers. It was undoubtedly a very important question, and he would be glad if Councillor Charlesworth would state whether any difficulties had arisen, or were likely to arise, in Bridlington.

Mr. J. P. Wakeford (Wakefield) said he desired to thank the members for electing him as hon. district secretary for the coming year, and to assure them that it would be his endeavour to make the district a pronounced success. He wished to thank Mr. Matthews and Councillor Charlesworth for their interesting and instructive papers, and he heartily congratulated Mr. Matthews on being the engineer to an authority who were able to keep their rates at 6s. 4d. in the £. With regard to private street works, were the streets to which he referred 36 ft. wide; also, did the price for improvement named include any proportion of the cost of the sewers, and was any charge made for supervision under the Private Street Works Act? With regard to the automatic flushing tanks for the sewers, did Mr. Matthews find these satisfactory? His own experience had been that they were unreliable in their action, and he had never found a tank that would fulfil the duties claimed for it. As regarded lampholes on sewers, he was rather opposed to the use of these, and preferred manholes. Proceeding, he asked whether the application of the cold tar was satisfactory. No doubt tar treatment prolonged the life of the roads, but his experience of the work was that it was satisfactory only so long as the traffic was not excessive. He would like to know also the reason for the preference for artificial flags, considering the price of York stone was no greater. The appearance was better, of course, and he would make use of them himself provided they were not likely to be disturbed, but in a manufacturing town, where they were constantly being lifted, they were liable to sustain damage. The consumption of water in Bridlington—43 gallons per head per day—seemed excessive, having regard to the fact that there

were no manufacturers or large trades in the town. They were not told whether Deacon meters were in use, but he could not help thinking a great amount of this was made up of preventible waste. He had had an experience of the use of the Deacon meter, and he had found that they enabled a saving up to 40 per cent to be made.

Mr. John F. Smillie (Tynemouth) said that was his first visit to Bridlington, and he therefore spoke with newly formed impressions of the town. He congratulated the mayor and corporation on the daring enterprise they had shown in connection with the municipal works, and on having such an exemplary officer to assist them in carrying out their duties. Bridlington was to be congratulated both on its corporation and its staff of officials. He had been struck by the extremely low cost at which the streets were constructed—namely 4s. 6d. per lineal foot of frontage. He did not know how the work was done for the money. Of course, Bridlington had gone in for a large quantity of tarred footpaths, but having regard to the frequency with which these had to be renewed—every three years—he suggested that it would be more economical in the end to adopt a more expensive form of paving. Cement concrete footpaths laid *in situ* appealed to him more, and he had found that these laid in panels not more than 3 ft. square had a life in residential districts of twenty years. He would like to know, in connection with the matter of the application of tar to macadam roads, whether Mr. Matthews found the application of cold tar successful. He had tried both hot and cold tar, but the latter had not given satisfaction. On the other hand, hot tar, well rolled in, had preserved the life of the road considerably. But he had not found tar in itself generally successful, and, as a rule, he had used a small quantity of pitch with it. Tar, as it came from the gasworks, became very soft, and was likely to cause damage to light wearing apparel, but that could be avoided by the addition of a little pitch, say in the proportion of 20 lb. to each 40-gallon barrel of tar, although the quantity would largely depend on the nature of the tar and the experience of the men engaged in carrying out the work. He congratulated Bridlington on its sea defence works, and it was pleasing to know that these had stood for forty years without any appreciable repair having been necessary. Mr. Matthews had referred to the contours of the walls and the material used. He (the speaker) had had experience of similar works in which cement concrete blocks had been employed, the manufacture of these blocks providing work for the unemployed. The blocks were cast hollow, and were braced together with wire rods, the whole being afterwards rendered monolithic by the cavities being filled with cement. That work had stood successfully through two winters. The whole of the parapet wall, including not merely the standards, but the rails as well, were constructed of ferro-concrete, though few people who saw them realised the nature of the material. In spite of the action of the large amount of shingle which came in contact with the base of the wall, the cement-concrete blocks had not deteriorated, and he thought it was a work that would require no further attention at his hands. He was [illegible] worth for the paper which he had submitted to the meeting, and was glad to see a member of a public body display such interest in their proceedings. Bridlington was to be congratulated on the success of its water undertaking, and particularly on the low charge which was made for water, in spite of the extravagant figure which was paid to the company from which the works were purchased and the fact that they contributed something to the relief of the rates. The [illegible] extended the works as the corporation had done. The consumption of water in Bridlington had struck him as being somewhat remarkable, and the corporation would, if the population continued to increase, have one day to consider how the figure could be decreased. A decrease of at least 30 or 40 per cent could be effected by a proper system of surveillance, and the people would still be very well supplied.

Mr. W. H. Smith (Scarborough) said that, as one who had had some little experience of various types of sea walls, he quite endorsed what Mr. Matthews had said on the question of the stepped face. His experience at Scarborough had been that there was nothing like the amount of scour on such a wall as there was on a curved face. The matter of the stone that was used was one for each place to settle for itself. He had some concrete block walls in Scarborough which had been up [illegible] years. Mr. Matthews had used cold tar for the tar-painting of roads. His predecessor started the practice, and he had seen no reason for making any change, the results having been most excellent. But the tar must be applied in a suitable way. The surface of the road must be absolutely dry, and warm weather was required for the work. When it came to tar-painting an ordinary macadam road, however, he quite agreed that boiled tar gave a better result. In making a macadam road he used a mixture of stone, dust, tar and fine ashes, grouting the surface of the roadway after it had been dry rolled with that mixture, and following on the next year with hot tar painting. The result obtained from that method was excellent. Mr. Smith added that he would like to know the amount paid to the electricity department by the street lighting department for current supplied to them, as it would be interesting to see whether the former were in any way subsidised by the latter department.

Mr. J. A. Iveson (Scarborough Rural) said he could support the observations of the last speaker as to road making.

Mr. W. E. H. Burton (Wakefield) inquired whether Mr. Matthews had made any provision for expansion of the roof covering on the lavatories he had described.

The President, in closing the discussion, said if he might offer one suggestion he would like to express the hope that the corporation of Bridlington would at an early date take into consideration the provision of a refuse destructor, a most important item, not only in a town of that character, but in every town in the country. It might not be common knowledge how deeply Mr. Matthews had interested himself in the problem of sea defence. He had given the closest attention to the question of the damage to the coast in that part, and the paper which he had read before the Institution of Civil Engineers was one of considerable importance and worth. He was quite in agreement with him in the opinion he had expressed in that paper that it was quite time the Government took in hand some portion of the work, for it seemed a great hardship that towns like Bridlington should have the whole expense to bear. Concluding his remarks, the president said he did not think they ought to forget, in speaking of the satisfactory position of Bridlington in the matter of sanitation and so forth, the valuable work of the medical officer and sanitary officers. They did much to keep down the death-rate and generally in administering to the welfare of the town.

The vote of thanks was carried.

Mr. Matthews said he was delighted there had been such a good discussion. The points raised were of great interest. He would like to thank the members of the North-Eastern district for the great honour they had done him in electing him as one of their two representatives to serve on the council of the institution, his colleague being Mr. E. B. Martin, borough engineer of Rotherham. He greatly appreciated the honour and would do all he could in the interests of the district. Mr. Massie had referred to the small number of empty houses in Bridlington. That state of affairs was very gratifying. At the present time there were about forty houses in course of erection, and plans for twenty were passed in the previous month. They had three screening chambers in the town; the sludge fell into a sump and never got into the sea, the material being disposed of to farmers, who were willing to take as much as could be supplied for their land. He admitted that the lack of accommodation at the town hall greatly hampered the officials of the corporation. He himself had no private office at all, but it was his hope the next time they visited Bridlington to be able to show them new municipal offices. The stepped face type of sea wall was, he was sure, the best, and he had come to that conclusion after inspecting most of the sea walls in this country and many on the Continent. With regard to the tarring of the roads, they put the tar on cold, but, as had been pointed out, it was advisable to choose suitable weather for the carrying out of the work. When they put the tar on an ordinary macadam road they heated the tar—but not always then. They were fortunate in getting the periods mentioned for the repayment of the loan for the ferro-concrete work, having regard to the apparent disfavour with which the Local Government Board looked upon the material. It was the first instance on record of the board having granted so long a period for repayment of a loan for such work, and he wished every engineer to know of it. They had not yet received a reply from the county council with regard to the tar-spraying machine. They had

several miles of roads outside the town for which they received nothing from the county council, and were hopeful that the reply, when eventually it was received, would be a favourable one. They obtained their tar from the local gasworks at the price of 9s. per 40 gallons cask. With regard to the housing scheme, the estimate included land, drainage, formation of footpaths, and so forth, and the council had unanimously approved of the project. Mr. Silcock had referred to the favourable condition of the town as regarded sewerage; the whole of the town fell towards the sea, and he had had no difficulty in that connection. Since the erection of the groynes on the north foreshore some years ago they had accumulated 2,000,000 or 3,000,000 more tons of sand than before. It would have been fatal to have built the sea walls without groynes. Nothing was allowed for sewer works in the price of 4s. 6d. mentioned in connection with private streets. The automatic flushing tanks worked satisfactorily, seldom getting out of order. They did not often put lampholes on their sewers. With reference to the artificial flags, they found them as good now in streets of heavy traffic as when they were first put down. They could be cut more easily to go round corners, and he very much preferred them to Yorkshire flags—which cost the same to lay. They had not done much in the way of concrete *in situ* footpaths, so he could offer no comparison. They did not add pitch to their tar. In regard to the roof coverings mentioned, they had found that where the roofs constructed of ferro-concrete were covered with Limmer asphalt they were absolutely watertight, but it was not so where ordinary steel joists and concrete were employed. He hoped to be able to show them a refuse destructor on the occasion of their next visit.

Mr. Charlesworth, in acknowledging the vote of thanks, said he hoped that the precedent he had set in reading a paper before the Institution would be followed in other towns they visited. The water charges for baths and water-closets were undoubtedly high, but it was the intention of the corporation to reduce them. As to back dividends, the company were paying up to 15 per cent; there was no question they were riding for a fall, and were taking out all they could. The question of a water softening plant had been discussed, but Yorkshire people strongly objected to the water being "doctored," and that was one reason why they had not installed one. But the water could be softened by boiling, which would render it practically the same as Leeds water. Several speakers had referred to the question of the consumption. He had been a strong advocate for a reduction of that, and he had been glad to hear what had been said. Without doubt they would have to reduce it, for it was far in excess of what it should be. Current was being supplied by the Electricity Department for lighting at cost price, and there was no subsidising such as had been suggested.

Since the meeting Mr. Matthews has prepared the following reply to Mr. Brodie's communication:—

In reply to the points raised in Mr. Brodie's letter, I would state that we are steadily increasing the percentage of water-closets at Bridlington. Water-closets have to be put in to all new houses, and we hope that the time is not far distant when we shall be able to say that we have no sanitary conveniences other than water-closets in the town. As to the screening arrangements for the sewage, this has already been dealt with in the reply given to one of the members of the institution who raised the point at the meeting. The hardness of the water is dealt with in Mr. Councillor Charlesworth's reply. As to the intensity of traffic on our tar-macadam roads, roads such as Cross-street, Bridge-street, and the Promenade are subject to a great deal of traffic, but none of it is what one might call heavy traffic, as would be found in an inland manufacturing town, for example; probably the heaviest loads that would pass over these roads would be loaded furniture vans and station rullies heavily loaded. As to the cost of private streets, this has already been dealt with in my reply to Mr. Wakeford's comments on the paper. As to the durability of Bramley Fall rock-faced stone, while granite or basalt, as I have said in my paper, are preferable for the facing of a sea wall, they are both considerably more expensive than Bramley Fall stone. The old Prince's Parade sea-wall at Bridlington, constructed nearly forty years ago, has needed no repairs, and has the appearance of lasting a century. I still adhere to my opinion that a stepped-face wall is the best type to construct, for the reasons already set out in my paper. As to Mr. Brodie's remarks respecting groynes, I scarcely agree with him that these upon a foreshore are a nuisance; the seventeen that we have put down upon our north foreshore, so far from being a nuisance, are a great convenience to the visitors, who use the low timber groynes as seats, and on some of these groynes in the height of the season it is difficult to find a vacant seat, a photograph which I showed to the members in the council chamber well illustrating this. As to tree planting in streets, Mr. Crofts, our town's gardener, informs me that he does find difficulty, especially on the sea front, in inducing the trees to take root. I thank Mr. Brodie for his useful criticism of my paper.

WEST MIDLAND DISTRICT MEETING AT STOURBRIDGE.

The last meeting of the Institution of Municipal and County Engineers held during Mr. Greatorex's term as president took place on Saturday last at Stourbridge. For a Midland gathering the attendance was considerably below the average, but the proceedings were none the less successful, an excellent—if somewhat brief—discussion following the presentation of the three papers which had been prepared for consideration, and the remainder of the day being devoted to an interesting round of visits. The meeting took place in the council chamber of the town hall, Mr. A. D. Greatorex, the president, in the chair, and others present including Messrs. J. S. Pickering (Chelmsford), Chas. E. Fox (Bromsgrove Rural), W. Ballard (Birmingham), C. E. Lawton (Birmingham), A. J. Dickinson (Redditch), S. Douglas (Kenilworth), H. Richardson (hon. district secretary, Handsworth), J. D. Barr (Bromyard), H. J. Coleby (Atherstone), W. Fiddian (Stourbridge), W. O. Thorp (Malvern), F. G. Beaumont (Wolverhampton), F. W. Richardson (Westminster), J. A. Spreckley (Ludlow), C. F. Gettings (Worcester), H. S. Harvey (Evesham), J. L. Harpur (Brierley Hill), members; T. Wooldridge (London), J. Hobley (Stourbridge), W. R. Kelleck (Stourbridge), W. V. Wallens (Kidderminster), W. S. Wilson (Kenilworth), J. Hammond (Stourbridge), W. B. Cleverley (Stourbridge), C. H. Webb (Stourbridge), A. Reed (Stourbridge), J. W. Robinson (Atherstone), B. F. Mason (Stourbridge), H. E. Folkes (Stourbridge), W. J. E. Baker (Malvern), J. V. Moon (Wolverhampton), E. W. Bloomfield (Oakham), W. H. Wright (Stourbridge), A. G. Taylor (West Bromwich), visitors.

The Chairman of the District Council extended a cordial welcome to the members, and said he hoped their visit would be a very interesting one, and that they would go from Stourbridge with very pleasant recollections.

The President (Mr. A. D. Greatorex), on behalf of the institution, thanked the chairman for his kind welcome to the members of the institution. That was the last district meeting during his year of office, but though the last, it was nevertheless one that gave him a great deal of pleasure to attend, particularly as his friend Mr. Woodward, their surveyor, was one of his assistants many years ago, and he knew the good work he had done and the efforts he had made to assist the council in bringing everything up to date. He felt that they would see works that had been well carried out. He trusted they would obtain their incorporation and become a borough, and be a progressive borough. He would not like to sit down without referring to the excellent work which had been done in the past by one of their members (Mr. Jones). He knew Mr. Jones very well, and the work he had done for Stourbridge, which had been of very great benefit to the town.

Mr. H. Richardson (Handsworth) read the minutes of the Nuneaton meeting, which were confirmed.

Mr. Richardson then announced letters of apology from Mr. A. T. Davis (Shropshire), who has been indisposed for a considerable time, Mr. G. J. Shepherd (Kidderminster), Mr. V. Barton (Stoke-on-Trent), and Mr. A. T. Stilgoe (Birmingham).

The meeting afterward proceeded to the discussion of papers, the first on the list being

SOME MUNICIPAL WORKS AT STOURBRIDGE.

By F. Woodward,

Surveyor and Architect to the Urban District Council.

Stourbridge obviously derives its present name from the bridge over the river Stour. The earliest mention of the town is in a deed of 1275, where it is described as "Sturbrigge." Stourbridge town is the head of a

union, a petty sessional division and County Court district, in the ancient parish of Oldswinford, in the Mid or Droitwich Division of Worcester. It is situated on the green borderland of the Black Country; on the north and east are the mining and manufacturing industries of South Staffordshire and East Worcestershire; on the south and west, attractive residential districts. It is separated from Staffordshire by the river Stour, which forms its northern boundary. In 1894 Wollaston was joined to Stourbridge, and the following year Upper Swinford also. The district has both a residential and industrial character. The chief manufactures in the district are (Messrs. J. Bradley & Co.) branded bar iron, where the first locomotive used in America, the "Stourbridge Lion," was made,

From photo by [*C. G. Mason, Stourbridge.*

MR. F. WOODWARD.

[Mr Woodward is a native of West Bromwich, and was articled to the late Alderman T. Rollason, then a surveyor of that town. In 1890 he became an assistant under Messrs. Pincher & Long, architects and surveyors of that town, and in 1893 was appointed assistant borough surveyor of West Bromwich under the late Mr J. T. Eayrs and the present borough surveyor, Mr. A. D. Greatorex. In 1899 he was appointed to his present position as town surveyor and architect to the Urban District Council of Stourbridge. Mr. Woodward was elected a member of the Institution of Municipal and County Engineers in 1899.]

fireclay goods, including glazed bricks and baths, flint and other glass, leather and fellmongery goods, buckets and other galvanised sheet-iron articles, chains, anvils, vices, &c.

King Edward VI. Grammar School in the town was founded by Royal Charter in 1552 at the request of the inhabitants of the town of Stourbridge. Since that date it has been entirely rebuilt. Considerable extensions have been made during the last few years, which has provided accommodation for over 300 boys. It is richly endowed, and one of the first in the county. The town and residential portion is on the new red sandstone formation, the other portion having a brick-clay surface overlying the coal and fire-clay measures.

GENERAL STATISTICS.

The estimated population of the urban district is 17,341; area, 1,920 acres.

Population per acre, Stourbridge ...	...	23·78
" " " Wollaston ...	...	6·05
" " " Upper Swinford	...	3·49
Entire district	...	9·03
Rateable value	...	£67,017
Approximate number of houses ..	...	4,250
Death rate, 1911	...	13·09
Birth rate, 1911	...	25·99

Rates.—District rates, Stourbridge, 3s. 10d.; Wollaston and Upper Swinford, 3s. 6d. Poor rate for Stourbridge, 5s.; Wollaston and Upper Swinford, 4s. 6d. Totals, Stourbridge, 8s. 10d.; Wollaston and Upper Swinford, 8s. A 1d. rate brings in £230.

ROADS.

There are 6 miles of main roads maintained by the council. The total annual cost is about £1,250 for ordinary maintenance and scavenging. The county council make an annual payment towards the cost. The town roads are 16 miles in length, and cost about £1,200 a year in maintenance. The main roads are repaired chiefly with Rowley and Clee Hill granite and the district mainly with broken slag.

Construction and Tar-spraying.—The council have experimented with Rocmac, Tarmac and tar-grouting with success. The council have decided to extend the use of Tarmac in future where the gradients will allow. For some years before tar-painting was done the chief main roads had become unbearable owing to the dust nuisance; liberal street watering did not abate the nuisance. For several years the chief roads have been tar-painted. Last year 45,000 yds. were done by machine, 8,100 yds. with bituminous compound, 12,800 yds. with refined, and 24,100 yds. with crude tar. The cost per yard was—bituminous, 2·037d.; refined, 0·872d.; crude, 0·568d. The covering capacity was—bituminous, 4¾ yds. to the gallon; refined, 7 yds.; and crude, 8 yds. The cost of labour by hand the first year was 0·347d. a yard; by machine, 0·212d. The painting has considerably increased the life of the roads. Potholes have diminished which were caused largely by the constant watering.

STREET IMPROVEMENTS.

Stourbridge, being an old town, has many narrow roads, and thousands of pounds could be spent in purchasing properties for desirable widenings; but, being a comparatively small one, it has to move slowly in this direction. Notwithstanding, the council have during the last three or four years borrowed sums amounting to £5,000 for purchasing properties for street widenings, the chief of which is the Market-street improvement, opposite the town hall, just completed, and the Hemplands and Round-court improvement (in hand), where twenty-six slum cottages have been demolished for the making of a new street. Every opportunity is taken to widen roads, and £3,000 has been spent on this work in various parts of the district out of revenue during the last ten years, and carried out by direct labour. Nearly all the land was given upon condition the council made the road and refenced. During the same period a sum of £6,000 has been borrowed on loan for paving works.

TRAMWAYS.

In 1898 the British Electric Traction Company obtained orders to construct tramways in the urban district under the Dudley and District Light Railways Order and (Extension) Order, and the Kinver Light Railways Order.

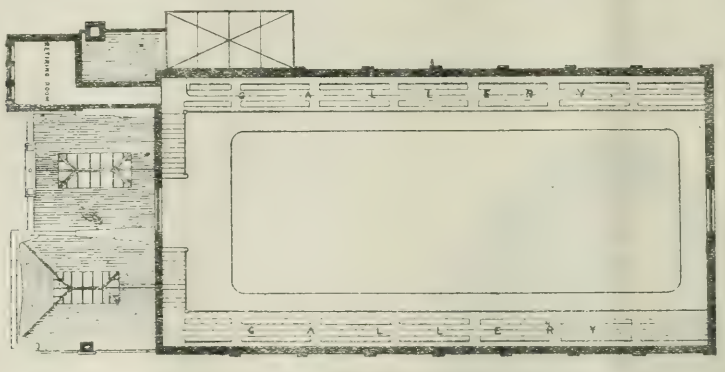
Many clauses were obtained for necessary street widenings, which were paid partly by the company and partly by the county and urban councils. The work of widening was carried out by the urban council and recharged to the parties concerned.

There are two miles of double track and one mile of single track in the urban district; 87-lb. grooved rails were used, laid upon a bed of 6-in. cement concrete. Between the rails, and for 18 in. on either side, it is paved with 5-in. by 3-in. and 5-in. by 4-in. granite setts, the whole being maintained by the tram company.

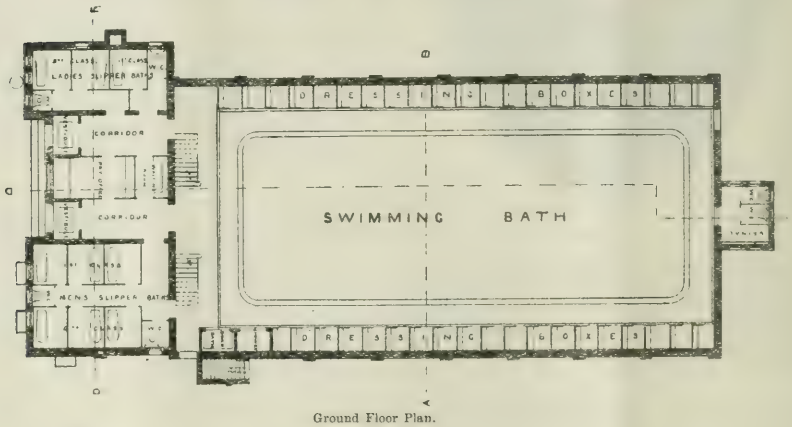
The High-street portion was too narrow for a single track up the centre, and a double line was laid as near to the kerb as possible. It is laid on 6-in. cement concrete, and paved the full width of carriageway with Jarrah wood blocks, and maintained by the council and recharged to the company under an agreement. It is now only used for running the cars through to the Lye. At first the company started running through from Dudley; but, owing to obstructions by vehicles unloading, &c., and only one tramcar being allowed in the street at one time, the company found it impossible to continue the service owing to delays, and the terminus is now by the town clock, for which the High-street traders are very grateful.

Kinver Light Railway.—This railway is about 4½ miles in length, about 1 mile being laid as ordinary tramway on the main road in the urban district, and the remainder in the Seisdon rural district, Staffordshire, being laid at the side of the main road and on a private right of way through the fields. The construction of the latter part consists of 4½-in. girder rails dogged to transverse sleepers. Power is supplied from a generating station situated at Hart's Hill, about 3½ miles from Stourbridge. This station is equipped with three 100 k.w. d.c. generating sets through a battery sub-station at Amblecote, and is conducted to the cars by means of the usual overhead trolley. The Amblecote battery consists of 256 Tudor cells, and is for the purpose of keeping a steady load on the generators at Hart's Hill and also to improve the average voltage on the trolley wires—that is, at times when the load is heavy, the battery discharges and helps the generators, and when few cars are run-

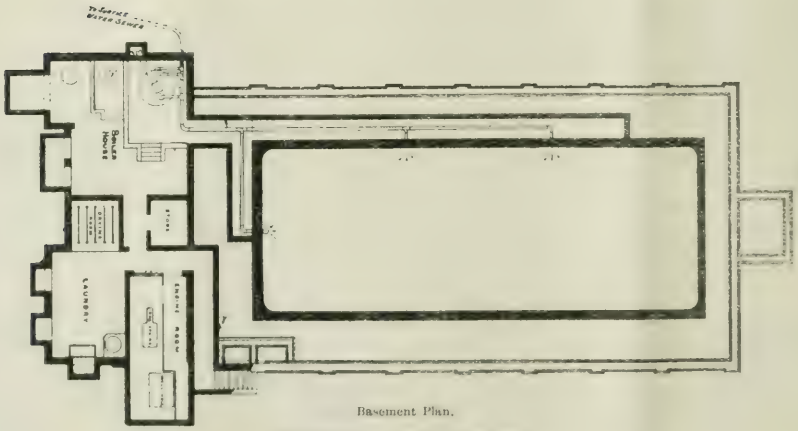
ning the generators then charge the battery. At times of heavy traffic a Diesel generating set, situated on the Lye route, is also put into service. This set is of 100 kw. capacity, and for Bank Holiday loads power can also be taken from the Midland Electric Corporation power station, Ocker Hill, through a 150 kw. generator situated in Amblecote sub-station. Sixteen capable of destroying 30 tons in twenty-four hours. The average daily quantity consumed is 22 tons. The furnaces are of the usual Horsfall type, erected at that time with back feed. The furnace gases pass through a Lancashire boiler on their way to the chimney shaft, and also through a Horsfall centrifugal dust catcher. The stack is 120 ft. high, and the whole



Gallery Plan.



Ground Floor Plan.



Basement Plan.

Stourbridge Public Baths.

(Plate 1.)

thousand people have been carried on this light railway on a Bank Holiday. The author is indebted to Mr. John Ward, traffic manager to the company for the above.

REFUSE DESTRUCTOR.

The destructor plant was erected in 1904. It consists of three furnaces each with 20 ft. grate area, plant is housed in substantial brick buildings. The site is 3 acres in extent, and is used for depositing the clinker and ash. The total cost was £5,325, including engineer's house, but of this sum £1,000 was spent for electric light purposes.

After the abandonment of the electric light scheme it was decided to carry a steam main a distance of

120 yds., for supplying the engines at the sewage pumping station with the surplus steam. The steam generated mainly goes to supply the steam jets for the forced draught, the surplus being responsible for pumping one-third of the sewage. This quantity does not come up to expectations owing to the supply being very intermittent. The total tonnage destroyed per annum is 5,500. The cost last year per ton for destroying, including all labour, upkeep, and rates and taxes, was 18·940d.

PUBLIC BATHS.

The public baths were erected in 1901, from the author's designs, at a total cost of £5,133, including water supply and engineer's house. Twenty-seven years' sanction was obtained for the erection and five years for the water supply. The cost, excluding site and water supply, but including boilers and heating arrangement, was 5½d. per foot cube. The boiler-house, laundry, pump-room and stores are situated in the basement. The swimming hall is 93 ft. by 46 ft., and the pond 75 ft. by 28 ft. Dressing-boxes are provided on two sides, and 5-ft. gangways, except at the deep end of bath, which is 12 ft. Galleries are provided over the dressing-boxes, and are approached by two staircases each side of main entrance. In connection with the swimming bath is a lavatory, soap bath, and shower, and a committee room leading from the gallery. The swimming-bath walls were constructed in brickwork in cement, having a ¾-in. rendering of cement in two layers before the glazed lining was put in. The bottom was constructed with 9-in. cement concrete and rendered as walls before laying glazed-brick bottom. The pond has been absolutely watertight from the first. There are two entrances for men and women. Between each corridor entrance are situated the pay office and waiting-room, and at the side of each entrance are six slipper baths for men and three for women. The interior walls of swimming hall and slipper baths are faced with Ruabon best facing bricks relieved with buff cornice. The roofs are matchboarded, and top lights provided with opening casements. The front elevation is faced with best local facings and relieved with buff terra-cotta dressings. The heating was carried out by Messrs. Jones & Attwood, of Stourbridge, on the low-pressure, hot-water circulating system.

The cost of this portion of the work was £350, which included connections and fittings to slipper baths, boilers and drying coils. This sum is included in the total amount given above. The system is simple and much cheaper than steam in first cost and maintenance. In our case the superintendent attends to the whole, except in the swimming season, when a youth is engaged.

The author is of opinion that for small baths this system is very satisfactory, and much more economical than steam, and occupies very little space. A powerful boiler is fixed below the level of the bath, and circulates through galvanised pipes from the boiler to the bath. The flow pipes are connected at the shallow end and near the bottom of the bath, returning from the deep end and from the bottom of the bath. A separate boiler is provided for the slipper baths and heating pipes, so that the upkeep is very small when the swimming bath is closed. The annual water consumption is approximately 3,500,000 gallons for the whole of the establishment. The fuel consumption is 110 tons, or about 31,818 gallons of water per ton of fuel used. The required temperature of 70 deg. is easily maintained. The water for filling the pond is pumped and heated through the boiler, and no complaints are received owing to bad circulation.

The borehole is 10 in. diameter, and carried through the new red sandstone to a depth of 250 ft. The borehole is lined to a depth of 60 ft. The pump is one of C. Islers & Co.'s improved deep-well pumps, capable of yielding 6,500 gallons per hour. Ample supply has always been obtained, and as the five years' loan charges are paid off, the cost of water is now under 1d. per 1,000 gallons. The average annual upkeep of the baths, including wages, rates and taxes, and repairs, &c., during the last seven years was £330; annual charges for repayment of loans, £260; average receipts, £250; average cost per annum to the ratepayers equals a 1½d. rate.

FREE LIBRARY, TECHNICAL AND GIRLS' SECONDARY SCHOOLS.

These buildings were erected in 1904 from the author's designs, and extended three years ago, at a total cost of £14,000. Mr. Carnegie contributed £3,700 towards the cost of the free library portion. The cubical contents are 465,628, which works out at 6½d. per cube foot.

The following is a brief description of the building:—

Basement.—Carpenter's shop, 39 ft. by 22 ft.; blacksmith's shop, 40 ft. by 21 ft.; recreation-room, 40 ft. by 21 ft.; and dining-room for girls, 40 ft. by 38 ft., with heating apparatus and stores.

Ground Floor.—Free library, consisting of main entrance and corridor, 47 ft. by 8 ft.; newsroom, 40 ft. by 38 ft.; ladies' room, 17 ft. by 13 ft.; magazine-room, 40 ft. by 21 ft.; lending library, 41 ft. by 25 ft. (open access system), librarian's room and stores. Approached from a separate entrance are two caretakers' rooms; modelling-room, 26 ft. by 21 ft.; cast-room, 21 ft. by 12 ft.; cookery-room, 26 ft. by 21 ft.; and store.

First Floor.—School of Art—namely: Elementary room, 43 ft. by 21 ft.; advanced room, 44 ft. by 21 ft. (which can be converted into one room, 87 ft. by 21 ft., by folding partition); life room, 23 ft. by 21 ft.; painting and antique room, 26 ft. by 21 ft.; mechanical drawing room, 38 ft. by 21 ft.; with secretary's room, lavatories and cloak-rooms.

Second Floor.—Girls' secondary school—namely: Five classrooms, each 23 ft. by 21 ft.; chemistry room, 26 ft. by 26 ft., with balance room: lecture theatre, 38 ft. by 21 ft., with lavatories, cloak-rooms, and teachers' rooms.

Two staircases are provided at each end of the building on each floor. The corridors and staircases are constructed in concrete, and the floors of all rooms are made sound-proof. All walls are plastered throughout except in the basement. There are 4,660 cub. ft. of terra-cotta as enriched work to the elevations, which was supplied by the Ketley Brick Company, of Brierley Hill.

TAR-MACADAM PLANT.

A plant for heating and mixing tar-macadam has just been erected at the council's depot at a total cost of £350. The heating arrangement consists of a 2-ft. revolving cylinder 10 ft. long inside a 3-ft. steel shell. The whole is built up on brickwork with an ordinary furnace. The heat passes round the cylinder and shell, and returns through the bottom of shell and round to chimney. This work, together with the mixer, was supplied by Messrs. Thompson & Southwick, of Tamworth. The power is obtained from a 5½ b.h.p. gas engine. The whole is covered with a galvanised iron shed, 51 ft. by 20 ft. It is estimated that with this plant 40 to 50 tons a day can be heated and mixed by three men.

PLEASURE GARDENS.

In 1903 the council purchased, at a cost of £2 000, 4 acres of land out of gas profits, for the purpose of cutting a new street and providing pleasure gardens. The author prepared designs for the laying out of about 3 acres, which was done by contract at a cost of about £800, provided by public subscriptions. The council have now under consideration the purchase of some 20 acres of land for a park, as the present grounds are not large enough.

PUBLIC MORTUARY.

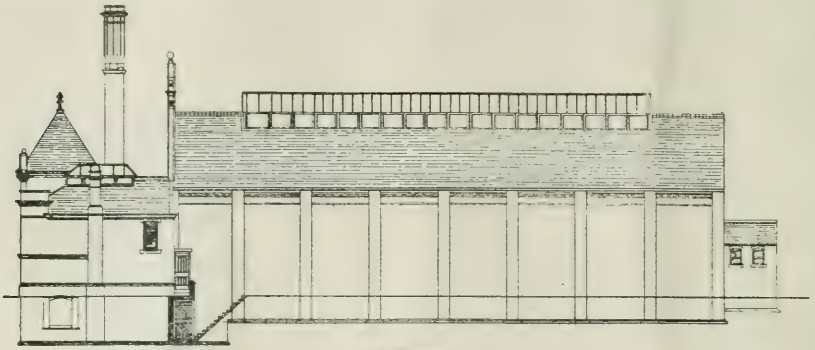
A public mortuary was erected in 1909 out of revenue from the author's design, on land adjoining the baths, at a cost of £225. It consists of a room 18 ft. by 18 ft., fitted up for post-mortem, and open entrance hall (where jury can view the body instead of in mortuary), and enclosed yard.

SEWAGE DISPOSAL WORKS.

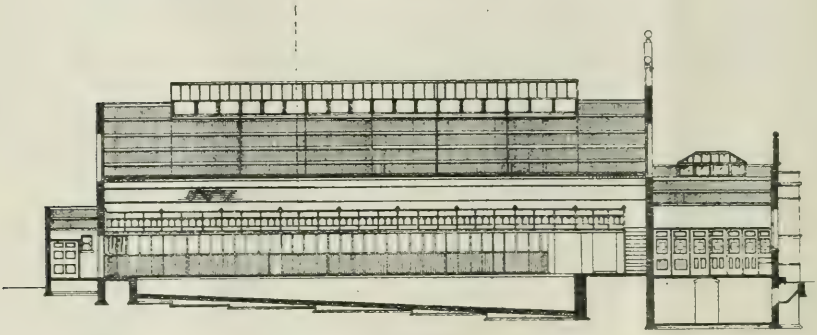
In 1891 a meeting of the association was held at Stourbridge, when Mr. Fiddian gave a paper on the sewage disposal works, so that it is only necessary to give a brief description. The disposal of the sewage is dealt with by the Stourbridge Main Drainage Board. The works comprise main sewers converging at a pumping station, from which the sewage is conveyed through a rising main to a farm about 2 miles distant, and there dealt with by broad irrigation. The lift is about 150 ft. The area of the farm is 296 acres, of which 275 acres is let to a tenant at a rental of about £250 per annum. The subsoil consists of from 5 ft. to 8 ft. of loam sand with a few pebbles overlaying the rock of the new red sandstone formation. The total quantity of sewage pumped last year was 344,000,000 gallons. The area of board's district is 2 574 acres, with a population of 20 500. Outside population served, 6,000, in addition. The quantity of fellmongers' waste fluids in the sewage is estimated at one-eighth of total. The capital outlay was £37 000, the bulk of which is nearly discharged. The annual expenditure is £2,700. The whole of the system was carried out about twenty-seven years ago, on re-

port of and to plans prepared by the author's predecessor, Mr. William Fiddian, who still holds the posi-

flushed weekly by twenty-five automatic flushing chambers and by car'. They were laid by Mr. Fiddian



Side Elevation.



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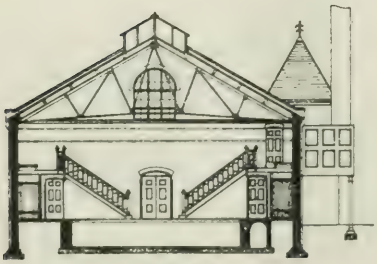
Section D F.

Elevation.



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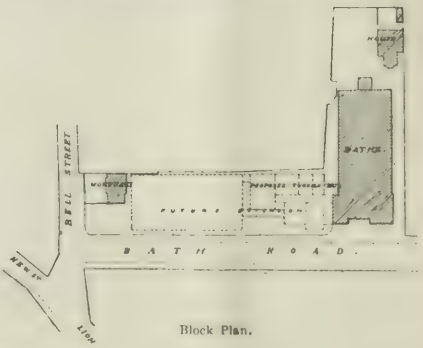

Block Plan.

Stourbridge Public Baths.

(Plate 2.)

tion of engineer to the board. There are twenty miles of collecting sewers in the urban district, which are

in 1885, at a cost of £11,000. These loans, together with the council's portion of the Drainage Board

loans, will be paid off in three years, equal to about a 7d. rate. The surface water is dealt with separately as far as possible, the old sewers being utilised for this purpose. The system of ventilation is by surface grids, but these have been replaced with solid ones where complaints have arisen from time to time, and shafts erected. Three Webb's ventilating lamps have been erected, which are partly lit all day, for which an additional £1 a year is paid for each lamp.

PRIVY CONVERSION.

During the last few years about 1,100 privies have been converted into water-closets, and there are now not more than half a dozen privies in the urban district. Credit is due to our sanitary inspector for obtaining this result. Under sec. 39, sub-sec. 4, of the Public Health Act Amendment Act, 1907, local authorities have to contribute one-half the cost for these conversions, but, in the author's opinion, sufficient powers exist without resorting to this Act, and I cannot think that many local authorities will put into force this section spending ratepayers' money improving private property.

CLEANSING OF ASHPITS, ETC.

Some eighteen months ago this work was transferred from the sanitary to the author's department for economical reasons. A considerable saving in horse hire has been made on the two departments due to one helping the other; 5,360 loads were removed in 1911, at a cost of £580, including establishment charges. About one-half the houses are provided with ashbins, which are emptied weekly.

UNDERGROUND CONVENIENCE.

A small convenience has been erected near the free library, at a cost of £250 out of loan. It consists of a four-stall urinal and three penny-in-the-slot water-closets. Without an attendant the water-closet locks get abused, and considerable damage is done at times.

STREET LIGHTING.

The 22 miles of roads are well lighted with 545 lamps, at a cost of £1,500 a year, which sum includes all maintenance. All are fitted with incandescent burners and lighted all the year round. The lamps are as follows:—

475	one light	100	candle-power
1	four ,,	400	,, ,,
2	three ,,	900	,, ,,
1	three ,,	300	,, ,,
66	two ,,	200	,, ,,

The gasworks (which include large urban and rural areas outside the council area) belong to Stourbridge Council. The works are situated outside the urban area in the adjoining county of Stafford, and are a very valuable asset to the town. Two-thirds of the profits are devoted to the relief of the rates, equal to an 8d. rate.

TOWN HALL OFFICES.

The town hall was erected on part of the Market Hall site in 1887, at a cost of £4,000, by public subscription, as a Jubilee memorial to the late Queen. It will hold about 1,200 persons. The architect was Mr. T. Robinson, of Stourbridge. The Town Commissioners erected in conjunction with the hall, public offices, fire station and council chamber, at a cost of £2,400.

MARKETS.

History states that the original town hall or market house was taken down in 1773, for the necessary purpose of widening the carriageway in the centre of the town. A new market hall was erected and opened in 1827, at a cost of £20,000, including old houses and the building of two shops. Unfortunately no provision appeared to have been made in the Act relating to the old market hall for the repayment of the loan obtained for its erection, and this omission was only rectified by an Act in 1891. The existing market hall has just been entirely renovated, at a cost of £850, under the author's supervision.

FIRE BRIGADE.

The council provide accommodation for fire brigade in the town hall buildings. The brigade is a voluntary one, but supported by the urban council, who pay duty-man's wages and house rent, and for occasional hose, &c.; otherwise the brigade is supported by voluntary contribution.

INCORPORATION.

In 1883 a strong effort was made to obtain a Charter of Incorporation for the town, to include some of the adjacent districts, but the scheme collapsed owing to strong outside opposition. It has again been before the public during the last eighteen months, and has progressed so far that a petition has been forwarded to the Privy Council. The petitioners are seeking to obtain a Charter of Incorporation for its present area before considering any proposal for including some of the adjacent districts.

INFECTIOUS DISEASES HOSPITAL.

The Stourbridge and Halesowen Hospital Committee comprises the areas of Stourbridge, Lye, and Wollescote and Halesowen, with a population of about 50,000. The hospital is situated about 4 miles from Stourbridge. It was built in 1899, at a cost of £10,000, and has accommodation for forty-eight beds. The architects were Mr. A. T. Butler and Mr. H. T. Hare. A small-pox hospital has just been erected near, with accommodation for eight beds.

CEMETERY.

About 11 acres of land was purchased in 1876 for the purpose of a public cemetery. The total cost of the work was £8,500.

WATERWORKS.

The town is supplied with water by the Stourbridge and District Water Board. The works have during the last three years been purchased from the company by four local authorities within its area. They are explained in Mr. Fiddian's paper, the consulting engineer to the board. The engineer and manager to the Water Board is Mr. W. B. Cleverly.

HOUSING AND TOWN PLANNING ACT, 1909.

The council have adopted this Act, and the committee have the matter under consideration. As the future development of the town will be on the residential side, I am hoping that the council will shortly see its importance. The author has already planned out certain areas.

[Papers by Mr. Wm. Fiddian and Mr. C. H. Webb, dealing with the Stourbridge and District Water Board's undertaking and the Stourbridge gasworks respectively, are reproduced on another page of this issue.]

DISCUSSION OF PAPERS.

Mr. J. S. PICKERING (Cheltenham) proposed a vote of thanks to the authors of the papers. He had known Mr. Woodward for a number of years; he was a member of the Institution who was very greatly respected. Mr. Fiddian was an older member still; he had known him many years, and he was glad to have the opportunity of meeting him again to see some of his work. The papers gave one the impression of a very progressive town. Mr. Woodward's paper was full of interest, almost beyond criticism being a descriptive paper, but it set forth very clearly the work which was being carried out, apparently in so able a manner, by the urban district council. He was greatly surprised to find that the authority there was an urban district council, but he understood steps were being taken to incorporate the town. It appeared to him that probably that step should have been taken long ago. It seemed very desirable in the interests of the ratepayers that a town of this character should seek incorporation, and the fact that the Privy Council had already decided to hold an inquiry was a long step towards the attainment of that very desirable end. He only hoped that they might soon have the pleasure of congratulating them upon the important step they were now about to take. They would no doubt get some opposition. Whenever progressive steps were taken there were always members of the community who seemed to take a pleasure in keeping matters behind. He did not know what opposition there was there; if there was any he hoped it would be very slight, and they would soon attain that status the importance of the town merited. There were only one or two matters in the paper he would like to refer to, more to get information than to criticise. As to the maintenance of the roads, he congratulated Mr. Woodward upon carrying them out at such a small cost. The main roads only cost £200 a mile, and the district roads only £75 a mile. That seemed a very low cost of maintenance. It was due probably to the narrowness of the roads and the low price at which the material was obtained. He would like to ask Mr. Woodward whether that included the tar-painting, which must cost from £30 to £40 per mile. If that was so, the upkeep of the roads was exceedingly small. He noticed that on the main roads two kinds of stone were used Rowley and Clee Hill. He would like to ask why that was—whether one stone was better than the other, or whether it was because of the hills, and one was more slippery than

the other? The council were fortunate in being able to obtain broken slag for their district roads. Certainly it made a cheap road, but whether it was sufficiently substantial with the present traffic he was unable to say. Perhaps Mr. Woodward would be able to say whether these roads were economical, though made up so cheaply. He noticed they were using three kinds of tar—bituminous, refined and crude. Would Mr. Woodward tell them what he found to be the advantages of these different kinds of tar; and whether the cost of bituminous tar made it desirable to use in preference to the cheaper kind? Then he noticed the corporation possessed a modern destructor, but there seemed to be some disappointment as to the quantity of steam that was produced from the refuse, and he was rather surprised to find in reading the paper that the steam mainly went to supply the steam jets. He would like to ask whether "mainly" meant that the greater portion of the steam went for the steam jets? He could not understand it at all, because the makers said that the steam required for forced draught was only from 5 to 10 per cent of that. He did not know whether Mr. Woodward had thought of using a fan instead of the steam jet, as it seemed the most economical form of obtaining a forced draught. He noticed also the steam was carried a distance of 126 yds. Might he ask whether it was superheated, and, if not, was there not a great loss from condensation? The swimming bath water, he understood, was warmed by the circulating system. Mr. Woodward did not give them the size or description of the boiler; he merely called it a powerful boiler. Perhaps he would not mind stating what kind of boiler it was, and also whether galvanised-iron pipes were used for circulation. It would also be interesting, as he gave the cost of warming the water up to 70deg., a ton of coal being used for 30,000 gallons of water, and, assuming that the price of coal was anything from 10s. to 15s. per ton, the cost seemed rather high. He thought the council were to be congratulated in being able to let their sewage farm for a rent of £250 per annum. Although less than £1 an acre seemed low, compared with other farms it was a fair figure, as many other authorities showed a considerable loss on sewage farming. Then he would like to ask whether the Webb lamps which were only partly lit all day were satisfactory; also whether the automatic flushing tanks used on the sewage farm were satisfactory? As to the fire brigade, he noticed it was supported by private subscriptions. He scarcely thought that was a proper system, and as every ratepayer would get the advantage of the brigade, it should be supported out of the rates. Mr. Woodward referred in the latter part of his paper to the Housing and Town Planning Act, and stated that that Act had been adopted by the council. He would remind Mr. Woodward that the Act was not an adoptive one; it was applicable without being specially adopted. Referring to Mr. Fiddian's paper, his description of the method of separating the two waters obtained from the upper and lower stratas was exceedingly interesting. Reading the paper alone, it was rather difficult to follow the method adopted, but since coming into the room he had had the advantage of seeing the diagram on the wall, and the matter was now made perfectly clear. He understood that a number of canvas bags filled with cement were put in in the first instance to fill up the interstices round the plug. He took it that the operation was carried out when the water in the borehole would be somewhere near the surface. It was an unusual practice which had been resorted to there; it had been a great success, and Mr. Fiddian was to be congratulated upon it.

Mr. Sholto Douglas (Kenilworth) said he had great pleasure in seconding the vote of thanks. With a descriptive paper like that of Mr. Woodward's it was difficult to criticise, but there were one or two points on which he would like information. He would be glad to know how much the county council paid towards the maintenance of the main roads, and whether what they contributed was paid by way of a contract extending over three or five years, or whether there was an annual adjustment based on the amount actually expended. He wished to know on how many of the 6 miles of main roads there were tramway tracks. Mr. Woodward was to be congratulated on the low cost of his crude tar-painting. He himself could not do it for less than 1d. or a trifle over. Did the figure of ·568 include dressing? If so, what dressing was used, and what was the cost per ton? He was deeply interested in the question of fellmongers' waste, and an analysis of the waste discharged into the sewer would be useful; also an analysis of the sewage. The cost of street lighting—which worked out at under £2 9s. per lamp—was exceedingly low, especially if the lamps were burning all night. He should be glad to know what was paid to the Gas Committee in this connection. The cost of the cemetery seemed somewhat high, but that was probably in a large measure due to drainage works. As regarded that drainage, perhaps Mr. Woodward would state whether that was treated in any way or discharged straight into the watercourse. With reference to Mr. Webb's paper, he would particularly like to know the cost of the dehydrating plant that had been installed at the gasworks, and the cost of the treated tar as compared with the crude tar.

Mr. A. J. Dickinson (Redditch) asked, in connection with the destructor, what were the number of stokers employed, the wages paid, and the hours worked. There was the inevitable loss recorded on the town's swimming bath, but he did not think the ratepayers would feel altogether sorry about that, for swimming and slipper baths were a boon even if they were a slight burden on the rates. Their bath at Redditch—an open-air one—only managed to pay its way once in about every six years. He would like to know in which months of the year the Stourbridge baths were open, because there was an impression that if they had permanent baths they could keep them open in the winter. His belief was that that was not usually a success. The acquisition of a further 20 acres of land for the purposes of a public park was a good step, and his hope was that the council would be as fortunate as he had been in the price they paid for the ground, the amount he had paid at Redditch being from £50 to £82 per acre. He congratulated the town on possessing the gasworks; the step they had taken in that matter was one in the right direction, and one taken at the right time. His own authority had the opportunity of doing the same thing some years ago, but did not avail themselves of it, and now had an electricity scheme which cost them £1 000 a year out of the rates. A tar dehydrating plant had also been suggested at Redditch, but nothing had yet been done in the matter.

Mr. W. Osborne Thorp (Malvern) remarked upon the low cost of the main roads, and inquired whether that was the amount paid by the county council or the actual cost. If so, was it wholly repaid by the county council, or was it only a proportion, and what was the proportion? His opinion was that all urban councils would be well advised to send in a bill each year and not enter into any contract, for they had found, owing to the increased amount of motor and traction engine traffic, that their bill had been mounting up year after year. They now had in tar-spraying something more satisfactory than the watering of streets, but unfortunately the county council did not contribute anything like a proper proportion of the cost of the work. At Malvern they had been offered only £30, whereas he proposed to spend £250, so that the ratepayers would be called upon to meet a difference of over £200. The cost of tar-spraying at Stourbridge was particularly low. He could not do it under 1d., having to go outside his town for the tar, but at Stourbridge, he presumed, they obtained the material practically at cost price. He would like to know the amount of tar that was used in the tar-mixing plant. At Malvern they did their mixing by hand, and by using 9 gallons of tar to the ton found they were able to get a very satisfactory tar-macadam. At some adjoining quarries they mixed their stone and tar with a tar-mixing plant, and they used 50 per cent more tar. He would like Mr. Woodward's views on the comparative advantages of the two methods. Speaking as the chief officer of the Malvern brigade, he would like to impress on the Stourbridge Council the desirability of taking over the whole of their fire appliances, because when the service was maintained by voluntary subscriptions it was open to a certain amount of abuse, and one never knew what the expense was going to be. Moreover, they had not the same control over the firemen as they had when the brigade was in the hands of the authorities. He would also be glad to have particulars of what the plant consisted of. He noticed the sewage farm was let to a tenant—a rather unusual way of dealing with sewage. Was the tenant responsible for the condition of the effluent? because one knew in cases like that, when crops were down and the season was a wet one, a farmer would not want his crops flooded with storm water. He was glad Mr. Webb had been able to put down the plant he had described, and hoped other authorities would follow his example, because the demand for tar was becoming greater and greater every year. Mr. Webb had made rather a hit at surveyors

on the subject of barrels. He did not think he could blame them, however, for their condition, because railways were not over careful, and they were subject to a good deal of rough usage by the men on the works. He was now supplying steel barrels, and thought it would pay in future to make use of these.

Mr. H. J. COLEBY (Atherstone) asked what the county council contributed towards the maintenance of main roads. He must also congratulate Mr. Woodward on tar-painting with crude tar. He could not do any tar-painting under ·9 of a penny; that included the painting and spreading with fine granite chippings. He would like to know whether this ·568 of a penny included painting and the chippings. With reference to the public baths, it was stated that a loan was granted of twenty-seven years for erection and five years for water supply. He would like to know the reason for the short period for the water supply; did it include the borehole or only the necessary pump and machinery? With reference to Mr. Fiddian's paper, he did not quite agree with Mr. Pickering that the description was hardly full enough. He found very little difficulty, and he was able after carefully reading the paper and the description to construct a sketch which he found was very similar to the drawings exhibited. With reference to the difference in the hardness of the two waters, he would like to ask what strata the top part of the borehole was put down in. He thought the paper only stated that the borehole was put down in the bunter series. If that was the case all the way down it seemed curious that there should be a difference between the upper and lower part of the bunter, or was any part in a different formation, like the Keuper sandstone? That might explain the difference in the hardness of the water. Then he would like to know the rate of boring, and whether he found any difficulty from loose pebbles or hard marl.

Mr. C. F. GETTINGS (Worcester) said, knowing the three gentlemen who had written the papers personally, he would like to add his thanks for their papers, which were very interesting. Particularly he would like to call the attention to the plant which Mr. Webb had laid down in connection with heating the tar. He thought he was to be commended for his enterprise, and if among his colleagues they were to knock their heads together with gas engineers in their respective towns, instead of the gas engineers trying to make the huge profit which some of them had been trying to do, and being satisfied with a reasonable turnover, they would all get a cheaper article, and be much better supplied than at the present time. He personally knew the plant which Mr. Webb had put up, and he had supplied them with a considerable quantity of tar, from which they were getting excellent results. He saw no reason why other towns should not do the same thing. It seemed ridiculous that many places with gasworks should send tar 50 and 60 miles away simply to be treated and come back again, when about half the cost was taken up with carriage. He thought both the companies and the corporations concerned would benefit by it.

Mr. J. A. SPRECKLEY (Ludlow) said he was interested in the question of the main roads, and would be glad to have some further particulars with regard to the figures and the way in which the Worcestershire County Council treated the council. He was afraid that in Shropshire the county council were not over-generous.

The PRESIDENT, in putting the vote of thanks, remarked that the paper of Mr. Woodward was full of interesting detail. When they had had an opportunity of visiting the works they would be struck by the skill which the surveyor had shown in the design of the free library and school buildings. It was not often the surveyor to a public body had the opportunity of designing buildings of that nature, which must remain as a monument to his name, for most of their work disappeared underground. From his knowledge of Mr. Woodward, he could say that he (Mr. Woodward) was not only an engineer but an architect of considerable repute, and they would appreciate what he had done. Stourbridge was to be congratulated on being able to deal with their sewage in such an easy manner as was done. The paper on the gasworks was most interesting to all of them, and he agreed with Mr. Gettings that a great deal more could be done in the direction of the dehydrating of tar, his view being that the material could be cheapened and a great deal more work done if gas engineers would co-operate with those responsible for the construction of highways.

Mr. WOODWARD, in reply, thanked them very much for the way in which they had received his paper. In reply to Mr. Pickering, he thought his first point was with regard to the low cost of maintenance of their by-roads. That was caused by their using a rather cheap material, a local slag, and the bulk of the by-roads having very little traffic.

Mr. PICKERING: What does the slag cost?

Mr. WOODWARD: Three shillings and sixpence per ton.

Mr. PICKERING: On the roads?

Mr. WOODWARD: No, on the wharf; it costs about 4s. 6d. on the road. With regard to the use of Rowley and Clee Hill stone, he had used both for the last twelve months, and had not had time to judge which was the better of the two stones. The Clee Hill cost them 1s. per ton more than the Rowley; it was supposed to make less mud and wear longer. They had always used Rowley stone on their main roads up to the last year or two, practically because it was a local quarry and the traffic was not excessive. With regard to tar-painting and the advantages of using different kinds of tar, his experience had been that bituminous tar for tar-painting was not worth the extra money. It cost more to put on, and during the season was a better looking surface, but in the autumn it had all worn off or turned into mud, just the same as the ordinary crude tar, and as a dust preventive he thought the refined or crude tar was equally as good as the bituminous, and cost considerably less. With regard to the remarks on the destructor, he must say, from the steam point of view, they had been very disappointed with it. It was owing to several causes: the plant was so far away from the pumping station, and they lost pretty well in condensation. They did have a superheater, but some of the tubes leaked so badly and continuously, and they had so much trouble with it, that he took it out a year or two ago, and it had not been put back. He had not found they had done worse since. They had considered the question of doing away with steam blasts and having a fan, and he had thought when they could afford it of going in for that system of draught. With regard to the baths, Mr. Pickering had referred to the circulation of the water and the boiler. It was an ordinary circular boiler, and was quite sufficient for the work. It was natural circulation. With regard to the coal, it was 11s. 6d. per ton. Webb's ventilating lamp they found perfectly satisfactory, when kept partly alight during the daytime. In fact, they had no complaints. Mr. Douglas asked the cost of their main roads. The cost had decreased during the last three years since they commenced tar-painting their roads. The cost given of £1,250 did not include tar-painting and any works on the footpaths; it was simply the maintenance of the carriageways. They had got pretty well all their main roads paved with setts or wood. The High-street was paved the full width of the carriageway, and since that was done it had considerably reduced the cost of maintenance. Several of their main roads were narrow, and, of course, the double tramway tracks took up much of the carriageway, and they had only narrow margins to maintain. The tar was applied by one of Llewellyn & James's machines. The tar-macadam plant had only just been completed, and so he could not tell Mr. Thorp what quantity of tar they used. The cost of their street lighting was about £1,500 a year. In reply to Mr. Dixon as to their destructor wages, they paid the foreman 35s. a week, two men 27s. 6d., and one man 25s. They worked on ten-hour shifts. In reply to Mr. Thorp, he said they did not enter into any contract—they had not done so for years; they submitted their accounts at the end of the year and made the best bargain they could. They got £1,150 from the county for ordinary maintenance, excluding works. Up to this year the county contributed 50 per cent to the cost of tar-painting, but in future they were going to get 70 per cent.

Mr. FIDDIAN, answering Mr. Coleby's question as to the nature of the strata, stated that the whole of the bore was in the bunter series. He could not explain why the upper part of the pebble beds gave so much more water than the lower portion of the series, but they knew it as a fact. His paper referred to the difficulties experienced in getting through the beds of pebbles. There were large loose pebbles, and the trouble in dealing with these was considerable. It was simply a question of time, for they had really to grind them away. As to the conglomerate and other portions of the stone where there was no looseness, it was interesting to see how quickly the work was got through, the rate being about 9 ft. per day, except where pebbles were met with. He agreed with Mr. Thorp that it was most unusual to find farms of that extent let to a tenant, but their experi-

ence had been quite satisfactory: the farm had now been in existence for about twenty-eight years, and they would soon have paid up the loan on it. There had been no complaints from the council as to the quality of the effluent, or from anyone as to the management of the farm. The responsibility for the effluent was put upon the tenant, with whom they had a very binding agreement, which required him to distribute the effluent by his own staff, though, of course, he was subject to supervision by the board's officials. He thought the fact that they had gone on for so long without any difficulty spoke very well for the arrangement.

Mr. Webb expressed his thanks to the members for the way in which they had received his paper. As to the cost of the dehydrating plant, the particular variety they had was made in two sizes. Theirs was the smaller of the two sizes, with a capacity of 1,000 gallons per twelve hours. Working day and night they could turn out 70 tons per week. The cost of the plant as supplied by the makers was slightly over £200. Then there were foundations and tankage to consider; they must have plenty of storage both for the crude tar and the finished product. In their case the total cost was between £300 and £350. With regard to the difference in the cost of the crude and dehydrated tars, they had only had a few months' experience of the plant, and he could not quite say yet. But he should say, taking working expenses, interest and sinking fund and so on, a difference of from 12s. 6d. to 13s. would be a fair figure; that was to say, taking the value of crude tar at about 30s., it would mean about 43s. He agreed as to the economy of using steel drums in place of barrels, and tractors and trailers would be more economical still.

Following the business proceedings the members paid a visit to the engineering works of Messrs. Jones & Attwood, and afterwards were afforded an opportunity of examining the oil-gas plant and tar-dehydration plant installed at the gasworks. Lunch was served at the Talbot Hotel, and in the afternoon the party drove to the sewage farms belonging to the Stourbridge and Upper Stour Valley Boards.

ANNUAL GENERAL MEETING IN LONDON.

Following the customary Orphan Fund and council meetings, the thirty-ninth annual general meeting of the Institution of Municipal and County Engineers was opened yesterday (Thursday) morning at Caxton Hall, Westminster, and Mr. R. J. Thomas, M.Inst.C.E., county surveyor, Buckinghamshire, was formally installed as president, in succession to Mr. A. D. Greatorex, M.Inst.C.E., borough engineer of West Bromwich. The retiring president occupied the chair at the outset of the proceedings, the attendance at which is given herewith:—Sir James Lemon (Southampton), Sir Maurice Fitzmaurice (London County Council), Messrs. H. E. Anderson (Lambeth), J. Anstee (Guildford), J. Patten Barber (Islington), E. M. Bate (Frinton-on-Sea), J. P. Bennetts (Harrow), W. Nisbet Blair (St. Pancras), J. H. Blizard (Southampton), J. Birch (East Ham), H. Percy Boulnois (Westminster), W. L. Bradley (Tonbridge), A. T. Bridgewater (East Ham), J. S. Brodie (Blackpool), S. E. Burgess (Middlesbrough), W. Burn (Sutton-in-Ashfield), E. E. Butt (Birmingham), T. Caink (Worcester), A. H. Campbell (Edinburgh), J. E. Cardell (St. Ives). G. F. Carter (Croydon), W. B. Chancellor (Lichfield), S. H. Chambers (Hampton), H. T. Chapman (Somerset), H. A. Clarke (Briton Ferry), J. W. Cockrill (Great Yarmouth), T. Cole (secretary), H. J. Coleby (Atherstone), T. P. Collinge (Mansfield), F. C. Cook (Nuneaton), A. P. I. Cotterell (Westminster), J. S. Crawshaw (Weybridge), J. W. Croxford (Brentford), E. H. Crump (Hinckley), W. R. Davidge (Lewisham), C. F. Dawson (Barking), N. F. Dennis (West Hartlepool), J. R. Dixon (Woolwich), P. Dodd (Wandsworth), R. H. Dorman (Armagh), S. Douglas (Kenilworth), W. J. Dresden (Battersea), J. H. Drew (Wath-upon-Dearne), W. Dyack (Aberdeen), E. J. Elford (Southend-on-Sea), J. England (Wrexham), E. Evans (Carnarvon), W. Fairley (Westminster), W. Fiddian (Stourbridge), W. Fowlds (Keighley), A. Freeman (Rickmansworth), H. A. Garrett (Torquay), C. F. Gettings (Worcestershire), S. S. Gettings (Tring), H. A. Giles (assistant secretary), A. Gladwell (Eton), R. M. Gloyne (London County Council), H. E. Goldsmith (Eastwood), W. J. Goode (Bristol), F. T. Grant (Gravesend), A. D. Greatorex (West Bromwich), G. Green (Wolverhampton), W. H. Grieves (Sutton, Surrey), J. E. Hargreaves (Farnborough), J. L. Harpur (Brierley Hill), W. Harpur (Cardiff), F. Harris (Tunbridge Wells), G. A. Hart (Leeds), G. B. Hartfree (Alton), T. H. Hartley (Colne), J. Hassall (Sheffield), T. W. A. Hayward (Battersea), C. A. Hazeltine (Stepney), H. Heckford (Poplar), H. N. Hedges (Tring), A. F. Henderson (London), T. Henry (Retford), H. Holmes (Ossett), R. L. Honey (Chatham), E. P. Hooley (Nottingham), H. Howard (Littlehampton), W. T. Howse (Bexley Heath), T. Hunter (Leigh, Lancs), S. Hutton (Exmouth), R. H. Jeffes (New Malden), C. J. Jenkin (Finchley), C. Jones (Ealing), Christopher Jones (Hythe), W. Jones (Colwyn Bay), J. Julian (Cambridge), J. D. Kennedy (Retford), A. M. Ker (Warrington), P. G. Killick (Finsbury), J. S. King (Friern Barnet), F. O. Kirby (Doncaster), G. W. Lacey (Oswestry), W. T. Lancashire (Leeds), W. H. Leete (Bedfordshire), W. R. Locke (Hemel Hempstead), R. A. MacBrair (Lincoln), L. F. Mackenzie (Bristol), J. Marshall (Malling), E. B. Martin (Rotherham), F. Massie (Wakefield), E. R. Matthews (Bridlington), E. G. Mawbey (Leicester), G. Newcomen (Finchley), J. H. Norris (Godalming), J. Owen (Sutton, Surrey), E. Parry (Hitchin), R. S. W. Perkins (Isle of Ely), F. R. Phipps (Basingstoke), J. S. Pickering (Cheltenham), T. S. Picton (Eccles), W. Plant (Stafford), S. S. Platt (Rochdale), A. E. Prescott (Eastbourne), W. H. Prescott (Tottenham), A. J. Price (Eccles), A. J. Price (Lytham), W. H. Price (Leeds), W. B. Purser (Kesteven), W. Ransom (Worcester), J. L. Redfern (Gillingham), E. J. Reynolds (Friern Barnet), F. W. Richardson (Birmingham), L. Roseveare (South Shields), T. J. Rushbrooke (High Wycombe), T. Salkield (Delhi), R. Saunders (Gravesend), W. H. Savage (Cockfosters), N. Scorgie (Hackney), J. A. Settle (Bury), W. Shackleton (Nelson), J. S. Shaw (Wrexham), F. E. Sharpe (Cheshunt), H. Shillington (Lurgan), G. Eaton Shore (Crewe), J. Siddalls (Tiverton), E. J. Silcock (Westminster and Leeds), J. F. Smillie (Tynemouth), J. Gould Smith (Beverley), S. Stallard (Oxfordshire), W. J. Steele (Newcastle-upon-Tyne), A. Stevenson (Ayr), R. T. Stewart (Aylesbury), W. Stubbs (Blackburn), G. Sturgess (Chelsea), B. W. Stuttle (Stepney), J. Sutcliffe (Deptford), D. S. Sutherland (Southgate), M. H. Sykes (Stockton-on-Tees), J. Taylor (Walsall), W. H. Taylor (Aylesbury), R. J. Thomas (Buckinghamshire), W. O. Thorp (Malvern), S. Turner (Ashby-de-la-Zouch), F. C. Uren (Aldershot), E. Van Putten (Lewisham), C. Vawser (New Barnet), J. P. Wakeford (Wakefield), H. T. Wakeham (Middlesex), J. H. Walters (Congleton), J. D. Watson (Birmingham, Tame and Rea Drainage Board), W. Welburn (Middleton), A. E. White (Hull), H. A. White (Battersea), H. G. Whyatt (Grimsby), C. F. Wike (Sheffield), F. Wilkinson (Wimbledon), H. B. Williams (Workington), J. Williams (Hampstead), E. Willis (Chiswick), O. E. Winter (Hampstead), B. J. Wolfenden (Bootle), F. J. Wood (Lewes), F. Woodward (Stourbridge), E. Worrall (Stretford), W. Wright (Grantham), and G. E. Wrigley (Sowerby Bridge).

The minutes of the last annual meeting were read by the secretary, Mr. T. Cole, and confirmed, following which the annual report was submitted.

ANNUAL REPORT OF COUNCIL.

The council have pleasure in presenting the thirty-ninth annual report, recording the work of the year 1911-12.

NEW CONSTITUTION.

The last annual meeting saw the inauguration of the new constitution, carrying in its train changes of great importance.

Districts.—The various districts into which the institution is divided for administrative purposes have been altered to agree, practically, with those of the N.A.L.G.O. Certain districts remain unchanged, but the Northern, Yorkshire, Lancashire and Cheshire, Midland, Eastern, Home and Western districts have been recast to form new districts as shown:

Name of new district.	District chairman.	District representatives.	District secretary.
Scottish. (Vice president) J. Bryce.	J. Bryce.	J. Young.	D. Ronald.
Irish. (Vice president) H. A. Cutler.	W. Collen.	R. H. Dorman	M. Sellars.

Name of new district.	District chairman.	District representatives.	District secretary.
NORTH-EASTERN.			
Comprising Northumberland, Durham, Yorkshire.	F. Massie	E. B. Martin, E. R. Matthews.	J. P. Wakeford.
NORTH-WESTERN.			
Comprising Cumberland, Westmorland, Lancashire, Cheshire, Isle of Man.	J. A. Brodie.	J. S. Brodie, C. Brownridge.	A. W. Bradley.
EAST MIDLAND.			
Comprising Lincolnshire, Nottinghamshire, Derbyshire, Leicestershire, Rutland.	E. G. Mawbey.	E. P. Hooley.	R. A. MacBrair.
WEST MIDLAND.			
Comprising Staffordshire, Shropshire, Herefordshire, Worcestershire, Warwickshire.	A. T. Davis.	H. E. Stilgoe.	H. Richardson.
NORTH WALES.			
Comprising Anglesey, Flintshire, Denbighshire, Carnarvonshire, Merionethshire, Montgomeryshire.	W. Jones.	I. P. Evans.	J. England.
SOUTH WALES.			
Comprising Radnorshire, Cardiganshire, Pembrokeshire, Carmarthenshire, Brecknock, Glamorganshire, Monmouthshire.	W. Harpur.	G. A. Phillips.	H. A. Clarke.
SOUTH-WESTERN.			
Comprising Cornwall, Devonshire, Somersetshire, Dorsetshire.	H. T. Chapman.	T. Moulding.	T. Moulding.
SOUTHERN.			
Comprising Gloucestershire, Oxfordshire, Wiltshire, Berkshire, Hampshire, Isle of Wight, Channel Isles.	R. Read.	L. S. McKenzie.	F. R. Phipps.
SOUTH EASTERN.			
Comprising Surrey, Kent, Sussex.	A. Dryland.	J. L. Redfern.	F. Roberts.
EASTERN.			
Comprising Norfolk, Cambridgeshire, Huntingdonshire, Northamptonshire, Suffolk, Buckinghamshire, Bedfordshire, Hertfordshire, Essex, and that portion of Middlesex not comprised within the Metropolitan district.	A. Fidler.	W. H. Prescott, H. T. Wakelam.	E. J. Elford.
METROPOLITAN.			
Comprising the area within which the Metropolis Management Acts are in force.	J. Patten Barber.	N. Seorgie, O. E. Winter.	N. Scorgie.
INDIA.	Unfilled.	—	Unfilled.
AFRICA.	Unfilled.	—	Unfilled.
ABROAD.			
Comprising members resident in places other than those included in the above districts.	—	—	

The elections to the new district offices take effect as from the annual meeting at which this report is presented, and the council trust that the closer association with the general body of members, which it is hoped will be established by the direct election of district representatives serving on the council, will prove conducive to the best interests of the institution.

DISTRICT EXECUTIVE COMMITTEES.

The by-laws provide for the election of an "Executive Committee" for each district, and the council trust that these committees will be forthwith appointed.

DISTRICT MEETINGS.

During the year twelve district meetings have been held: At Handsworth, July 29th; Gidea Park, September 22nd; Paignton, September 30th; Battersea, October 21st; Westminster, February 9th; Exmouth, May 4th; Nuneaton, May 11th; Stirling, June 7th and 8th; East Ham, June 15th; Lowestoft, June 22nd; Bridlington, June 29th; and Stourbridge, July 6th.

VISIT TO PARIS.

A most interesting visit to Paris and its municipal works was paid at Whitsuntide, 1912, when about sixty of the members and their friends were most hospitably received by the authorities at the Hotel de Ville. The engineers of the various departments arranged a most instructive programme, and they spared no pains in explaining the several works and in giving every assistance in making the meeting an unqualified success.

HONORARY MEMBERS.

In view of the great interest taken in the work of the institution by the French engineers, the council have elected the following gentlemen as honorary members of the institution: Mons. G. Bechmann, Mons. M. F. Bienvenue, Mons. Colmet-Daage, Mons. de Pontich, and Mons. M. P. Tur.

SPECIAL MEETINGS.

Special meetings were held July 29, 1911, January 13, and February 9, 1912, in connection with the alterations to Memorandum and Articles desired by the institution, and also those insisted upon by the Board of Trade. The council trust to be able to report shortly that all statutory requirements have been complied with, and the Memorandum in its new form, removing the objectionable footnote to the testamur, and widely extending the scope of the work of the institution, is by the sanction of the court at last an accomplished fact.

THE ROLL OF THE INSTITUTION.

During the financial year ending April 30th last, 109 new members, consisting of 34 ordinary members, 46 associate members, and 29 students, have been elected. Twenty-eight resignations have been accepted and thirty names have been written off.

The names on the roll of (1) Associate Members, and (2) Associates and Graduates, on July 29, 1911, were respectively transferred (under the operation of Article 8) to the classes of (1) Members, and (2) Associate Members, and the roll now stands:—

—	1906 to 1907.	1907 to 1908.	1908 to 1909.	1909 to 1910.	1910 to 1911.	1911 to 1912.
Hon. members	9	9	8	8	8	13
Members	850	854	818	820	839	1,028
Associate members	—	39	78	114	128	243
Associates	141	123	127	137	131	—
Graduates ...	204	204	170	160	151	—
Students	—	—	—	—	—	29
Affiliated members	—	—	—	—	—	47
Total ..	1,206	1,509	1,301	1,239	1,257	1,360

The council record with regret the deaths of Mr. Lewis Angell (past-president), the founder of the institution, and of Mr. J. T. Eayrs (past-president), also of Messrs. G. J. Bell, W. Diggle, G. Heaton, E. I. Lord, and T. H. Tarbit.

The Council desire to urge upon the younger members of the profession the importance of becoming attached to the institution as students at as early an age as possible, and would ask the cordial cooperation of those members who have pupils or assistants upon their staffs not connected with the institution to induce them to join.

THE NEW COUNCIL.

Consequent upon the alteration in the constitution the number of ordinary members of council has been reduced from fifteen to ten, and district representatives have taken the place on the council hitherto held by the district secretaries.

The scrutineers, having examined the ballot lists, report the following members elected as the council for the year 1912-13:—

President: Mr. R. J. Thomas.

Vice-Presidents: Messrs. J. W. Cockrill, T. W. A. Hayward and J. S. Pickering.

Ordinary Members of Council: Messrs. J. Patten Barber, J. A. Brodie, J. S. Brodie, A. H. Campbell, G. F. Carter, A. E. Collins, W. Harpur, W. T. Lancashire, H. P. Maybury and C. F. Wike.

Hon. Secretary: Chas. Jones.

Hon. Treasurer: Sir James Lemon.

Serving upon the council, in addition to these, are the district vice-presidents and district representatives recorded earlier in this report.

THE FINANCES.

The accounts which accompany this report for the financial year ending April 30, 1912, have been duly audited by the official auditors, Messrs. Wood, Drew & Co., and are presented with this report. The fact that the year's working shows a slight deficit is accounted for by the heavy printing and lithography charges due to special expenditure on the Housing and Town Planning Conference volume, and to abnormal expenditure in connection with the reconstitution of the institution.

Having regard to the immense value of this con-

ference, and the gain in the prestige of the institution, as evinced by inquiries for the volume from all parts of the globe, the council are satisfied that the money has been wisely spent. During the year £600 has been invested in India 3½ per cent stock.

HOME EXAMINATIONS.

During the year three examinations have been held, for which eighty-six candidates entered (seventy-five presented themselves) for examination. Forty-three candidates satisfied the examiners, and have been granted the testamur of the institution. The council would again press upon members the desirability of requiring the possession of the testamur of the institution, or an equivalent qualification granted by a recognised examining body, as a condition precedent to making appointments to their staffs.

COLONIAL EXAMINATIONS.

An examination was held in Cape Town in April last, at which one candidate satisfied the examiners, and has been granted the testamur of the institution.

The long distances to be travelled by candidates, both in Africa and India, present considerable difficulty in making arrangements, but the council trust that these will be overcome, and that this branch of the work of the institution will be extended in the near future. Arrangements for the holding of an examination at Hong Kong are at present under consideration.

PREMIUMS.

The council have awarded the following premiums for papers published in the last volume of "Proceedings":—

£5 5s. to A. J. Price (graduate), for his paper, "Pumping Plant for Sewerage and Water Works."

£4 4s. to W. Ransom, for his paper, "Filtration and Purification of Water for Public Supply."

£3 3s. to F. G. Holmes, for his paper, "The Main Drainage and other Municipal Works at Govan."

£3 3s. to C. G. Mason, for his paper, "Municipal Progress in Guildford."

For papers read at the Housing and Town Planning Conference the council awarded institution premiums as follows:—

£3 3s., T. Wallis Gordon, for "Town Planning as Applied to Suburban Areas."

£2 2s., W. Wainwright, for "The Municipal Engineer and Town Planning."

£2 2s., E. A. Slater, for "The Planning of an Industrial Suburb."

PRESIDENT'S PRIZE.

The prize offered by Mr. A. D. Greatorex (president) for the best paper read by a student at the annual meeting has been awarded to Mr. W. H. Price for his paper on "Town Planning," to be read at this forthcoming annual general meeting.

AFFILIATION OF THE SCOTTISH ROAD SURVEYORS' ASSOCIATION.

The council record with pleasure the completion of the affiliation of this association with the institution, resulting in an accession of fifty-three affiliated members. Six of these gentlemen have been elected at their request to full membership.

ADMISSION OF VISITORS.

The council have revised the regulations for the admission of visitors to the meetings of the institution, and the new arrangements appear to be giving general satisfaction.

NEW OFFICES.

Continuous efforts have been made during the past year to find more adequate and suitable premises for the increasing work of the institution, and for the holding of the numerous council, committee and other meetings, but up till now without success. The new council will therefore take up this task as one of the urgent matters requiring their attention.

ARBITRATION CLAUSE.

The council received a request from the National Federation of Building Trades Employers, and referred the consideration of a clause relating to arbitration in engineering contracts to a committee. After very full discussion, the council, on the recommendation of the committee, have informed the federation that they are prepared to recommend that the members of the institution adopt the form of clause set out hereunder in lieu of the usual clause appointing the engineer to the arbitrator in case of dispute with a contractor.

ARBITRATION.

In case any dispute or difference shall arise between the council, or the engineer on their behalf, and the contractor, either during the progress of the works or after the determination, abandonment, or breach of the contract, as to the construction of the contract, or as to any matter or thing arising thereunder (except as to the matters referred to in the undermentioned clauses "*a* to . . . "), all which shall be left to the sole discretion or decision of the engineer—*viz.*:—

*(*a*) As to the provision of everything necessary for the proper execution of the works, &c.

*(*b*) As to the amendment of errors arising from inaccurate setting out of works.

*(*c*) As to the quality of materials and workmanship.

*(*d*) As to the competency of the general foreman on the works.

*(*e*) As to the competency or conduct of any person employed on the works by the contractor.

*(*f*) As to the measurement and valuation of extra work and variations, or the mode of ascertaining the amount to be allowed for extra work and variations.

*(*g*) As to the rejection and removal of work and materials not in accordance with the specification or the instructions of the engineer, and the substitution of other work and materials therefor, and all other matters referred to in this clause.

*(*h*) As to defects or faults which may appear in the works after completion.

*(*i*) As to the opening of work for inspection.

*(*j*) As to the date when the works are completed.

*(*k*) As to the execution of works having been delayed by inclement weather and other causes.

*(*l*) As to the carrying on of the works with due diligence, &c.

*(*m*) As to the expenditure of provisional sums.

*(*n*) As to the issuing of certificates relating to payments to the contractor.

Also, except as to the matters referred to in the under-mentioned clauses numbered "A to . . . ," all of which shall be left to the sole discretion or decision of the council:—

*(A) As to the assignment or sub-letting of any portion of the works.

*(B) As to the determination of the contract by the council, or as to the withholding by the engineer of any certificate to which the contractor may claim to be entitled, either party shall forthwith give to the other written notice of such dispute or difference, and such dispute or difference shall be and is hereby referred to the arbitration and final decision of a person to be appointed, on the request of either party, by the president for the time being of the Institution of Municipal and County Engineers, and the award of such arbitration shall be final and binding upon the parties. Such reference, except of the question of certificate, shall not be opened until after the completion, or alleged completion, of the works, unless with the written consent of the council, or the engineer, and the contractor. The arbitrator shall have power to open up, review, and revise any certificate, opinion, decision, requisition, or notice, save in regard to the said matters expressly excepted above, and to determine all matters in dispute which shall be submitted to him, and of which notice shall have been given as aforesaid, in the same manner as if no such certificate, opinion, decision, requisition, or notice had been given. Upon every or any such reference, the cost of and incidental to the reference and award respectively shall be in the discretion of the arbitrator, who may determine the amount thereof, or direct the same to be taxed as between solicitor and client, or as between party and party, and shall direct by whom and to whom and in what manner the same shall be borne and paid. This submission shall be deemed to be a submission to arbitration within the meaning of the Arbitration Act, 1899:—

Provided always that this clause shall not apply to any contract, the total original amount, sum, or value of which, exclusive of any extras or additions, is less than one thousand pounds (£1,000), or to any differences or disputes which in connection with any one contract shall involve a total amount, sum, or value of less than fifty pounds (£50), in either of which two events all matters arising out of the contract and any differences or disputes shall be in the sole judgment and discretion of the engineer, whose decision shall be final and binding on all parties and without appeal.

PRICED SCHEDULES WITH TENDERS.

The same federation drew the attention of the council to the practice of many engineers to local authorities

* These are intended as illustrations of the matters which engineers may wish to deal with, them-selves, or may wish their councils to deal with, instead of allowing them to be submitted to arbitration. Each engineer can insert in this part of the clause whatever matters he desires to exclude from arbitration.

requiring that priced bills of quantities and schedules should accompany tenders. The council passed the following resolution, and recommend the same for adoption by the members: "That it is not necessary, nor is it desirable, that priced bills of quantities and schedules should be sent in openly with the tenders; but that it is essential that the prices in the bill of quantities and schedule should be approved by the engineer before a tender is recommended for acceptance."

HOUSING AND TOWN PLANNING CONFERENCE.

The council record with gratification the great success of the conference held at West Bromwich in connection with the last annual meeting, when nearly 200 delegates were appointed by their respective authorities to attend. Seventeen papers dealing with the subject in all its aspects were read and discussed, and were subsequently printed, together with the discussions, in a volume published by Messrs. Spon & Co., 57 Haymarket, price 10s. 6d. Copies may still be obtained, but the edition is being rapidly exhausted. The papers were profusely illustrated and numerous reproductions of the plans kindly lent by various authorities and others, and exhibited during the conference, were also included in the volume. Unfortunately the engagements of the Right Hon. John Burns, President of the Local Government Board, prevented his attendance, but in a letter subsequently written to the secretary he conveyed his hearty congratulations to the institution upon the valuable addition afforded by the volume to the literature upon this important subject. The council have received an invitation from the Royal Institute of British Architects to appoint delegates to a conference to be held in the near future to consider the necessity for the co-ordination of town planning schemes. The council have delegated Messrs. John A. Brodie, J. W. Cockrill, and H. E. Stilgoe to represent the institution at this conference.

HONOURS TO MEMBERS.

The council record with gratification that the honour of knighthood has been bestowed on one of the members of the institution, Sir Maurice Fitzmaurice, C.M.G., and that a past-president, Mr. John A. Brodie, has been chosen to advise the authorities in the town planning of Delhi, the new capital of India.

ENGINEERING APPOINTMENTS BOARD.

The council desire to draw the attention of the members to the Appointments Board recently formed by the Institution of Civil Engineers. This board, for a nominal fee, will endeavour to bring those requiring engineering assistants and those qualified to fill the position into contact. At the same time the council would remind members that the services of the official staff of this institution are always at their disposal in this direction.

MUTUAL DEFENCE FUND AND THE CASE OF MR. W. JONES (COLWYN BAY) *v.* FROST.

The council referred this particularly hard case, in which the plaintiff was compelled to bring an action to vindicate his character, to their solicitor, Mr. A. M. Bramall. Mr. Jones achieved complete success, being awarded heavy damages and his costs, but, unfortunately, the defendant proved to be utterly without means, and Mr. Jones has been unable to recover either damages or costs, the latter amounting to some £240. Mr. Bramall advised the council that, although legal assistance might have been provided out of the funds, had application been made to the council for such assistance, the memorandum clearly prohibited the payment of any sum of money to recoup Mr. Jones. Hitherto the power to assist members, by the provision of legal advice, contained in the memorandum, has been relied upon, but with the increased scope of the memorandum as it now stands the council feel that a defence fund has become an urgent necessity. On the motion of Mr. A. D. Greatorex (president), the council recently referred the matter to the chairmen of their Standing Committees, and it is to be hoped that a scheme will shortly be placed before the members for their approval and adoption. In the meantime the council have started the Mutual Defence Fund with donations amounting to some £30, and a circular letter, appealing for immediate support, accompanies this report. Direct financial assistance from the funds of the institution being prohibited by the Memorandum of Association as aforesaid, the council have already assisted out of the defence fund, and trust that a cordial response from the members will enable them further to assist the hard case above referred to, and to place the fund on a working basis.

STANDARDISATION COMMITTEE.

This committee has held numerous meetings during the past year, and has had under consideration a number of matters relating to standardisation, the more important being the following:—

Concrete Flags.—The standard specification has been completed and published at 2s. 6d. per copy. It has met with a ready sale, and the first edition is being rapidly disposed of.

Vitrified Pipes.—See delegates' reports.

Period of Loans for Wood Paving.—This question has also been under the consideration of the committee, and they have now received an intimation from the Local Government Board that, as a general rule, the period for repayment of loans for creosoted soft woods will be the same as for hard woods—*viz.*, ten years, the period for uncreosoted soft woods being five years.

ROADS COMMITTEE.

The council's attention having been called by the Cyclists' Touring Club to the damage caused to road surfaces by studded tyres, a reply was sent that the council had already endeavoured to obtain an amendment to the law relating to this subject, and will continue to press the importance of the matter upon the Local Government Board. The council have given careful attention to the urgent necessity of amendments to the Highways and Locomotives Act, 1878, and the Heavy Motor Car Order, 1904, and have made strong representations to the Local Government Board accordingly. The council have also considered suggestions as to caution symbols, and have forwarded their recommendations to the County Councils Association. A resolution passed by the Lower Thames Valley District Surveyors' Association, as to further powers being conferred upon local authorities to define the routes of heavy motor traffic, was received. After careful consideration the council found themselves unable to agree with the suggestion that local authorities should have conferred upon them the power to define routes for such traffic.

DELEGATES.

The following gentlemen have been appointed to serve the institution as delegates to other bodies:—

Mr. Charles Jones, hon. secretary to the Sanitary Inspectors' Examination Board.

Messrs. A. D. Greatorex and N. Scorgie to the N.A.L.G.O.

Mr. E. B. B. Newton to the Plumbers' Registration Committee.

Messrs. W. Harpur and C. F. Wike to the Engineering Standards Committee (Tramway Rails).

Messrs. J. Patten Barber, E. J. Elford, and F. W. Pearce to the Engineering Standards Committee (Vitrified Ware Pipes).

Messrs. E. J. Elford and R. J. Thomas to Engineering Standards Committee (Conference on Road Materials).

Messrs. A. D. Greatorex and J. Walker Smith to the Royal Sanitary Institute Congress.

Mr. E. Purnell Hooley to the Central Committee on Road Statistics.

Messrs. E. Purnell Hooley, H. P. Maybury, and R. J. Thomas to Central Committee on Road Statistics (Conference on Highways and Bridges Act).

Messrs. G. F. Carter, E. J. Elford, T. W. A. Hayward, E. B. B. Newton, and N. Scorgie to the Institution of Electrical Engineers (Joint Conference on Street Lighting).

Messrs. A. D. Greatorex, E. P. Hooley, A. T. Davis, H. P. Maybury, and R. J. Thomas to the General Committee, International Roads Congress, 1913.

Messrs. E. J. Elford, A. D. Greatorex to Engineering Standards Committee (Cast-iron Pipes).

REPORTS FROM DELEGATES.

Mr. N. Scorgie: *National Association of Local Government Officers.*—During the past year meetings of the National Council have been held in London and at Leamington, and the membership roll since the last report has increased by nearly 7,000.

The activities have been great during the past twelve months, one of the most notable accomplishments being the inauguration of an extensive scheme of examination for the clerks of the various departments of a local authority. This scheme has met with universal approval by the progressive young men engaged in local government administration, and will meet a long-felt want by those officers who have never before had an opportunity of securing a diploma of efficiency in their particular kind of work. There is not any intention by the N.A.L.G.O. of competing with

existing examinations conducted by professional associations, and every precaution has been taken to avoid overlapping.

In the surveyors' section the professional side is not touched, but an examination for clerks in engineer and surveyors' departments is held. The syllabus for this department is wide, and any clerk desirous of passing the examination will have to be well versed in the general routine and organisation of a surveyor's department, and be possessed of a good knowledge of the law relating to our work. Anything which tends to improve the efficiency of the municipal clerk should be grasped by both hands. The launching of the N.A.L.G.O. examination scheme will be a decided help to the engineers and surveyors of the service, since it helps to make more proficient their clerical staffs.

The Benevolent and Orphans' Fund, which only came into real existence about twelve months ago, is making rapid strides. During the past year several cases of distress have been taken in hand. It is confidently anticipated that by the end of the association's current year—September next—several hundreds of pounds will have been accumulated. With such an extensive membership as the N.A.L.G.O., and given proper support, it should be possible for this fund to meet all cases of distress that may occur in the local government service. The ideal being aimed at by the National Association is a high one, and it is quite within the bounds of possibility that its scope of usefulness will overtake that of the N.U.T. and other great institutions.

The superannuation question is the one no doubt nearest to our hearts, and no one can say that the N.A.L.G.O. is lacking in efforts to bring about legislation embodying a system of deferred pay for municipal officers. It is, however, a problem pregnant with difficulties, one of the greatest of which is to educate our employers—the authorities—to realise that the officers will not benefit alone by a proper scheme of national superannuation. The primary object and ultimate effect of a national superannuation scheme is efficiency. It is no rash statement to say that a contented municipal officer is a valuable asset, and to be relieved of the worry of making provision for the evening of our careers would allow most of us to give our best to the service with a feeling of contentment. The policy of the National Association is not to rush hazardously to Parliament and demand superannuation, but to petition the Government and the local authorities, through their organisations, with a view to an all-round appeal being made for treating the local government officer like other public servants as regards superannuation. In this direction rapid strides have been made. The N.A.L.G.O. has been successful in enlisting the sympathy of the County Councils' Association, the Urban District Councils' Association, and is now in negotiation with the Association of Municipal Corporations, which important body it is hoped will make a favourable report in the near future. It is much better to meet any opposition before going to St. Stephen's than after entering the House of Commons, and the N.A.L.G.O. is to be complimented upon, and encouraged in, furthering the safe policy which it has adopted on this important matter.

Security of tenure of office is another subject which interests the municipal engineer, and it will no doubt be a source of satisfaction that the N.A.L.G.O. superannuation includes a clause to ensure the security of tenure of the office of the local government officer.

The interests of the local government officer have been closely watched with regard to the National Insurance Act. A special committee has been sitting for many months past, and has made periodical reports to the federated branches, repeatedly making suggestions as to the line of action which they should take up. An approved society has been formed through which the officers will get better benefits than any other society can offer in return for the minimum total contributions of employer and employee of 7d. per week. This step is one of paramount importance to local government officers, and will, no doubt, be supported by thousands.

The N.A.L.G.O. has applied for a Royal Charter of Incorporation, and is now awaiting the decision of the Privy Council.

The foregoing report deals chiefly with what might be termed the "large" objects of the association; but the work and influence of the N.A.L.G.O. is by no means confined to those matters. The question of altering the Treasury's ruling on compensation on abolition of office has received careful attention during the past year, and the efforts of the N.A.L.G.O. will no doubt bring about some improvement. Assistance has been given to the Irish officials in their efforts to include safeguards in the Home Rule Bill. The association has also been of great assistance to a large number of officers in tendering legal advice on matters affecting their status, and this year a large proportion of the association's income has been earmarked for law and Parliamentary purposes.

Mr. W. Harpur: Your representatives on the Engineering Standards Sub-Committee on Tramway Rails have to report that little work has been done in connection with standardisation during the past year, their work having practically ceased when the standards were agreed to by the main committee.

There have, however, during the year been several additions made to the committee, and, in consequence, there have been proposals for certain alterations in the standard sections of rails. Nothing, however, has been definitely decided upon these matters, which are still under consideration.

Recently further additions to the Tramway Rails Sub-Committee have been made by the appointment of two additional representatives, each from the Light Railways and Tramways Association and the Municipal Tramways Association.

As a consequence your Tramways Committee have asked for similar increased representations on the sub-committee, and the matter is to come before the main committee at an early date.

Mr. E. J. Elford: *Vitrified Ware Sewer and Drain Pipes.*—The draft specification prepared by your Standards Committee has been referred to the Engineering Standards Committee, and is now being dealt with by a sectional committee, comprising engineers, architects, manufacturers, and representatives of Government departments. The various clauses of the draft have been discussed at considerable length, and a number of points have been agreed. The representatives of this institution have reported from time to time to the Standardisation Committee, and various modifications have been agreed to.

Cast-Iron Pipes.—The committee have drafted a specification, which has been printed and circulated.

Mr. R. J. Thomas: Your delegates attended a conference called by the Engineering Standards Committee to consider whether the standardisation of road material is desirable.

It was resolved that such standardisation was desirable, and that the Main Engineering Standards Committee be recommended to form a sectional committee to deal with the matter.

Mr. T. W. A. Hayward: The council last year were invited to send five representatives to a conference to take into consideration the preparation and issue of a standard specification for street lighting. The council, on the recommendation of the Standardisation Committee, appointed the following as their representatives: Messrs. G. F. Carter, E. J. Elford, T. W. A. Hayward, E. B. B. Newton and N. Scorgie.

Thirteen meetings have been held, the attendances of your representatives being as follows: Mr. E. J. Elford, 12; Mr. T. W. A. Hayward, 12; Mr. E. B. B. Newton, 11; Mr. G. F. Carter, 9; Mr. N. Scorgie, 8. The draft specification has been prepared, and will, in the near future, receive the consideration of the council of the institution. It is hoped that the specification may be issued at no distant date.

Mr. E. Purnell Hooley: The question of systematically dealing with direction-posts and danger-signals has again been the chief question before the committee, as the committee's previous recommendations were again amended by the County Councils Association. A difficulty in getting sufficient members to attend on any one day has been experienced, and the committee has been asked to accept the name of a second representative of this institution.

Mr. R. J. Thomas *International Roads Congress.*—Messrs. A. D. Greatorex, E. P. Hooley, H. P. Maybury and R. J. Thomas, representing the institution upon the General Committee of the International Roads Congress, 1913, attended the meeting of the General Committee, when sub-committees were elected to deal with each question set forth in the official programme. It is satisfactory to note that the institution is represented by a large number of members upon these sub-committees. Several meetings have been held, the course generally adopted being to invite observations and opinions on each question from those conversant with and experienced in the branch of road work referred to. Each Committee will consider the views set forth in these communications, and prepare for the congress a report indicating

the generally accepted practice in this kingdom relative to the question under review.

CONCLUSION.

In conclusion, your council feel, in a review of the proceedings, which have occupied the attention of the various committees and the council at large, that they have much reason to congratulate the members upon the satisfactory results of the year. There has been no more critical year in the history of the institution. Subjects upon which much difference of opinion existed have been satisfactorily arranged, and new departures have been inaugurated which, your council feel assured, will tend still further to strengthen the bonds of union which in the past have tended so materially to the best interests of the institution in which we are all so deeply interested.

The RETIRING PRESIDENT (Mr. A. D. GREATOREX) formally moved that the annual report be received and approved.

Mr. W. H. PRESCOTT (Tottenham) seconded, and remarked that he had a very decided sympathy with the general scope and objects of the recommendation in the report. A scheme of mutual defence was long overdue, and he was glad indeed that an energetic and determined step was at last being taken as a counter-stroke to the scandalous attacks made upon municipal engineers in the honourable discharge of their public duties. He thought it ought to be made clear in this connection that the question of superannuation and security of tenure would not be relegated to a secondary place.

Mr. T. HENRY (Retford) said he was glad to hear from the last speaker that superannuation and security of tenure were not to be thrown into the background by the establishment of the Defence Fund. When an important official like the ex-town clerk of Nottingham wrote, as he recently did, that official life had been made intolerable, he (the speaker) thought it behoved every one of them to use all their efforts in furtherance of superannuation and security of tenure.

Mr. C. VAWSER (New Barnet) commented approvingly upon the increased membership of the institution, but called attention to the fact that there were still 1,441 public authorities unrepresented in the institution. He trusted, now that a new council was coming into existence, they would seek to do everything possible to increase the roll of members, and thus add to the value of the institution's work. In their report the council again pressed upon members the desirability of acquiring the testamur of the institution, or some equivalent qualification granted by a representative body. It was to be regretted that the council did not carry that recommendation out by communicating with public authorities when vacancies arose requesting the recognition of these qualifications. The speaker urged that further energy should be exercised by the council in the effort to obtain new official premises, and proceeded to contend that they would be quite justified in using the institution moneys as a Defence Fund. Alluding to the report of Mr. Scorgie, the speaker said he was pleased to hear that the National Association of Local Government Officers was not lacking in efforts to bring about legislation embodying a system of deferred pay, but it did not

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDING APRIL 30, 1912.

Dr. *Cr.*

EXPENDITURE.	£ s. d.	£ s. d.	INCOME.	£ s. d.	£ s. d.
To Reports of meetings	—	50 8 0	By Subscriptions	—	1,795 9 6
,, Examiners' Fees and expenses	—	102 5 10	,, Entrance fees	—	66 5 6
,, Printing, lithography, and stationery (including postage)	—	792 14 8	,, Examination fees	—	258 6 0
,, ,, on new constitution	—	64 0 3	,, Delegates fees	—	64 1 0
,, ,, conference volume	—	278 17 8	,, Sale of proceedings	—	123 10 9
,, Expenses of meetings	—	92 15 5	,, Interest on investments and on deposit	—	75 13 0
,, Rent of office and coals	—	79 5 8	,, Deficiency for year carried to accumulated fund	—	24 3 6
,, Bankers' charges	—	0 8 2			
,, Telegraphic address and telephone	—	10 16 0			
,, Expenses of delegates and affiliation	—	15 1 7			
,, Premiums	—	31 4 3			
,, Law reports and Parliamentary papers	—	10 7 6			
,, Salaries	—	601 0 4			
,, Office expenses	—	62 14 0			
,, Petty cash—					
Postage	—	44 6 6			
General	—	11 0 0			
,, Legal charges	—	24 9 6			
,, Audit fee	—	10 10 0			
,, Amounts written off—					
Subscriptions	52 1 0				
Investments	61 10 11				
Office furniture	11 12 0				
		125 3 11			
		£2,407 9 3			£2,407 9 3

BALANCE-SHEET ON APRIL 30, 1912.

Dr. *Cr.*

LIABILITIES.	£ s. d.	£ s. d.	ASSETS.	£ s. d.	£ s. d.
To sundry creditors	—	194 1 8	By cash—		
,, Premiums in respect of Volume xxxvii.	—	15 15 0	at bank	85 19 2	
,, Subscriptions in advance	—	32 18 6	in hand	9 9 8	
		242 15 2			95 8 10
,, Accumulated fund—			,, Investments—		
Balance at April 30, 1911	2419 10 2		£199 Southampton Corporation 3½ per cent Stock at 91	178 12 0	
Less deficiency for year ending April 30, 1912	24 3 6		£554 2s. 9d. India 2½ per cent Stock at 66½	367 16 9	
		2,395 6 8	£650 0s. 3d. London County 2½ per cent Stock at 71	461 10 2	
			£200 Metropolitan 2½ per cent Consolidated Stock at 77½	155 0 0	
			£407 11s. 9d. New South Wales 3½ per cent Stock at 97½	397 7 11	
			£600 India 3½ per cent Stock at 93	558 0 0	
					2,118 6 10
			,, Subscriptions in arrear	370 0 6	
			Less reserve	150 0 0	
					220 0 6
			,, Amount due for sale of proceedings	—	23 16 8
			,, Stock of proceedings—estimated value	—	100 0 0
			,, Office furniture	—	80 9 0
		£2,638 1 10			£2,638 1 10

A. G. GREATOREX (*President*).
JAMES LEMON (*Hon. Treasurer*). THOMAS COLE (*Secretary*).

Report to the Members of the Institution of Municipal and County Engineers.

In accordance with the provisions of section 113 of the Companies (Consolidation) Act, 1908, we report that we have examined the above Income and Expenditure Account and Balance Sheet with the books and vouchers and have obtained all the information and explanations we have required. The Balance Sheet, in our opinion, is properly drawn up so as to exhibit a true and correct view of the state of the Institution's affairs according to the best of our information and the explanations given to us, and as shown by the books.

WOOD, DREW & CO. (Chartered Accountants), Auditors to the Institution.
6 & 7 Queen Street, Cheapside, London.
June 22, 1912.

appear that any progress had been made. As to security of tenure, he admitted that that was a question surrounded by very great difficulties.

Mr. W. H. Grieves (Sutton, Surrey) complained that the Association of Kent Surveyors should have taken upon itself, with respect to the election of a district representative, a duty that ought to have devolved jointly upon the Kent, Surrey, and Sussex local bodies, which comprised the South-Eastern district. In this connection he also objected to the letter sent out by Mr. Maybury.

Mr. A. Ernest Prescott (Eastbourne), as one who was responsible for the correspondence that appeared in the Press with respect to the subject referred to by the last speaker, did not mind saying that he should do the same thing again, because he did not think the members of the South-Eastern district had been treated fairly. There was a meeting convened—(cries of "No!")—well, there ought to have been. He was sorry Mr. Maybury was not present, as the explanation asked for with respect to the matter had not been forthcoming.

Mr. E. Willis (Chiswick) said he rose to bless rather than to curse, because he thought the council were very much to be congratulated on their report. Mistakes might have been made with regard to the district committees, but he thought it was hard that the council should be blamed for them. He urged the desirability of fostering still further the interests of the pupils and younger members, because he saw that a large number of junior members were joining another institution—an institution which might have very laudable objects, but which was not so representative as this one. He was of opinion that progress was being made in the matter of superannuation, and that it would be obtained before five or six years had passed by. Security of tenure, he admitted, was a very difficult problem. He supported the Mutual Defence Fund, and he was particularly delighted to find that the Orphan Fund was pushing ahead. He appealed to the members for further support of this fund, even if they only gave a shilling a year.

Mr. G. W. Lacey (Oswestry) thought that there had been initial difficulties with respect to the district committees which would not exist in the future, when the necessary officials had been appointed. He noticed that the account for printing was £792, an increase of nearly £100, which did not appear to be accounted for by the increase of membership or the cost of printing.

Mr. W. T. Wakelam (Middlesex) thought that Mr. Willis had struck the keynote of the discussion when he said "Support the council." Continuing, the speaker said that when he started the question of the Defence Fund he was not aware that the council had taken the matter up. When he ascertained this, he at once handed over the correspondence and contributions he had received to the council.

Mr. W. Harpur (Cardiff) thought he was right in saying that as a matter of fact the district committees did not come into actual operation until that day (Thursday), and the meetings previously held were therefore quite informal. He endorsed the appeal of Mr. Willis for subscriptions to the Orphan Fund, and gave a cordial support to the Defence Fund movement, remarking that it was an object to which they could not devote too much attention.

Mr. T. S. Picton (Eccles) called attention to the amount of the arrears of members' subscriptions (£220), and earnestly appealed for the clearance from the books of this particular item.

The Retiring President (Mr. A. D. Greatorex) then replied to the discussion, and explained that the printing bill had been unavoidably increased owing to the negotiations with respect to the alteration of title and changing of the constitution. He ought, he said, to have stated, in moving the adoption of the report, that the final stage had been reached and the title granted. He endorsed the statement of Mr. Harpur that the district committees did not come into operation until the meeting that day, and that the previous meetings were informal ones. He personally wrote to certain members of the council and asked them to call those informal meetings, and it was therefore evident that some little misunderstanding must have taken place. There could have been no shadow of complaint if his instructions had been carried out. With respect to the subscriptions in arrear, the Finance Committee had made every possible effort to reduce the amount. It was to be regretted that the members of the institution could not see their way to pay their subscriptions when due, and he trusted the hint would be duly taken. Another matter to which the attention of the council had been called was the subject of a very nastily written letter which appeared in one of the professional newspapers dealing with the integrity of municipal surveyors. The council felt they could not allow the matter to be overlooked, or allow the meeting to pass without reference to it, and he proposed to move that the members of the institution strongly resented the imputations contained in the letter in question, which gravely reflected upon the integrity of municipal surveyors and surveyors generally.

Mr. W. H. Prescott (Tottenham) seconded, and said it should be made clear that the writer was a man holding a responsible position who supplied stone-breaking machinery to various municipalities. Their difficulty in the matter was that the writer had been careful not to make a specific charge against an individual. The writer made charges of bribery, and it was to be recalled that lately several well-known municipal engineers had found it necessary to bring actions to clear themselves from libellous imputations. In every case the charges were proved to be utterly false. Personally he was in favour of proceeding by way of criminal information in cases in which there was a doubt about the financial stability of the defendant. (Hear, hear.)

Mr. W. Nisbet Blair (St. Pancras) pointed out that the offensive passages in the letter were expunged by other professional journals, who had treated them honourably and fairly.

The report and balance-sheet was then adopted, and the resolution put from the chair was carried unanimously.

PRESENTATION OF PREMIUMS.

Premiums for papers read during the year were presented to the writers, whose names are set out in the annual report.

The new president, Mr. R. J. Thomas, M.Inst.C.E., having been invested with the chain and badge of office of the retiring president, proceeded to read his address, as follows:—

PRESIDENTIAL ADDRESS.

The recent confirmation by the Court of the Amended Memorandum of Association has brought to a conclusion the labours of your council, and particularly of the Constitution Committee, which, presided over by its indefatigable chairman, Mr. J. Patten Barber, considered in minutest detail various suggestions and proposals having as their objective the improvement of the professional status of members, and of the institution's position among kindred societies.

In such an organisation as ours there must necessarily be varied opinions and convictions relative to the best methods for hastening its development in practical utility and power; were it not so the incentive to progress and activity would be absent. Recent events have shown many divergent views in matters of detail affecting our welfare, but, inspired by the predominant desire to promote the best interests of the institution, mutual concessions have been made, and I have every faith that the amendments agreed to will be accorded hearty and loyal support by our members.

It is to be regretted that some of the recommendations made by the council, and adopted by the members, failed to secure the approval of the Government department having the power of veto, and had therefore to be amended in accord with its requirements; but it is confidently believed that the memorandum as now sanctioned will materially assist the institution in its efforts to advance the interests of its members individually and collectively. That this belief should prove well founded is my earnest desire, particularly in the interests of our younger members, to whom belongs the future of the institution.

DISTRICT REPRESENTATION.

We are entering upon the new system of district representation adopted by the members, and I fully believe that such alterations cannot fail to yield beneficial results, by stimulating local effort, encouraging intercourse between members located in each district where, presumably, many of the conditions and difficulties are common to all, and, by frequent meetings, bringing members into closer touch and within reach of that personal support and intercourse which so materially assists and encourages an engineer, who has perforce to carry out his arduous duties in professional isolation during the greater part of the year.

It will no doubt require time to secure perfect working of the new arrangement, but, with energetic district officers and committees, and whole-hearted support from their constituents, its benefits and advantages must, at an early date, produce substantial results, enhance the value of the institution to its members, and improve its position in the local government of the kingdom.

It is desirable that meetings be arranged in each district at the earliest possible date, to elect committees and determine the working arrangements. The discussion to be raised during this meeting should materially assist district officers in these preliminaries.

THE INSTITUTION EXAMINATIONS.

It is most encouraging to find that the number of candidates presenting themselves for examinations held by the institution is well maintained, although the educational qualifications required before applications to sit can be granted are now in accord with the requirements of modern professional life; as a consequence, there is an obvious improvement in the general quality and form of the answers given in the examinations, affording abundant promise of future distinction to the candidates and dignity to this institution.

To one who found the testamur of the utmost value at a critical period in his early career, nothing in the work of the institution appeals with greater force than these examinations, and I trust that members will continue to afford every opportunity to their assistants to prepare for and take part in them.

It is desirable to inform parents of prospective pupils that certain scholastic credentials are necessary prior to obtaining permission to sit for the examination, and that it is generally easier for a youth to obtain these before leaving school or immediately after than later.

SUPERANNUATION AND STATE PROTECTION OF OFFICIALS.

Superannuation is still unattained, although the National Association of Local Government Officers continues its efforts, supported by subscriptions and delegates from this institution; but, although recent rumours of early attainment may be too optimistic, it is difficult to comprehend how some public officials can longer be excluded from benefits granted to others having no more arduous or responsible duties to perform. It is much to be hoped that Imperial Parliament may make time to consider the long-overdue claims of local government, of which adequate superannuation of all officials who have given of their best to the common weal should form an early instalment.

No less important is the provision of State protection for officials whose duties inevitably bring them at times into conflict with those who endeavour to evade the requirements of public authorities, and who, having influence with members, and even themselves sitting upon such bodies, are prone to make a conscientious official's life a burden to him, and often succeed in securing his dismissal, unless he is prepared to abandon his principles and betray the trust placed in him by his employers.

It is too true that there are many instances of this in smaller towns and districts, where the emoluments are so small that the official is sorely tried in his efforts to provide honourably for those dependent upon him. That such cases should exist is an anomaly, as Departments of State which sanction loans, by-laws and regulations should afford protection to those officials responsible for their observance, and who, upon adequate investigation, are found to have carried these duties out faithfully and impartially.

Having had experience of the difficulties attached to communications and interviews with authorities whose treatment of their surveyors was, in the opinion of your council, such as to warrant protest, I am strongly of opinion that in a very large majority of cases this interposition of an institution having practically no executive power can secure but little relief to the officer, however cautiously and tactfully this interference between employer and employed is effected.

It is essential that either this institution should have far larger powers in this direction, or that the State should afford our profession the measure of protection accorded to others.

The opinion of our solicitor that the new memorandum of Association as amended by the Board of Trade precludes the use of the institution's funds to defray the costs incurred by a member in a recent libel action is most disappointing, and members are justified in feeling their regret that this desirable power has been denied them.

The alternative appears to be an independent fund raised by annual subscriptions, and, as steps have been taken to formulate a scheme, I feel confident that for such a desirable object members will gladly subscribe, so that a substantial fund can be established upon which a representative committee can draw in support of all cases which, after due investigation, are found worthy of financial support.

ROADS.

The past year has witnessed the active participation of the Road Board in the work upon our roads, and we can but regret that they are precluded from making any contribution towards the rapidly increasing maintenance charge. This presses especially hardly upon rural districts of small rateable value and encumbered with a large mileage of roads, many used in ever-increasing proportion by through traffic, heavy and rapid. The board's contributions towards the extra cost of employing materials and methods more suited to modern traffic must gradually retard that rapid growth in expenditure experienced during recent years, when roads adequate and suitable for the traffic of ten to twelve years ago have been found unequal to the task of sustaining the phenomenal growth of self-propelled traffic, and the annual cost for maintenance of which has risen a million during that period.

The assistance afforded to local authorities in widening exceptionally narrow roads, and in opening out dangerous corners must be of general advantage to the travelling public, especially as the policy adopted of providing an unobstructed view across dangerous corners and at intersecting roads, rather than rounding off such places, adds to the security of general traffic without facilitating more rapid negotiation of such corners.

That there are many difficulties to overcome and interests to be considered before the roads in this country can be straightened, widened and improved, so as to compare with those in countries of recent development, is exemplified by the divergent views expressed relative to the board's offer of a contribution towards the provision of a new and adequate approach road to London from the west.

Although the board's scope and powers are at present somewhat restricted, I believe the future will see important and far-reaching developments, when the fact becomes more and more evident that the traffic upon our roads is no longer local and intermittent, but national and constant, unrestricted by distance, time, or season, thus making it essential that national funds be allocated to the uniform maintenance of important highways, whether traversing thinly-populated and poor districts, where an expenditure of, say, £100 per mile means a 1s. rate, or those in crowded and wealthy areas, where a similar expenditure represents but a 1d. rate.

It is a matter of satisfaction and congratulation that the Engineering Consultative Committee of the board is composed of prominent members of this institution, whose technical knowledge and experience are of the highest and command the confidence of our profession.

The Third International Road Congress takes place in London next year, when I trust the members of the institution will be largely represented and assist in making the congress the most successful and beneficial yet held. The past few years have witnessed an exceptional advance in the practice of road construction and maintenance in this country, including the provision of mechanical appliances of the greatest utility, and unquestionably there is a mass of valuable information available if our members take their part in providing the congress committees now at work with the results of their investigations and practice.

I trust therefore that members who have not yet contributed the results of their experience will, at an early date, communicate with the honorary secretary of the congress or any members of the institution acting upon its various committees, by whom such information will be duly considered and incorporated in the reports to be submitted to the congress, as representing the opinion of road engineers of this country.

The inconsistencies and anomalies in the Highways Acts, the Motor Car Act, and the Heavy Motor Car Order, relative to weights permitted upon roads, licences payable, &c., are daily becoming more apparent, and further efforts should be made to secure their amendment and simplification, not only in the

interests of road authorities, but also of owners of some classes of self-propelled vehicles, now seriously handicapped in the keen struggle for existence.

Progress has been made in this direction by the institution in calling the attention of the Local Government Board and the County Councils Association to these urgently required amendments, and I am strongly of opinion that the institution should continue its efforts to secure early adjustment of these important variations, which are now responsible for needlessly heavy injury to roads maintainable by authorities already severely handicapped by the rapidly increasing expenditure due to the growth of general traffic. The introduction of the trackless trolley system between Leeds and Bradford is a new departure in this country which will be closely watched, as the possibilities it opens out, if successful, are considerable. The question of contribution to road upkeep by the owners of these vehicles is one that will merit consideration.

THE DUTIES OF MUNICIPAL ENGINEERS.

Recent additions to the municipal engineer's duties include those imposed by the Housing and Town Planning Act, and much progress has already been made in the difficult task of providing habitations for residents of the poorer class whose present abodes are required for widening or new street construction in congested parts of great towns; also in laying out and developing entirely new towns or colonies in rural surroundings; but in the latter case it is not certain that all recent enterprises have improved upon the ordinary suburban road or house, either in general arrangement, quality of work, or general effect. The adjustment of artistic aspirations to the essential requirements of modern by-laws is often difficult, sometimes impossible.

The duties and responsibilities of the local government engineer are ever increasing, the requirements of the public become more exacting, and the area of municipal work is constantly extended. It requires, therefore, ceaseless activity on our part to be abreast of the times and to make ourselves conversant with all recent developments in our profession, so that our authorities can, with every assurance, rely upon their officers when work of such a character is contemplated.

In the preparation necessary for this contingency our institution has a record of excellent service, the numerous visits paid to towns throughout the country having enabled members to inspect works of the latest and most modern types of which their designers have unreservedly afforded complete and minute descriptions.

That this practice will continue and develop I have not the least doubt, and its existence will add to the usefulness and power of this institution.

LOCAL AUTHORITIES' EXPENDITURE.

The increase in the expenditure of local authorities continues as new duties and responsibilities are placed upon them by the inevitable demands of a higher civilisation, and it is a matter of vital importance that the liabilities of the present and future ratepayer be fully considered and equitably adjusted.

The growth in expenditure defrayed by loan has been phenomenal, and the proportion of present-day rates required to meet these charges is rapidly increasing.

It is a matter worthy of serious examination whether the ease with which loans can be resorted to is not at times responsible for expenditure not entirely necessary and upon work of limited durability.

Consideration is desirable to the probabilities of future developments and discoveries superseding much of our modern practice, so making useless many undertakings upon which the loan charges have still to be paid, and which would in such cases be a burden upon our successors, who would presumably have, in addition, the responsibilities of their generation to meet.

THE INSTITUTION ORPHAN FUND.

No annual address is complete unless reference be made to our voluntary organisation for the relief of our helpless little orphans. Instituted by one of our most esteemed past-presidents, whose labour of love must assuredly be accounted not the least of his life's good works, this fund has accomplished much already in providing for and educating little ones made orphans by the decease of the breadwinner; and the information laid before the committee in these cases is of such a heartrending character that it has been a matter of extreme difficulty in many instances to afford relief in any degree adequate to the requirements.

Need I repeat that additional subscribers will be welcomed, however divergent the amounts they find it practicable to contribute, and that the entire income of the fund, less postages, is actually expended in direct relief to children of deceased members whom many of us have known, admired, and mourned.

CONCLUSION.

In conclusion, may I be allowed to thank you for placing me in this proud position, an honour which I prize more than words can express?

To profit by the example of the many illustrious men who have occupied this chair is my ambition. To equal their achievements is impossible; but with the assistance of the council and officials, and your generous forbearance, I will endeavour to discharge the duties pertaining to my position with the wholehearted desire to encourage our younger members, to promote the best interests of all, and to increase the usefulness and prestige of our institution.

Votes of thanks were passed to the president for his address, and to Mr. A. D. Greatorex for his services as president during the year.

(To be continued.)

ORPHAN FUND MEETING.

Mr. A. D. Greatorex, the retiring president, occupied the chair at yesterday morning's general meeting of subscribers to the Orphan Fund.

The minutes of the previous meeting having been read and confirmed, Mr. O. Claude Robson, the hon. secretary and treasurer to the fund, presented the

ANNUAL REPORT.

To the Subscribers to the Orphan Fund of the Institution of Municipal and County Engineers.

Gentlemen,—Your committee beg to report that while but little improvement can be recorded in connection with the subscriptions received towards the fund during the year ended December 31, 1911, they are nevertheless pleased to report that no serious diminution occurs in the annual income during the year, the amount subscribed having been £128 5s., as compared with £144 1s. 9d. in 1910, while the number of subscribers has been 149—a three less than in the preceding year.

Every endeavour has been made by circular and otherwise to augment the number of subscribers to the fund, so that the list may show a better proportion to the numbers enrolled upon the books of the Institution, but unfortunately the numbers remain very similar to those of previous years. It is, however, attributable to report that three members fallen out of the roll have paid their subscriptions, so that the list is but slightly reduced, while it has been found possible to provide grants to all those applying, to invest a further £50 in London County Stock, and to carry forward a balance of £120 1s. 1d.

The grants made have rendered assistance to six widows of late members of the institution towards the schooling and maintenance of their children, while one child still remains at the British Orphan Asylum, for which a presentation was purchased on May 15, 1909, for a period of seven years. Thus it has been possible for your committee to provide assistance towards the maintenance of thirteen children during the year, and they have also been enabled to satisfy all claims of a justifiable character that have been made upon the fund.

The market value of the stock invested at the end of the year was somewhat less than at a similar period in 1910, but owing to an additional investment during 1911 the dividends received were slightly more. The accompanying balance-sheet summarises the condition of the fund at the end of the year 1911.

The amended title of the Institution of Municipal and County Engineers necessitated a similar alteration in the title of the fund, which was duly effected at a special general meeting of subscribers, held on August 18, 1911, and the rules and regulations governing the fund were altered accordingly.

Your committee have to express their regret at the lamented death of the late Mr. J. T. Eaves, who had been a trustee of the fund from its inception, and had at all times taken an earnest and generous interest in its work. It will be necessary by Rule 26 to appoint

a new trustee in his place, for which purpose a special general meeting of the subscribers will be held after this meeting.

Your committee append a list of subscribers to the fund at the end of the year 1911, and would take this opportunity to again express their thanks to the secretaries of the various districts for the assistance they have at times rendered towards augmenting the fund by application for subscriptions at the vari-

CASH ACCOUNT FOR THE YEAR ENDING DECEMBER 31, 1911.

Dr.	£ s. d.	Cr.	£ s. d.
Balance brought forward, January 1, 1911	115 18 5	Grants to Orphans ...	108 15 0
Donations	2 5 6	Postages, Printing and Sundries	5 12 9
Subscriptions	104 18 6	Purchase of £56 14s. 6d. London County 2½ per cent Consolidated Stock	50 0 0
Interest on £148 Portsmouth Corporation 3½ per cent Stock	1 17 6	Balance	120 1 1
Interest on £22 L. & N.W. Rly 4 per cent Debenture Stock ...	0 11 0		
Interest on £160 West Ham Corporation 3½ per cent Stock	1 4		
Interest on £264 15s. 4d. Consols, 2½ per cent	6 1 8		
Int. on £165 14s. 10d. London County 3½ per cent Stock	12 15 4		
Return of Income Tax (4 years ending March 1911)	0 15 7		
Total	£284 8 10	Total	£284 8 10

GROSS ASSETS.

	£ s. d.
Balance on Current Account	120 1 1
London and North Western Railway Stock	196 0 10
Portsmouth Corporation Stock ...	148 10 5
West Ham Corporation Stock	91 0 0
Consols	264 4 0
London County Stock	295 11 0
Total	£1,151 7 4

Examined and approved
W. [illegible], Drew & Co., [illegible]

LONDON, 6 & 7, QUEEN STREET, E.C.
2nd May, 1912.

ous districts during [illegible]. Your committee attach [illegible] importance to the method of increasing the number of subscribers to the fund, and sincerely trust that renewed endeavours will be made at future meetings in this direction, while the subscribers themselves, in addition to their own generous action in connection with the fund, will do their best to induce their friends and brother engineers to follow their example.

LIST OF DONATIONS AND SUBSCRIPTIONS FOR THE YEAR ENDED DECEMBER 31, 1911.

NAME.	Donation.	Annual Subscription.	Total Contribution.
	£ s. d.	£ s. d.	£ s. d.
Angell, L., Eastbourne	—	1 1 0	1 1 0
Barker, J., Fatton, Ludlow	—	1 1 0	1 1 0
Barrett, E. J., Staines	—	0 10 6	0 10 6
Beaumont, A., Beverley	—	1 1 0	1 1 0
Beaumont, G. E., Grenoside ...	—	1 1 0	1 1 0
Bell, G., Seaham	—	0 10 6	0 10 6
Bentall, J., Brigg ...	0 10 6	—	0 10 6
Biggs, Mrs. E., Richmond	—	0 10 6	0 10 6
Blair, W. N., St. Pancras	—	1 1 0	1 1 0
Block, E. H., Westminster	0 1 0	—	0 1 0
Brierley, J. H., Richmond	—	0 10 6	0 10 6
Brodie, J. A., Liverpool	—	1 1 0	1 1 0
Brodie, J. S., Blackpool ...	—	1 1 0	1 1 0
Brown, A., Nottingham ...	—	1 1 0	1 1 0
Brown, E., Southall-Norwood ...	—	0 10 6	0 10 6
Burn, W., Sutton-in-Ashfield ...	—	0 5 0	0 5 0
Burton, A., Stoke-on-Trent	0 10 6	—	0 10 6
Bushrodge, J. A., Maidstone	—	0 10 6	0 10 6
Butt, E. E. W., Birmingham	—	0 5 0	0 5 0
Campbell, A. H., Edinburgh ...	—	1 1 0	1 1 0
Card, H., Lewes ...	—	0 10 6	0 10 6
Clowes, W. H., Burnham	—	0 10 6	0 10 6
Cline, J., Sheffield	—	0 5 0	0 5 0
Clarry, W. A. H., Sutton Coldfield	—	0 10 6	0 10 6
Clarson, H. J., Tamworth	—	0 5 0	0 5 0
Clews, G. A., Derby	—	0 10 6	0 10 6
Coales, H. F., Sunbury-on-Thames	—	0 5 0	0 5 0
Cockrill, J. W., Great Yarmouth	—	1 1 0	1 1 0
Cole, T., Westminster	—	1 1 0	1 1 0
Coleby, H. J., Atherstone	—	0 5 0	0 5 0
Collins, A. E., Norwich	—	1 1 0	1 1 0
Colmer, Adamson, A. C., Hoxton	—	0 5 0	0 5 0
Cook, E. C., Newcastle	—	0 10 6	0 10 6
Cook, F. P., Mansfield Woodhouse	—	1 1 0	1 1 0
Cooper, H., Wakefield	—	1 1 0	1 1 0
Cooper, F. A., Colombo, Ceylon ...	1 1 0	—	1 1 0
Cooper, L. A., Chiswick	—	0 10 6	0 10 6
Cornell, A. E., Southall	—	0 10 6	0 10 6
Davis, A. J., Shrewsbury	—	1 1 0	1 1 0
Dickinson, R., Berwick-on-Tweed	—	0 5 0	0 5 0
Diver, D. J., Marple	—	1 1 0	1 1 0
Douglas, Kenilworth	—	0 10 6	0 10 6
Dunn, J., Cambridge ...	—	0 10 0	0 10 0
Elford, E. J., Scarborough	—	1 1 0	1 1 0
England, J., Wrexham	—	0 10 6	0 10 6
Farrington, W., Woodford	—	1 1 0	1 1 0
Fieldian, W., Stourbridge	—	1 1 0	1 1 0
Finch, A. R., Kensington	—	1 1 0	1 1 0
Finch, H. T., Ingrave	—	0 10 6	0 10 6
Gamble, S. G., Southwark	—	0 10 6	0 10 6
Giles, H. A., Westminster ...	—	0 5 0	0 5 0
Gladwell, A., Slough	—	1 1 0	1 1 0
Goodyear, H., Gravesend ...	—	0 5 0	0 5 0
Grant, F. T., Gravesend ...	—	0 10 6	0 10 6
Greatorex, A. D., West Bromwich	—	1 1 0	1 1 0
Green, G., Wolverhampton	—	1 1 0	1 1 0
Gulbert, T. J., Guernsey ...	—	1 0 6	1 0 6
Gunnis, J. W., Longford, Ireland	—	1 1 0	1 1 0
Harpur, W., Cardiff ...	—	1 1 0	1 1 0
Hart, G. A., Leeds ...	—	1 1 0	1 1 0
Hayward, T. W. A., Battersea ...	—	1 1 0	1 1 0
Heath, J. Urmston	—	0 5 0	0 5 0
Hellawell, O., West Didsbury	—	0 10 6	0 10 6
Higgens, T. W. E., Chelsea	—	1 1 0	1 1 0
Hooley, E. Purnell, Nottingham	—	1 1 0	1 1 0
Horton, J. W., Derby	—	0 10 6	0 10 6
Howard, H., Littlehampton ...	—	0 10 6	0 10 6
Humphreys, H. H., Westminster	—	1 1 0	1 1 0
Hurst, W., Westminster	0 1 0	—	0 1 0
Hutton, S., Exmouth	—	0 10 6	0 10 6
James, A. C., Grays	—	1 1 0	1 1 0
Jenkin, C. J., Finchley	—	0 10 6	0 10 6
Jones, Lt.-Col. A. S., Finchhampstead	—	1 1 0	1 1 0
Jones, C., Ealing	—	1 1 0	1 1 0
Jones, H. O., Folkestone	—	0 5 0	0 5 0
Killick, P. G., Finsbury	—	1 1 0	1 1 0
Lacey, G. W., Oswestry	—	0 10 6	0 10 6
Lancashire, W. T., Leeds ...	—	1 1 0	1 1 0
Leete, W. H., Bedford	—	1 1 0	1 1 0
Lemon, Sir J., Southampton ...	—	1 1 0	1 1 0
Lovegrove, E. J., Horsham ...	—	1 1 0	1 1 0
Lower Thames Valley District Surveyors Association ...	—	1 1 0	1 1 0
MacBrair, R.A., Lincoln	—	0 10 6	0 10 6
Mansergh & Sons, Westminster ...	—	2 2 0	2 2 0
Massey, F., Wakefield ...	—	1 1 0	1 1 0
Mawbey, E. G., Leicester	—	1 1 0	1 1 0
Maybury, H. P., Maidstone ...	—	1 1 0	1 1 0
Maylan, S., Basford ...	—	0 10 6	0 10 6
Meade, T. de C., Manchester	—	1 1 0	1 1 0
Norris, J. H., Godalming	—	0 10 0	0 10 0
Oakden, R., Jun., Newark ...	—	0 10 6	0 10 6
Palmer, P. H., Hastings	—	1 1 0	1 1 0
Perkins, J., Birmingham	—	0 5 0	0 5 0
Pickering, J. S., Cheltenham	—	0 10 6	0 10 6
Platt, S. S., Rochdale	—	1 1 0	1 1 0
Price, A. J., Lytham	—	0 10 6	0 10 6
B. A. O. W. C.'s	1 11 6	—	1 11 6
Reed, R., Gloucester	—	1 1 0	1 1 0
Renwick, R., Horsham	0 5 0	—	0 5 0
Richardson, F. W., Aston Manor ...	—	1 1 0	1 1 0
Richardson, H., Hollesworth ...	—	1 1 0	1 1 0
Robson, O. Claude, Wilkeston ...	—	1 1 0	1 1 0
Rogers, W. E., Rugeley	—	0 10 6	0 10 6
Rushbrooke, A., Willesden	0 2 6	—	0 2 6
Salkield, T., Delhi	—	1 1 0	1 1 0
Scorgie, N., Hackney	—	0 10 6	0 10 6
Scott, H. H., Hove	—	1 1 0	1 1 0
Shipton, T. H., Oldbury	—	0 5 0	0 5 0
Silcock, E. J., Leeds	—	2 2 0	2 2 0
Smith, F. Hall, Sheringham ...	—	0 5 0	0 5 0
Stallard, S., Oxford	—	1 1 0	1 1 0
Stilgoe, H. E., Birmingham ...	—	1 1 0	1 1 0
Stubbs, W., Blackburn	—	0 10 6	0 10 6
Sumner, F., City Corporation	—	1 1 0	1 1 0
Surveyor, Editor of the ...	—	5 5 0	5 5 0
Thomas, R. J., Aylesbury	—	1 1 0	1 1 0
Travers, W. H., Egremont	—	0 10 6	0 10 6
Van Putten, E., Catford	—	1 1 0	1 1 0
Vincent, S. J. L., Newbury	—	1 1 0	1 1 0
Watson, J. D. Birmingham ...	—	1 1 0	1 1 0
Weaver, W., Putney Hill	—	0 10 6	0 10 6
Webb, J. A., Great Stanmore	—	0 10 6	0 10 6
White, A. E., Hull	—	1 1 0	1 1 0
White, W. H., Oxford	—	1 1 0	1 1 0
Whyatt, H. G., Grimsby	—	1 1 0	1 1 0
Wilding, J., Ramsgate ...	—	0 10 6	0 10 6
Wiles, J. W., Gorton ...	—	0 10 6	0 10 6
Wilkinson, F., Wimbledon ...	—	0 5 0	0 5 0
Willcocks, G. Waller, Rochampton ...	—	1 1 0	1 1 0
Willcox, J. E., Birmingham	5 5 0	—	5 5 0
Willis, E., Chiswick ...	—	1 1 0	1 1 0
Wood, O. E., Hampstead ...	—	0 10 6	0 10 6
Wolfenden, B. J., Bootle ...	—	0 10 6	0 10 6
Woodward, F., Stourbridge ...	—	0 10 6	0 10 6
Worrall, E., Old Trafford	—	0 10 6	0 10 6
Wrigley, G. E., Sowerby Bridge ...	—	0 5 0	0 5 0
Yabbicom, T. H., Bristol	1 1 0	1 1 0	2 2 0
[illegible]	2 9 3	—	2 9 3
Stratford-on-Avon, per Mr. H. Richardson ...	7 10 3	—	7 10 3
Croydon, per Mr. G. F. Carter ...	0 15 6	—	0 15 6

Mr. J. S. BRODIE (Blackpool) seconded the adoption of the report.

Mr. E. WILLCOCKS (Newcastle) thought the hon. secretary and treasurer was to be complimented on the position of affairs disclosed by the report before the meeting. Although they had dealt with thirteen cases during the year, they were able to show a balance of no less than £130. It was clear that they had not gone back in any way; the decrease in subscriptions was so slight that it was really not worth troubling about.

Mr. W. NISBET BLAIR (St. Pancras) said an important point to remember was that the assistance rendered by the fund had been given without reducing their invested capital.

Mr. R. L. THOMAS (Barking) congratulated the [illegible] an admirable balance-sheet with respect to the expenses [illegible] amounted to [illegible] —a wonderfully small percentage. Everything else had gone to the orphans.

The report was approved.

It was announced that Messrs. Cockrill, Hedley Jones and Willis had been elected to fill vacancies on the General Committee.

Mr. G. W. LACEY (Oswestry) proposed [illegible] Mr. O. Claude Robson as hon. secretary [illegible]

Mr. E. WILLCOCKS (Newcastle) seconded the proposition, which was carried.

Mr. ROBSON, in acknowledging the compliment, said he would do his best to carry on the work of the fund in the same way as his predecessor had done.

Mr. J. A. BRODIE (Liverpool) proposed a vote of thanks to the auditors, Messrs. Drew & Co., for their services.

Mr. W. NISBET BLAIR (St. Pancras) seconded the motion, which was carried.

Mr. R. L. THOMAS (Barking) proposed a vote of thanks to the chairman, Mr. Lacey, for presiding at the meeting.

Mr. LACEY, in acknowledging the compliment, said he would like to see the fund increased to £2,000, and he hoped that the subscribers would do their best to bring about that result.

Mr. E. WILLCOCKS (Newcastle) seconded the motion, which was carried.

who had anything to do with the fund would appreciate the value of the work done by Mr. Robson.

Mr. R. J. Thomas, in seconding, said it was difficult adequately to convey the extent of Mr. Robson's personal interest in the cases which came under his notice in connection with the administration of the fund.

The proposition was unanimously agreed to, and Mr. Robson returned thanks in brief terms. He could only say what he had said before, that he would do his level best in the interests of the fund. He must confess that he was somewhat disappointed that the list of subscribers was not a little more commensurate with the number of their members, but it was satisfactory that up to the present at any rate they had been able to meet all the claims which had been made upon the fund.

A special general meeting was held for the purpose of appointing a trustee to the fund in the place of the late Mr. J. T. Eayrs, Mr. S. Stallard (Oxfordshire) being unanimously selected.

The proceedings closed with a vote of thanks to the Chairman, who, in acknowledging the compliment, expressed the hope that the recent formation of district committees of the institution would result in a material increase of subscriptions to the fund.

THE NEW PRESIDENT.

Mr. R. J. Thomas, county surveyor, Buckinghamshire, the newly installed president of the Institution of Municipal and County Engineers, served his articles with his father, the late Mr. J. Thomas, county surveyor, Carnarvonshire, and after filling minor appointments at Croydon, Salisbury, and Carlisle, became engineer-in-charge of the restoration of the Shrewsbury and Holyhead Road when that highway came under the control of the county of Carnarvon. On the death of his father, Mr. Thomas was appointed county surveyor, holding that position until 1890, when he obtained his present appointment. He developed the system of direct maintenance in Buckinghamshire, where the main roads now exceed 500 miles in length, and organised the County Council's extensive scheme for contributions to district highways. In addition to numerous county bridges, he has erected, among other structures, court houses and police buildings, and carried out extensions to the lunatic asylum. Mr. Thomas is a member of the Institution of Civil Engineers, and a past president of the County Surveyor's Society.

A portrait of the new president accompanies this issue of The Surveyor in the form of an inset.

A RETROSPECT OF THE INSTITUTION.

By a Surveyor *Contributor.*

Early in the year 1870 the late Mr. Lewis Angell, M.Inst.C.E., then the surveyor of Stratford, London, wrote to the chairman of a Royal Sanitary Commission, then sitting on the preparation of the Public Health Act, 1875, calling attention to the unprotected position of the surveyor of a local board as compared with that of Poor-law officers, and suggesting that there should be an appeal to some Government office. The Local Government Board was not in existence at that date. He pointed out that he had no personal grievance, but he hoped that his suggestion would receive the consideration of the Commission. It is hardly necessary to say that no notice was taken of this appeal, and the commission made the following recommendation, the principle of which was eventually adopted in the Act of 1875: "That the officers of every local health authority should be appointed and removed by such authority; but medical officers of health should be appointed subject to the veto, and should not be removed without the sanction of the central authority; and inspectors of nuisances should be removable either by the central or local authority."

It is not the object of the present article to deal with the gross injustice of this decision, which appears to have been arrived at without hearing any evidence on behalf of the surveyor. But to pass on to Mr. Angell's next step. He circularised the whole of the surveyors in England and Wales asking them to unite for the purpose of protection, and suggesting the formation of an "Association of Local Board Surveyors." In reply to this circular Mr. Angell received "an immense number of letters of approval," and he then proceeded to write to various Government departments on the subject of protection. But, of course, nothing came of it.

However, the outcome of this loyal energy on the part of the late Mr. Angell was the formation in the year 1873 of the "Association of Municipal and Sanitary Engineers and Surveyors."

The inauguration of this important association was, as is often the case, quite simple. A meeting was held in March, 1871, in Mr. Angell's office, at which only Mr. Greatorex of Portsmouth, Mr. Jacob of Bromley, Mr. Monson of Acton, Mr. Angell of West Ham, and Mr. Jones of Ealing were present. Of these pioneers only Mr. Jones survives, and it is very interesting to note that he still retains his then position at Ealing, where he is held in the greatest respect. As far as "protection" is concerned there appears to have been no need for any anticipatory selfish motives in Mr. Jones' association with the movement. Mr. O. Claude Robson, of Willesden, who is still with us, should also be recalled as the first honorary secretary of the new body, of which he became president in 1898-9, and in connection with which his name will be honourably associated for all time in connection with the establishment of the Benevolent Fund.

In April, 1871, a conference of surveyors was held and a committee was formed.

In February, 1872, there was a general meeting, and a memorial was presented to the Local Government Board praying for "protection." It was signed by 135 surveyors, and a deputation was subsequently received by the then President of the Local Government Board, who heard their views, and in reply expressed his sympathy with the position and the grievances of local officers, suggesting at the same time, however, that if such protective clauses were inserted in the Bill [the subsequent Act of 1875], its passing might be jeopardised! So, of course, nothing came of it.

In February, 1873, a general meeting of local surveyors was held, and the formation of an association was unanimously agreed upon, as well as the rules, and the "Association of Municipal and Sanitary Engineers and Surveyors" sprang into life.

The inaugural meeting was held in May, 1873, was very largely attended by surveyors from all parts of England and Wales, and at this meeting the first council was formed, and consisted of the following—names which will interest those of us who have watched the great developments in municipal engineering during the thirty-nine years which have passed since this historic meeting was held. They are as follows: Angell of West Ham, Ashmead of Bristol, Dunscombe of Kingston-upon-Thames, Ellice-Clark of Ramsgate, Fowler of Salford, Greatorex of Portsmouth, Grindle of Hereford, Hornibrook of Reigate, Jacob of Barrow-in-Furness, Jones of Ealing, Lemon of Southampton, Lockwood of Brighton, Lynde of Manchester, Morant of Leeds, Stephens of Leicester, Thompson of Derby, Thorburn of Birkenhead, Marshall of Tottenham, and Wheeler of Boston. How many of these names now remain in the books of the institution? Certainly, with the exception of Mr. Jones, of Ealing, there is not a single one of the above-mentioned authorities which has not now another name as that of its surveyor!

In the year following there was published the first balance-sheet, which showed an income of £270 [practically for two years] and an expenditure of £203. It is interesting to compare this with the balance-sheet for this year, which shows an income for 1911 of £2,383, and an expenditure of £2,407, the slight excess of expenditure over income being merely due to exceptional circumstances.

Nothing of importance seems to have occurred in the history of the association until the year 1880, when Mr. Thomas Cole was unanimously appointed secretary, an office which he has since held with conspicuous ability and courtesy, and the growth and success of the institution has been in no small measure due to his efforts. It may be of interest to note that for this same year the income was £262, and the expenditure was £329. The following year the income was £216 and the expenditure £191, showing that the work of the newly appointed secretary had tended to the showing of a balance on the right side, and this seems to have happily continued ever since.

The examinations for diplomas in municipal engineering [illegible] instituted about this date (in 1884), and further activities followed.

In the year 1889 it was resolved that the association should be registered under the Companies Act, and in the following year this was carried into effect. It is interesting also to note that in this year the association was able to invest, for the first time,

The Surveyor

And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
Aerial Nuisance from Sewage Works	43, 79
Appointments Vacant	90
Assistants' and Students' Section	75
Association of Managers of Sewage Disposal Works: Annual Summer Meeting at Wolverhampton	79
Bridlington Waterworks	44
Construction and Maintenance of American Highways	84
English Garden City and Housing Schemes	78
Gyratory Traffic Regulations	43
Institute of Sanitary Engineers	90
Institution of Municipal and County Engineers: Annual Meeting	41, 58
Annual Report of Council	58
A Retrospect	12, 68
North-Eastern District Meeting at Bridlington	44
Notices	88
Orphan Fund Meeting	66
Presidential Address	64
West Midland District Meeting at Stourbridge	50
Institution of Municipal Engineers: Joint Eastern and North-Eastern District Meeting	86
Notices	89
Law Notes	76
Local Government Board Inquiries	70
Motor Fire Engine for Norwich	78
Municipal Competitions Open	90
Municipal Contracts Open	90
Municipal Work in Canada	84
Municipal Work in Progress and Projected	71
Northamptonshire Roads	75
Personal	75
Prevention of Aerial Nuisance from Sewage containing Brewery Waste: Deodorisation: Methods in use at Stratford upon Avon	43, 79
Recent Publications	88
Road Board Grants	82
Royal Institute of Public Health Congress in Berlin	89
Royal Sanitary Institute Congress at York	89
Sewerage of Fleet, Hants	85
Some Municipal Works at Stourbridge	50
Staffordshire Roads	42
Stockport Waterworks	69
Stourbridge and District Water Board's Undertaking	83
Stourbridge Gasworks	87
Tenders for Municipal Works or Supplies	92
Water Purification: An Efficient English System	42

moneys that had been saved by careful administration of its affairs. From this year also, until the year 1909, the institution was known as "The Incorporated Association of Municipal and County Engineers," it having been resolved to include county surveyors in the membership of the association.

Nothing of importance seems to have happened in the unbroken record of success until the year 1910, when it was decided, after considerable discussion, again to change the title of the association to that of "The Institution of Municipal and County Engineers," the name which it now bears.

The roll of the institution now contains the names of members representing nearly all the more important towns of Great Britain, as well as those of the engineers and surveyors of counties, urban and rural districts, and many Colonial municipal engineers—in fact, nearly all those who are eligible for election. It would be impossible in the limits of an ordinary article even to epitomise all the excellent work which the institution has from time to time carried out. Suffice it at present to say that the institution, born in 1873, has now passed a vigorous manhood and nearly forty years of existence, and that it is hoped that the coming year will see a further active growth under the able and energetic guidance of its new president, Mr. R. J. Thomas, the well-known county surveyor of Bucks, and its representative vice-presidents and council.

Compulsory Open Windows.—Chelmsford Rural District Council this week made an order compelling owners of cottages to make it possible for their windows to open. It was stated that some cottage windows had never been opened, as they were not made to open.

Lincoln Water Supply: New Works Completed.—The city of Lincoln's new water supply scheme, which has cost £225,000, was practically completed on Wednesday, when the Mayor turned on the valve of the Bracebridge Heath reservoir. The reservoir has cost £27,000. It has a capacity of 60,000,000 gallons, equal to more than a three days' supply for the city.

STOCKPORT WATERWORKS.

INAUGURATION OF KINDER RESERVOIR.

Yesterday saw the inauguration of the Kinder reservoir works of the Corporation of Stockport.

When in 1899 the corporation acquired the water undertaking the area of supply was rather more than 70 sq. miles in extent, and the population supplied numbered about 140,000; the quantity of water available was some 3,250,000 gallons a day. The corporation then decided that the existing supplies, obtained from works at Lyme Park, Disley, and Wilmslow, coupled with water available from Manchester, were insufficient for the growing needs of the district, and in 1901 necessary Parliamentary powers were obtained for the construction of works on the Kinder, Rett, and Hollingworth Clough streams, in the neighbourhood of Hayfield. The rainfall here has been found to be on the average about 45 in. a year, and the supply to be obtained is expected during a drought to amount to between 4,000,000 and 5,000,000 gallons a day.

The new reservoir has a capacity of 515,000,000 gallons and an area of about 44 acres. It is at the foot of Kinder Scout. The embankment by which the reservoir is formed is nearly 1,200 ft. in length, and the height from the bed of the river to the top is about 116 ft. At the ground level the maximum width is 590 ft., and the width at the top 14 ft. Provision has been made for dealing ultimately with 5,000,000 gallons a day. The water, after being filtered, will pass into two tanks adjoining the south side of the filter-house, with a capacity of 1,250,000 gallons each.

The works have been carried out by Messrs. G. H. Hill & Sons, engineers, of London and Manchester, with Mr. Basil Mackenzie as works manager, and Mr. A. M. Fairbairn as resident engineer.

L.C.B. and Proposed Municipal Golf Course.—On the ground that the price is excessive, the Local Government Board have refused a loan of £10,000 applied for by Yarmouth Town Council in connection with a golf course scheme. The council proposed to acquire 85 acres of sandy denes along the seashore between Yarmouth and Caister. The trustees of the Yarmouth Golf Club, which has amalgamated with the Caister Golf Club, in order to provide a full 18-hole course, proposed to sell this land to the corporation for £10,000, and then to take it on a thirty years' lease from the corporation, at an annual rental of £300, the land reverting at the end of the term to the corporation, who proposed to take the old golf links and make a municipal course.

Paris Housing: £8,000,000 Loan.—The Government Bill authorising the loan of £8,000,000 voted by the municipal council for the construction of cheap dwellings has been signed by the President of the Republic, and was laid upon the table of the House on Tuesday. Out of the proceeds of the loan the City of Paris will lend £2,000,000 to societies for the construction of cheap dwellings. The residue will be applied by the Municipal Council to the construction, the acquisition, or the sanitary improvement of buildings containing lodgings. Two-thirds of these lodgings, calculated according to the rental value, are to be reserved for families with more than three children under sixteen. The rest will be fixed within the maximum and minimum limits determined by the Cheap Dwellings Act now being discussed by the Chamber.

Municipal Engineering (Edited by Sydney G. Turner, ASSOC.M.INST.C.E. Price 3s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.).—This volume consists of model answers to questions set at recent examinations of the Institution of Municipal and County Engineers, and is the second edition. It is practically identical with the first issued. It is not suggested that it should take the place of recognised text-books, but it provides useful summaries of various subjects, as well as indications as to how different types of questions may be answered. Every effort has been made to render the answers as accurate and comprehensive as possible, though they contain more than a candidate would be expected to supply. The answers are founded upon examinations held in Birmingham, London and Manchester. The appendix contains examples of questions on sewerage, sewage disposal, tramway construction, bridges, water supply, road construction, buildings, sanitary science as applied to towns and buildings, drainage, and other matters. It will be seen, therefore, that the book is comprehensive, practical and exhaustive.—*Local Government Journal.*

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Balby U.D.C. (June 19th. Mr. R. G. Hetherington).—£1,373 for works of sewerage and surface-water drainage. The extension of the council's sewerage works has become necessary through the overflow of the Doncaster population into the Balby-with-Hexthorpe area, and the increase in the population brought about by the sinking of the Yorkshire Main Colliery in the adjoining parish of Edlington. Mr. G. Gledhill, surveyor to the council, said it was proposed to proceed with the sewerage for the new houses built as early as possible, as some of the houses were practically completed, and the owners wanted to let them. The council had accepted a contract for £1,415 for the whole of the work. With regard to the future, Mr. Gledhill said that in Balby they would eventually draw into the Balby area 6,063 houses, and into the new area 6,065, making a total of 12,128 houses. Hexthorpe is mainly drained through the Doncaster Corporation system. Dr. Wilson, of the West Riding Rivers Board, expressed the opinion that in the next ten years Doncaster and district would increase more than any other part of the West Riding. The surveyor submitted and explained the plans, which concluded the inquiry.

Bray U.D.C. (July 3rd. Mr. P. C. Cowan).—£10,000 for the purpose of erecting working class lodging houses, and £1,000 for laying new water mains. It was stated that at various times the council had erected houses, and now owned in all some ninety-one houses. Mr. P. H. McCarthy, surveyor to the council, also gave evidence.

Chelmsford T.C. (June 25th. Mr. Edgar Dudley).—£840 for the purpose of defraying the council's share of the cost of widening Baddow-road, and £3,920 for widening and improving Rectory-lane and New-street. With regard to the former amount, the town clerk, Mr. W. Smith, explained that it was required for the purchase of the Old White Hart premises, in order to widen a dangerous corner at the entrance to Baddow-road from High-street. Referring to the Rectory-lane and New-street widening, the town clerk said there was an extraordinary amount of traffic along those roads, and, as the Rectory estate was being sold for building purposes, the council thought it most essential that they should avail themselves of an opportunity for widening the road. The surveyor, Mr. T. P. Harrison, gave details as to the proposal to put down a special paving in New-street, from the point where the present wood paving ends.

Southampton T.C. (July 5th. Mr. F. H. Tulloch).—£12,653 for street improvement. There was no opposition, and Mr. R. R. Linthorne, the town clerk, and Mr. J. A. Crowther, the borough engineer, formally stated their case. At the conclusion the inspector visited and examined the roads in respect of which the loans were asked.

Waterloo-with-Seaforth U.D.C. (July 3rd. Major J. Stewart).—£10,750 for the purchase of property for the widening and improvement of Crosby-road North, Mount-pleasant, and Seaforth-road. Mr. H. P. Cleaver appeared on behalf of the council, and stated that to carry out the improvements it was necessary to acquire certain business premises as well as dwelling houses. They were not leaving derelict land at any point, but were utilising everything.

APPLICATIONS FOR LOANS.

Atherstone R.D.C.—£3,000 for the provision of twelve [illegible]

Burnley T.C.—£197 for alterations to a school.

Carnarvon T.C.—£500 for a brick chimney stack for [illegible]

Chester T.C.—£4,000 for a sewerage scheme.

Darlington T.C. [illegible]

Driffield R.D.C. [illegible]

Hadleigh U.D.C. [illegible]

Harrogate T.C. [illegible]

Hereford T.C.—£1,000 for laying electricity services.

Horwich U.D.C. £1,827 for new streets, £570 for street [illegible]

Meriden R.D.C.—£200 for the extension of the water mains.

Middleton T.C.—£5,200 for electricity cable required during the ensuing five years.

Newbury T.C.—£3,310 for the purposes of school provision.

Poole T.C.—£300, a further loan for a steam disinfector, making £1,075.

Quorn U.D.C.—£503 for alterations to the Hall.

Romford U.D.C.—£520 for a road improvement.

Rye T.C.—£300 for a caretaker's house at the cemetery.

Stoke-on-Trent T.C.—£1,928 for a school site.

Stroud U.D.C.—£1,000, further loan for sewage disposal works.

Walthamstow U.D.C.—£1,984 for alterations to school buildings.

Wednesbury T.C.—£1,000, additional loan for extension to the municipal offices and public baths, making a total of £6,000.

Woolwich B.C.—£50,000 for the electricity undertaking.

LOANS SANCTIONED.

Acton U.D.C.—£1,000 for fire hydrants.

Bacup T.C.—£2,555 for repaving with granite setts.

Belfast T.C.—£10,000 for motor fire appliances.

Billericay R.D.C.—£800 for a sewerage scheme.

Brighton T.C.—£8,700 for the redemption of mortgages and debenture debts.

Chapel-en-le-Frith R.D.C.—£4,000 for a new reservoir.

Chichester T.C.—£875 for making up two streets.

Clacton-on-Sea U.D.C.—£2,122 for paving the cliff promenades.

Harrogate T.C.—£3,307 for public baths extensions.

Hastings T.C.—£10,000 for road widening and constructing new roads.

Selby R.D.C.—£300 for water supply works.

South Shields T.C.—£6,484 for street repairs.

Teddington U.D.C.—£1,890 for making up Blackmore's-grove and Cambridge-road under the Private Street Works Act.

Torquay T.C.—£7,000 for the extension of electricity mains.

FORTHCOMING INQUIRIES.

JULY.	£
16.—**Barnard Castle.** For water, sewerage, and public convenience purposes (Mr. A. A. G. Malet)	2,971
16.—**Barrow-in-Furness.** For electricity purposes (Mr. T. C. Ekin)	22,000
16.—**Exeter.** For a housing scheme (Mr. Wm. Henry Collin)	8,847
16.—**Rhyl.** For the purchase of Rhyl Pier (Mr. P. M. Crosthwaite)	52,780
16.—**Rotherham.** For water supply purposes (Mr. A. W. Brightmore)	14,027
16.—**West Hartlepool.** For the construction of a new road (Mr. F. H. Tulloch)	586
17.—**Hartlepool.** For a new cemetery (Mr. F. H. Tulloch)	2,775
17.—**Hexham.** For sewage disposal purposes (Mr. A. A. G. Malet)	1,180
17.—**Ilford.** For the purchase of land for a dust destructor (Major C. E. Norton)	1,057
18.—**Birkenhead.** For gas and park purposes (Mr. P. M. Crosthwaite)	32,581
18.—**Oldham.** For electricity purposes (Mr. T. C. Ekin)	—
18.—**Scarborough.** For street widening purposes (Mr. F. H. Tulloch)	390

A Vacuum Street Cleaner.—The tramway tracks in the city of Strassburg will hereafter be cleaned by means of a vacuum cleaner recently adopted. In form and appearance it resembles a box car, and is equipped with drive and vacuum cleaner motors. The dirt is first sprinkled and then sucked up into the car by the vacuum apparatus. This device enables one man to clean 25 miles of track per day, which is equivalent to the output of seventeen men under old conditions.—From *Engineering and Contracting.*

Municipal Work in Progress and Projected.

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The following are among the more important projected works of which particulars appear below: Buildings—Glasgow £150,000, Lurgan £10,000, Poole £2,823; housing and town planning—Hendon; refuse collection and disposal—Pontypool; roads and materials—Woolwich £3,500; sewerage and sewage disposal—Bognor £10,480, Oakengates £13,450; Rainham £10,750, Whitstable; miscellaneous — Leamington, Ramsbottom.—Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Beverley T.C.—The Mayor (Captain H. Samman) has given a site for public baths.

Birmingham T.C.—The bridge in Aston Church-road is to be reconstructed and the approaches widened and improved.

Coventry T.C.—The tender of Garlicks, Limited, at £2,433, has been accepted for the construction of a public mortuary.

Dumbartonshire C.C.—A site has been purchased near Drumchapel for the erection of a small-pox hospital.

Dundee T.C.—The Lochee branch public library has been reconstructed, at a cost of £1,300.

Essex C.C.—The tender of Mr. A. E. Symes, of Stratford, at £16,777, has been accepted for the erection of a new secondary school at Southend. The tender of Messrs. Clemens Brothers, at £2,575, has been accepted for additions to the asylum.

Frome R.D.C.—The reservoir at Wurry Catch is to be enlarged, at a cost of £160.

Glasgow T.C.—The council have approved of the general conditions for the competitive designs to be invited from outside architects for the proposed extension of the municipal buildings. Mr. John J. Burnet, LL.D., A.R.S.A., has been appointed by the corporation to act for them in the competition, which closes on October 29th. The corporation are advised that a building suitable for their requirements should be obtained for £150,000, including the expense of alteration of the existing building.

Greenock T.C.—A committee of the town council has recommended the provision of public baths and washhouses in Ann-street.

Ilford U.D.C.—The surveyor, Mr. H. Shaw, has been instructed to confer with the Wanstead surveyor, Mr. C. H. Bressey, with the object of preparing designs and estimates for the construction of a 50-ft. bridge to take the place of the existing Red Bridge.

Lichfield T.C.—The new central school in Frog-lane is estimated to cost £3,300. Mr. Fred. T. Beak, of Wolverhampton, is the architect, and the contractors are Messrs. Thornloe & Sons, of Lichfield.

Lurgan U.D.C.—An industrial dwellings scheme is to be carried out, at a cost of £10,000.

Poole T.C.—A new infants' school is to be built, at an estimated cost of £2,823.

Spalding R.D.C.—The tender of Mr. G. Barnsdale, at £998, has been accepted for the erection of six cottages.

Staffordshire C.C.—The tender of Mr. W. Roe, of Wolverhampton, at £4,387, has been accepted for the erection of a new school at Upper Penn.

Woolwich B.C.—The tender of Messrs. E. Proctor & Sons, of High-street, Plumstead, at £1,050, has been accepted for the construction of an underground convenience in Beresford-square.

HOUSING AND TOWN PLANNING.

Hendon U.D.C.—In accordance with a suggestion by the Local Government Board, the council have amended plans for the erection of artisans' dwellings by increasing the number of bedrooms from two to three.

Merton U.D.C.—The surveyor, Mr. G. Jerram, will submit to the Housing and Town Planning Committee particulars of a scheme embracing the whole of the West Barnes Ward, and such portions of the Bushey Mead Ward as may, in his opinion, be advantageously dealt with at the same time.

PARKS AND OPEN SPACES.

Whitby U.D.C.—It has been decided to purchase the Spa and grounds, extending from Khyber Pass to near White Point, for £4,550, including the cliff face, sands and foreshore, and to ask for five years in which to make a marine drive from beyond the Metropole Hotel to the existing road near White Point.

REFUSE COLLECTION AND DISPOSAL.

Leith T.C.—It has been agreed that the scavengers' wages should begin at 24s. per week, rising to 25s. at the end of six months, and to a maximum of 26s. at the end of twelve months, with 2s. extra when on duty on Sundays. The men are also to be given three days continuous holidays in the year.

Pontypool U.D.C.—A proposal to construct a refuse destructor, at a cost of £1,500 has been rejected, and alternatively it has been decided to seek a new tipping site.

Ramsbottom U.D.C.—A tender has been accepted for the erection of a refuse destructor and steam disinfector, at an estimated cost of £4,300.

Wednesbury T.C.—A disinfector is to be provided, at an estimated cost of £350.

ROADS AND MATERIALS.

Banff C.C.—It has been agreed by the Upper Banffshire District Committee to carry out improvements at the part of the main road at Tomnavoulin termed "Sojers' Hill," at an estimated cost of £125, exclusive of haulage.

Middlesex C.C.—The following proposed works have been approved. Relaying with creosoted deal woodblocks the wood paving in Willesden-lane (main road), Willesden, £1,052; one-fourth of the cost of relaying with creosoted deal wood-blocks the wood paving in Canterbury-road, Willesden, £187; a moiety of the cost of relaying with creosoted deal wood-blocks the wood paving in Salusbury-road, Willesden, £72; and a moiety of the cost of substituting rock asphalt for creosoted deal wood-blocks in Malvern-road, Willesden, £1,455.

Perth T.C.—The Work and Paving Committee have presented a report recommending the council to purchase a bituminous mixing plant.

Southport T.C.—The widening of Lord-street, for which a loan of £700 was sanctioned, has been completed. The cost is inclusive of £200 for the purchase of the necessary land.

Woolwich B.C.—Powis-street is to be repaved with wood blocks at a cost of £3,500.

SEWERAGE AND SEWAGE DISPOSAL.

Arundel T.C.—The surveyor, Mr. E. F. Farrington, has been instructed to prepare plans for alternative schemes for sewers in South Marshes.

Belfast T.C.—The Improvement Committee have accepted the tender of the British Welding Company, Glasgow, for the supply of cast-iron pipes in connection with the drainage works.

Bognor U.D.C.—A scheme of sewerage, estimated to cost £10,480, has been adopted. The proposed works include an outfall pipe (£6,440), building and sumps (£2,530), and engines, pumps and elevator (£1,510).

Epsom R.D.C.—The Local Government Board have written stating that the subsoil of the land proposed to be purchased for the extension of the sewage works is clay, and therefore unsuitable, and that the council should consider whether it would not be better to construct additional filters on the present site, and that on this the council should consult an experienced engineer, a copy of whose report should be sent to the board. The council last week decided to inform the board that the land in question is exactly similar to that on which are the existing works, and that the contract to purchase it lapses by the 21st inst.

Hove T.C.—The Works Committee recommend the council to accept the tender of Messrs. Parsons & Sons, Hove, for constructing new sewers in Queen's-gardens, Grand-avenue, The Drive, Holland-road, and Davigdor-road at a cost of £6391; also that of the same contractor for carrying out new street works in Lorna-road (west end of Selborne-place) for £89.

Laurencekirk T.C.—The tender of Messrs. Wellwood & Lunan, of Bowhill, Cardenden, at £1,333, has been accepted for the construction of sewage disposal works.

Middlesbrough T.C.—The borough engineer, Mr. S. E. Burgess, reports that the Stockton-road sewer is almost completed, and that the cost would be £1,393, or £350 within the estimate. The work was carried out by the works department under the supervision of a clerk of works.

North Bromsgrove U.D.C. — At a council meeting recently Mr. Robert Green, M.Inst.C.E., of Birmingham, was instructed to prepare the necessary detailed drawings, &c., for submission to the Local Government Board for sewering and dealing with the sewage of Plymouth-road, Twatling-road, Station-road, and Fiery-lane, Barnt Green.

Oakengates U.D.C.—Proposals for sewerage extension are estimated to cost £13,450. The engineers are Messrs. Berrington, Son & Watney, of Wolverhampton.

Rainham U.D.C.—A sewerage and sewage disposal scheme is to be carried out at an estimated cost of £10,750. The engineer is Mr. S. B. Grant, of Sittingbourne.

Romford U.D.C.—A Blackstone crude-oil engine of the H.C. type and 45 b.h.p. is to be provided at the sewage farm at a cost of £325.

Whitstable U.D.C.—The council have adopted the scheme for the treatment and purification of the sewage prepared by Mr. Weeks, of Messrs. Strachan & Weeks, of Westminster.

WATER, GAS, AND ELECTRICITY.

Alnwick U.D.C.—The tender of the Alnwick Gas Company, at £507, has been accepted for a period of five years for lighting the town.

Ashby R.D.C.—The tender of Messrs. W. Moss & Son, of Coalville, at £170, has been accepted for laying on the Coalville water to the New Swannington area.

Belfast T.C.—The report of the Gas Committee on the past year's working of the department states that, after paying dividends and sinking fund, they had set aside to reserve fund £20,000; insurance of works, £3,200; and contingent renewal fund, £6,000. They had also contributed £10,000 to the general purposes fund in aid of the rates, and £11,355 for the dividends and sinking fund of the new city hall, a total of £21,355, and they carried forward the balance of £19,353.

Billinge U.D.C.—In connection with the extension of the waterworks, the council have accepted the tender of the Staveley Coal and Iron Company for pipes, and the tender of Messrs. Blakeborough & Sons for fittings and special pipes.

Cardiff T.C.—Prospective unemployment is to be provided against, as far as possible, by the determination of the Waterworks Committee to continue the relaying of the mains during the ensuing winter, and also the cleaning of the filters at the Heath and Rhubina.

Falkirk T.C.—It has been arranged to alter the lighting system. Certain old burners are to be replaced by swan-neck burners, and each different type of burner is to be controlled by a meter of its own class. Round globes are to be replaced as occasion arises by square lanterns, and the whole lighting system is to be converted in two years according to a plan suggested by the burgh engineer.

Llandudno U.D.C.—It has been agreed to adopt an automatic street lighting and extinguishing apparatus with which the engineer had been experimenting, and on which he reported favourably. The apparatus will be adapted to fifty-three lamps, at a cost of £77 a year, and it is estimated that the annual saving will be £29.

Market Harborough U.D.C. — The remainder of the lamps not at present lighted and extinguished automatically are to be fitted with the "A & M" patent automatic-pressure controllers, at an estimated cost of £225.

Plymouth T.C.—A nett profit of £8,361 was earned by the water undertaking during last year.

St. Helens (Isle of Wight) U.D.C.—Plans, specifications and estimates have been approved for the construction of a reservoir on a field known as Broomlands, St. Helens, at an estimated cost of £1,600.

St. Pancras B.C.—The Electricity Committee recommend the acceptance of the tender of Messrs. Bruce, Peebles & Co., Limited, at £5,310, for two 1,000-kw. motor generators.

Selby R.D.C.—The Local Government Board have given their consent to an extension of the Cawood water supply scheme, at a cost of £300, the amount being paid out of the unapplied balance in hand.

Stockton T.C.—The extension of the gas undertaking, at an estimated cost of £30,000, is under consideration.

Stoke Newington B.C.—The tender of Messrs. Bruce, Peebles & Co., Ltd., at £1,720, has been accepted for a 400-kw. motor converter at the transformer station.

Sunderland T.C.—A nett profit of £5,957 is reported on the year's working of the electricity undertaking.

York T.C.—A report has been presented from the Gas Committee, giving the result of the negotiations with the gas company, which had been provisionally agreed to, subject to the approval of the corporation and Parliament. The undertaking to purchase includes all reserves, amounting to £25,000, which will be purchased at the figures at which they stand, with some floating balances and other funds, and all the works. The capital of the company is £42,000, yielding 4 per cent dividend, and is quoted at £93.

MISCELLANEOUS.

Barry (Glam.) U.D.C.—In furtherance of a proposed improvement scheme at Whitmore Bay, Barry Island, the surveyor, Mr. J. C. Pardoe, has been instructed to draw up an estimate of the cost of two schemes—(1) to cover the entrance to the sands and provide a shelter; (2) to provide a similar shelter, with six shops and a pavilion roof, which would form a further shelter, and for entrance to which a charge should be made.

Leamington T.C.—The Fire Brigade Committee have been authorised to purchase a motor fire engine, at a cost not exceeding £1,000.

Ramsbottom R.D.C.—Contracts for the construction of a railless traction service between Holcombe Brook and Edenfield will shortly be entered into by the council. The route is 3½ miles in length, and the cost is estimated at £10,000, which includes the installation of three cars, overhead fittings, waiting-rooms and car sheds. The estimated cost of running per mile is 8½d., which also includes sinking fund and interest charge and full equipment.

Tipton U.D.C.—The surveyor, Mr. W. H. Jukes, has submitted a list of quantities of provender used for four weeks, from which it appeared that the cost of horse keep amounted to 14s. 6d. per horse per week.

Oil Testing Machine. — The Stern Sonneborn Oil Company, Limited, Royal London House, Finsbury-square, E.C., have issued an illustrated pamphlet giving particulars of the Sternol oil testing machine. This machine is considered to represent an important step in the scientific testing of oils, as by its means comparative values of lubricating and cylinder oils and greases can be established under actual working conditions at the actual temperature and pressure the lubricants undergo in practical use.

Law of Private Street Works.—It is surely a commentary on our system of legislation relating to what may be termed domestic matters that the owner of house property (to say nothing of the occupiers of his houses) has to thread his way through a maze of statutes and decisions to ascertain his rights and his liabilities in connection with questions which may arise every day. Such, however, being the case, text-books dealing with what on the face of them might be deemed to be simple matters have become an actual necessity, although the owner of property is lucky if the text-book suffices and he is not driven to consult a specialist. The work before us* deals with one of such subjects, private street works under the Public Health Acts and the Private Street Works Act, 1882, but not with the Metropolitan Management Acts; the statements in the text are supported by decided cases, with references printed in the text; there is also a table of cases and an index, and it should prove a useful hand-book. We find the recent decisions included, and the work seems to have been carefully prepared.—*The Builder.*

* "Notes on the Law of Private Street Works under the Public Health Acts." By J. B. Reginier Corder, a Solicitor of the Supreme Court. 4s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.

PERSONAL.

Mr. P. H. Palmer, borough surveyor of Hastings, has had his salary increased to £800 per annum.

Mr. Reginald Blomfield, A.R.A., F.S.A., has been elected president of the Royal Institute of British Architects, in succession to Mr. Leonard Stokes.

Mr. E. J. Harber, surveyor, civil and sanitary engineer, and estate agent, has removed from 118, Colmore-row to Union Chambers, 63 Temple-row, Birmingham.

Mr. J. Kirton, surveyor to the Withernsea (Yorks) Urban District Council, has been presented with a silver cake-stand, subscribed for by the members of the council and officials, on his approaching marriage.

Mr. A. E. S. Murray, assistant engineer of the outfall works of the West Kent Sewerage Board, has been appointed superintendent of the works, at an increased salary of £20 per annum, and has been provided with a motor-cycle.

Mr. B. Kilner, of Sedbergh, has been appointed highway surveyor to the Wetherby (Yorks) Urban District Council, in place of Mr. R. A. Watson, who has received a similar appointment under the Derby County Council.

Mr. P. M. Wakefield and Mr. C. K. Robertson, two members of the engineering staff of Mr. Charles J. Jenkin, M.INST.C.E., engineer and surveyor to the Finchley U.D.C., were last week successful candidates for vacant public positions, Mr. Wakefield being appointed assistant surveyor to the borough of Harwich and Mr. Robertson engineering assistant to the borough surveyor of Luton.

Mr. H. C. Phillips, surveyor to the Hursley (Hants) Rural District Council, apropos of the new scheme by which the county council have undertaken the direct maintenance of main roads in the council's district, has been informed that no alteration will be made in his salary as a consequence of the change. In addition the council complimented Mr. Phillips upon the ability he had shown in the performance of his duties.

Mr. Allan Waters, the city engineer of Nanaimo, British Columbia, was born in Sussex, in 1868, and was educated at the Collegiate School, Tunbridge Wells. On leaving school he was articled to Mr. S. W. Haughton, M.S.A., architect and surveyor, and upon the completion of his articles entered the office of a London architect and district surveyor. Later he acquired architectural experience in the Midlands, which he left for South Wales upon his appointment as assistant-surveyor to the Barry and Cadoxton local boards. Afterwards he entered the offices of the now defunct Metropolitan Board of Works. In 1893 Mr. Waters received an appointment on the staff of the director of works of the Admiralty, and in 1896 was made officer-in-charge at the Halifax (Nova Scotia) Naval Yard. Returning to England in 1899, after a short period at the Admiralty offices, he was sent out to the Island of Ascension, immediately before the outbreak of the Boer War, as engineer-in-charge of various works of fortification, water supply, and new buildings, and on his return to England he was awarded a gratuity for his services. Upon the termination of the Boer War Mr. Waters left the Admiralty and went to the Northern Transvaal to join three brothers who had served through the campaign, and among his various commissions was the preparation of reports on irrigation schemes and several important works of building construction. Later he accepted an engagement with Mr. D. Leitch, engineer of the Johannesburg Municipality. In 1906 he left the Transvaal for Australia, and having obtained an appointment with the Ferro-Concrete Company of Australia he proceeded to Auckland, New Zealand, where the company had extensive contracts from the Harbour Board for the reconstruction of large reinforced concrete wharves and docks. Upon the completion of this work Mr. Waters accepted a position with the City Engineer of Auckland, but in 1909 left there for British Columbia, and was appointed city engineer of Nanaimo after a short term with the Provincial Lands Department.

Institution of Water Engineers. — The concluding instalment of our report of the recent summer meeting of the Institution of Water Engineers is unavoidably held over until next week.

NORTHAMPTONSHIRE ROADS.

COUNTY SURVEYOR'S REPORT.

No alteration in or addition to the mileage of main roads in Northamptonshire is reported by the county surveyor, Mr. Charles S. Morris, in his recently published eleventh annual statement.

The total cost of maintenance (exclusive of improvements and Road Board work) was £25,319, which is £719 over last year, and £510 over the average for the past three years. The total cost, including improvements, was £26,480, which is £200 over last year, and £447 over the average for the past three years. This is accounted for by the fact that over 2,000 tons more metal was applied to the rural roads, while the cost of night watching during the progress of the work has also to be allowed for. The cost per mile, exclusive of improvements, was £79·54, and, inclusive of improvements, £83·19.

A total quantity of 28,405 tons of granite and granite chippings, 449 tons of local chippings, and 334 tons of slag chippings was purchased during the year, and practically the whole quantity applied to the roads. The total (29,188 tons) is the largest quantity applied in any year since the passing of the Local Government Act of 1888.

The three steam rollers have been regularly at work (except when stopped for repairs or by frost), and an additional roller was hired for a period of seventeen weeks. The total quantity consolidated was 27,120 tons, at a cost of £649 19s. 7d., or slightly under 6d. per ton (5·72d.). The expenditure includes £30 for steel plating the driving wheels to one of the rollers.

The carrying out of the Road Board schemes has largely increased the work of Mr. Morris's department, as the greater part of the work, involving an expenditure of £7,293, was carried out by his staff. The work of tar-grouting and surface tarring was carried through expeditiously, owing to the exceptional fine weather of the summer. The tar-grouting was carried out in various lengths upon all the most important roads, and their condition during the winter clearly showed the advantage of the system over water-bound roads.

The following statement gives the particulars of the tar-grouting done during the year:—

—	Urban districts.	Roads directly maintained.	Total.
Area treated ...	36,895 sq. yds.	134,816 sq. yds.	171,711 sq. yds.
Metal and chippings used	3,689 tons.	12,865 tons.	16,554 tons.
Total cost of grouting ...	£872.	£2,623.	£3,495.
Cost per ton of metal treated (including chippings)	4s. 6d.	4s. 1d.	4s. 2¼d.
Cost per yard super. ...	5·67 pence.	4·67 pence.	4·88 pence.
Average thickness of coating	3·14 in.	2·86 in.	2·90 in.

The surface tarring carried out on the main roads passing through the villages has proved a great boon and to a small extent increased the life of the roads, but the county surveyor points out that this is only a temporary measure, and that the difficulties which present themselves will not be overcome until the roads are recoated with metal treated with a bituminous binder.

Dangers of Deep Excavations.—The Home Office Departmental Committee appointed two years ago to inquire into the dangers of deep excavations has just issue a report. A series of regulations for excavations exceeding 10 ft. in depth is suggested by the committee, which recommends that the work should be under the direct supervision of a person of wide experience, that workings and gangways should be fenced, and that there should be a daily inspection.

Drainage Works and Sanitary Fittings.—A third edition, revised and brought up to date, particularly as regards the questions of concrete sewers, sewer ventilation and flushing, and the Public Health Acts Amendment Act of 1907, still further evidences the success of this little manual,* which manifestly deserves the attention and confidence of all concerned in the important subject with which it deals.—*The Bookseller.*

* "Drainage Work and Sanitary Fittings." By Wm. H. Maxwell, Price 2s. nett. London: St. Bride's Press, Ltd., 24 Bride-lane, E.C.

FOR OTHER ADVERTISEMENTS

See End of Paper.

CITY OF BATH.

TWERTON AND WESTON SEWERAGE.

The Bath Corporation are prepared to receive Tenders from competent Contractors for the Construction of New Iron and Stoneware Intercepting Sewers, &c.

These works will comprise about 2,598 yards of main iron intercepting sewers varying from 24 in. to 9 in., 2,128 yards of 24 in. to 9 in. stoneware sewers; 220 yards of 4 ft. 6 in. diameter, 450 yards 3 ft., and 130 yards of 2 ft. 6 in. diameter brick culvert; 3,408 yards of 9 in. and 7 in. high level iron sewers; 2,900 yards of 6 in. and 4 in. flush water-mains; and 1,410 yards of replacement of old stone sewers by new iron and stoneware pipe sewers and other appurtenant works.

The plans may be seen and quantities obtained at the office of the Engineer, Mr. W. H. Radford, C.E., Albion Chambers, Nottingham, on deposit of Three Guineas, which sum will be returned on receipt of a *bonâ-fide* Tender and the return of the quantities.

The plans will also be on view at the City Surveyor's Office, Guildhall, Bath, on and after the 17th July, 1912.

The lowest or any Tender will not necessarily be accepted.

Sealed and endorsed Tenders to be sent in to the undersigned on or before July 29th next.

FREDK. D. WARDLE,
Town Clerk.

Guildhall, Bath.
July 8th, 1912.

BARNET URBAN DISTRICT COUNCIL.

TO CONTRACTORS.

STREET-PAVING WORKS.

The Council invite Tenders for Works of Re-paving Re-kerbing, and Channelling in High-street, Barnet.

Persons desiring to submit Tenders may, upon depositing with the Council the sum of £2 2s., obtain copies of the Bill of Quantities and Specification, and inspect the drawings and obtain all information from Mr. W. F. Wilkins, Surveyor to the Council, at his office, No. 40 High-street, Barnet.

Such deposit will be refunded after the Council have come to a decision on the Tenders received, provided the person or persons obtaining the copies aforesaid have submitted a *bonâ-fide* Tender to the Council.

Tenders, on the Bill of Quantities supplied, sealed and endorsed "High-street Paving," must be addressed to the undersigned at No. 40 High-street, Barnet, and delivered not later than noon on the first day of August, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

HY. W. POOLE,
Clerk of the Council.

July 10, 1912.

CITY OF BIRMINGHAM.

The Public Works Committee are prepared to receive applications for the appointment of a thoroughly competent Road Foreman in the City Surveyor's Department. Wages 40s. per week, rising by annual increments of 2s. 6d. per week to 45s. Candidates must be fully qualified persons who have had recent practical experience in the construction, maintenance, and scavenging of the various classes of roads and streets of a large town; also in the management of large bodies of workmen. They must be able to keep clearly their note-books, set out works from plans, measure up works in course of construction, and prepare estimates.

The Candidate appointed will be required to devote the whole of his time to the service of the Corporation and to contribute to the Superannuation Scheme.

Applications, in Candidate's own handwriting, stating age which should not exceed 40, experience, past and present employment accompanied by copies of not more than three recent testimonials, and endorsed "Road Foreman," to be sent to the undersigned not later than Monday, July 22, 1912.

Canvassing, either directly or indirectly, will be a disqualification.

HENRY E. STILGOE,
City Engineer and Surveyor.

The Council House,
Birmingham.
July 11, 1912.

CANNOCK URBAN DISTRICT COUNCIL.

WASHING BACTERIA BED MEDIUM.

The Cannock Urban District Council invite Tenders for the Excavating, Removal, Washing and Replacing of Filtering Material in Bacteria Bed, &c., at their Sewage Farm, Longford-lane, Cannock.

Specification, Schedule, and Form of Tender may be obtained on application to Mr. Robt. Blanchard, Engineer and Surveyor, at the Council Offices, Cannock.

Sealed Tenders, endorsed "Tender for Washing Filtering Material," and addressed to the Chairman of the Sewage Farm Committee at the Council Offices, Cannock, are to be delivered not later than 10 a.m. on Friday, the 2nd day of August, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

Clerk to the Council.

Council Offices, Cannock.
June 19, 1912.

BOROUGH OF LUTON.

The Council of the Borough of Luton invite Tenders for the supply of Broken Granite and Broken Slag.

Specifications and Forms of Tender can be obtained on application at the Office of the Borough Surveyor.

Tenders, sealed and endorsed "Tender for Road Material," accompanied by samples of the materials proposed to be supplied, are to be delivered to Mr. J. W. Tomlinson, Borough Engineer and Surveyor, Town Hall, Luton, not later than noon on Saturday, July 20, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

BRUCE PENNY,
Town Clerk.

Town Hall, Luton.
July 10, 1912.

BARNET URBAN DISTRICT COUNCIL.

TO CONTRACTORS.

PRIVATE STREET WORKS ACT, 1892.

The Council invite Tenders for the Making-up, under the above Act, of the Private Street within their District known as Normandy-avenue (1st Portion).

Plans and Specification can be seen and all information and Form of Tender obtained, on application to Mr. W. F. Wilkins, Surveyor to the Council, at his Office, No. 40 High-street, Barnet, any day during office hours.

Tenders, on Official Forms only, sealed and endorsed "Tender for Normandy-avenue," to be addressed to me and delivered at the Council Offices, No. 40 High-street, Barnet, not later than noon on Thursday, August 1st, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

HY. W. POOLE,
Clerk of the Council.

July 10th, 1912.

PUBLIC HEALTH ACT, 1875.

BRADFIELD RURAL DISTRICT COUNCIL IN THE COUNTY OF BERKSHIRE.

PARISH OF STRATFIELD MORTIMER.

TO WATERWORKS CONTRACTORS.

The Rural District Council of Bradfield are prepared to receive Tenders for the Construction of Waterworks in the Parish of Stratfield Mortimer, consisting of Water Mains, Engine House, and Water Tower.

Particulars and Forms of Tender may be obtained, and Plans may be seen, at the offices of the Consulting Engineer, Mr. H. Howard Humphreys, 28 Victoria-street, Westminster, S.W., on the 22nd day of July, 1912, between the hours of 10 a.m. and 5 p.m.

Intending Contractors will be required to deposit a sum of £5 prior to particulars being furnished, such sum being returned on receipt of a *bonâ-fide* Tender.

Tenders, endorsed "Waterworks, Mortimer," must reach the undersigned not later than 4 p.m. on the 29th day of July, 1912. The Council do not bind themselves to accept the lowest or any Tender.

Given under my hand this 9th day of July, 1912.

R. E. RAWSTORNE,
Clerk to the Council.

4, Bridge-street,
Caversham, Reading.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions: -

252. Girder Bridge —Design a girder bridge to carry a 24-ft. road over a river and railway (at an angle of 60°) of two spans, 70 ft. and 42 ft. respectively. The mean height of road surface above bed of river is 21 ft. 6 in., and 17 ft. above rails, and the foundation is clay. Please show calculations and give an estimate of the cost. ("Nomad.")

256. Leak in Drain Pipes.—What is a reasonable amount of leakage to be expected in newly laid stoneware drain pipes of 6 in. and also 12 in. diameter? State the type of joint, average depth of trench, and class of soil. Is one gallon per mile of pipe per hour a permissible amount? ("Welsh.")

258. Roof Design.—Is it necessary or advisable to allow for expansion and contraction in a roof of 50-ft. span? What is a simple and efficient arrangement for such a roof, assuming that this is required? ("Student.")

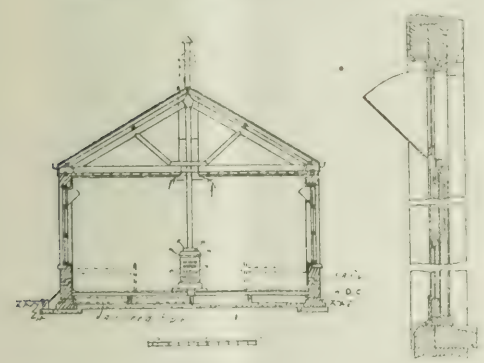
259. Mechanics.—What is meant by "Instantaneous centre of rotation"? Give an example. What points on the rim of a carriage wheel are moving at the same rate as the middle of the axle? ("A.M.I.C.E.")

260. Refuse Disposal.—Where there is no system of sewers in a district, what are the best methods of collecting, removing and disposing of the fluid and solid refuse from the community?

REPLIES TO QUESTIONS.

253. Hospitals.—Give a typical cross-section of an infectious diseases hospital ward. Specify for finishing the internal surfaces. Give detail sketches of a window. ("M. and C.E.")

The walls should be rendered in Keene's or similar cement, and all angles at door and window openings and at the junction of the floor, walls and ceiling should be neatly rounded. The walls should be painted three coats of bright coloured paint and finished off with one coat of good varnish. The floor should be laid with 7 in. × 1 in. tongued and grooved white floor boards well cramped together and spiked down. The ceiling should be plastered on metal lathing, the first coat, "coarse stuff," composed of 2 of sand to 1 of lime, with 1 lb. of long clean cow hair



to every 3 cub. ft., uniformly and evenly laid, and roughed to form a key; the second coat, "fine stuff," composed of slaked lime and fine sand with a little hair, applied as soon as the first is set. This should in turn be roughed with a birch broom, and the setting coat, of about ¼ in. of Keene's cement applied and trowelled to a smooth surface. (W. D., *Dudley.*)

257. Brick-plant.—Sketch and describe a plant for making bricks and flags from refuse destructor clinker. (T. R.)

T. R. will find sketches of plants for making bricks and flags from refuse destructor clinker in the Horsfall Destructor Co., Ltd., book on "Destructors."

The plant necessary for making clinker bricks consists of the following:—

(1) Perforated bottom grinding pan. (2) Lime slaking and mixing machine. (3) Moulding press. (4) Wagons, rails and steaming chambers. (5) Engine, shafting, piping and valves. (6) Weighing machine for proportioning the rough clinker and lime. (7) Barrow hoist for lime.

In this system the clinker is first crushed in a perforated bottom grinding machine, which grinds it and removes scrap-iron, nails, &c. The proper proportion of quicklime is added in this pan. The crushed clinker and lime is then conveyed by an elevator to the slaking and mixing machine, where it is treated with the minimum quantity of water which is chemically necessary in a steam-heated vessel, where it is also subjected to the action of low pressure steam and mechanically treated by means of a specially designed worm, actuated by gearing having a reversing motion. This treatment exposes the entire charge of the vessel to the full effects of the steam, and thus completes the process of slaking, the resultant material being mixed clinker and hydrated lime of exceeding fineness. From this machine the ground clinker and lime are delivered automatically to the feed hopper of the moulding machine. After moulding, the bricks are stacked on platform wagons and taken to the steaming chambers, where they are exposed to the action of steam at atmospheric pressure for a period of from 8 to 24 hours.

Flags. The plant necessary for making flags from the clinker consists of the following:—

(1) Grinding mill. (2) Mixing machine. (3) Hydraulic flag press with pumps and accumulators. (4) A good place for seasoning the flags after their manufacture.

The flags are produced by finely grinding the clinker in a mortar mill with perforated bottom, mixing it with Portland cement in the proportion of 75 parts clinker to 25 parts Portland cement, and pressing by hydraulic pressure to about 60 tons per square foot of surface. In this process the superfluous water is squeezed out and a solid flag is produced which will bear a certain amount of handling, and soon sets very hard. A finer surface is sometimes obtained by adding a small proportion of granite chippings. (W. D., *Dudley.*)

An Opportunity for Assistants and Town-Planning Experience.—A SURVEYOR reader—an Assoc.M.Inst.C.E. who has in hand schemes which will involve a knowledge of the use of the tacheometer and percentage unit theodolite, will shortly be able to give employment for three months to two "good third-year municipal engineer's pupils." They would be paid "according to their worth." The same correspondent prefaces with the comment that he has "strong views that town-planning is a municipal engineer's job," an intimation that if there be "a man wanting a holiday send him here and I'll put him up and give him something interesting." If those to whom either of these opportunities appeals will communicate with us we shall be pleased to forward their letters to our correspondent. All such communications should be addressed to the editor of the SURVEYOR, and their envelopes should be marked "Appointment."

A Tricycle Street Sweeper.—Jacquelin, a French champion cyclist, has just secured a patent for a tricycle to be used in street cleaning. A cylindrical brush is fastened by gas pipes to the tricycle. In front of it and between the two rear wheels is a basket or scoop for the sweepings. Above the brush a guard is fastened which prevents the sweepings from dropping out of the basket. When nearing a heap of dirt, Jacquelin backs his tricycle, the brush revolves, picks up the matter and throws it into the receptacle. This is, however, only necessary when considerable quantities of dirt have to be collected; if it is simply intended to sweep the street, this is done while the rider rides the tricycle in the ordinary way, the brush turning and gathering the dust into the basket. The machine does the street sweeping more quickly and thoroughly than a number of men can accomplish it.—From *Scientific American.*

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries which should be written legibly on foolscap paper, one side only, should be addressed to "The Law Editor," at the office of THE SURVEYOR, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—*i.e.*, without re-drawing or amendment.** ***Unless these conditions are complied with we cannot undertake to reply to queries.***

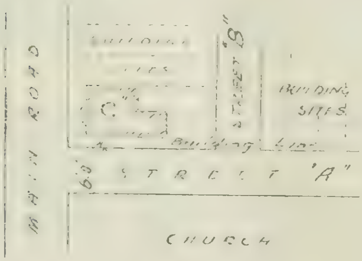
QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

STREET OBSTRUCTIONS.—"Vertex" writes: An occupier of a building in a street 30 ft. wide, in which there are footpaths 5 ft. wide on each side, has erected in front of the house occupied by him a fence about 2 ft. high for a distance of about 20 ft. The fence is erected at right angles to his house. It is, of course, dangerous to passengers, who have to turn off the footpath and walk in the roadway in consequence. The street is a private one and a *cul-de-sac*. In the same street at the top and the end another owner, who is also occupier, erected a privet hedge, also in the footpath, about ten years ago. This was never the subject of any inquiry by the district council, being allowed to remain. Now that the first case mentioned has been reported the occupier demurs to remove his fence unless the first offender, as he alleges, is also to receive notice from the district council to remove the privet hedge. What I wish to ask is this: Is it not quite in order to serve notices under sec. 69 of the Towns Improvement Clauses Acts, 1847, and will it apply to both occupiers as well, notwithstanding, in the second case, it has been allowed to remain the length of time stated without any notice from the authority?

This would appear to be so. The section does not specify any limit of time within which the notice must be given.

PUBLIC HEALTH (BUILDINGS IN STREETS) ACT, 1888.—"J." writes: May I suggest that your answer to "Quest" in THE SURVEYOR of May 31st (p. 802) needs reconsideration? The Public Health (Buildings in Streets) Act, 1888, prohibits the erection or bringing forward of a building "beyond the *front main wall* of the house or building on either side of the same." In



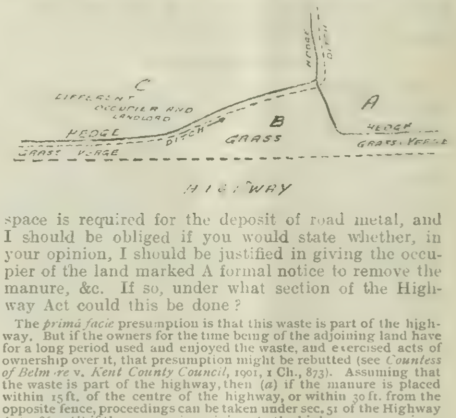
the case put to you the "front main wall" of C is clearly in main road; the building line of premises in street A is therefore not affected by the house C at all. If houses had been built in street A and main road before the erection of C, then, for the purpose of fixing its building line, C would be in both streets, and could be required to be kept within the building lines of both main road and street A.

I am much obliged to "J." for his communication. I quite agree that unless the front main wall of house C is in street A the building line of premises in that street is not affected by the house, and I regret that I overlooked this in my reply to "Quest." Certainly from the plan the front main wall appears to be in the main road.

WATER SUPPLY.—"A. T." writes: I recently submitted plans to a rural district council for the erection of a cottage on the site of an existing one, which is constructed of timber and tiles, whereas the proposed one would be of brick, slate and in every way in accordance with the by-laws of the district. I have received notice that the application and plans in question are disapproved, as the council do not consider that there is provided within a reasonable distance of the house a supply of water available for domestic purposes. For a considerable number of years, and at the present time, the water is carted or carried to the cottage. I should be glad to know whether you can, through your paper, state a case or give any information on the matter.

In my opinion the council are not justified in disapproving the plans on the ground stated. If the plans comply in all respects with the by-laws, the owner can either proceed with the erection of the building or apply to the Court for a *mandamus* to compel the council to approve the plans (Lumley's "Public Health Acts," 7th Edition, p. 358). But the house must not be *occupied* until a certificate has been obtained from the council, under sec. 6 of the Public Health (Water) Act, 1878, that there is provided within a reasonable distance such an available supply of wholesome water as may appear to the council, on the report of their inspector of nuisances or of their medical officer of health, to be sufficient for the consumption and use for domestic purposes of the inmates of the house. The Local Goverment Board have expressed the opinion that in deciding what is a "reasonable distance" regard must be had to the labour involved in carrying by hand a sufficient amount of water for the purpose of an ordinary household, and to the injurious results, as regards cleanliness and health, which are likely to arise if, in order to avoid this labour, the water used is stinted, or impure water more easily obtained is substituted for that which is purer but more distant (*Ibid.*, p. [illegible]).

ROADSIDE WASTE.—"L. C." writes: I should be glad of your opinion on the following: The occupier of the land marked A has recently deposited a considerable amount of manure and soil upon what, in my opinion, is roadside waste. The waste referred to is marked B, and has always been open to the public. The



space is required for the deposit of road metal, and I should be obliged if you would state whether, in your opinion, I should be justified in giving the occupier of the land marked A formal notice to remove the manure, &c. If so, under what section of the Highway Act could this be done?

The *primâ facie* presumption is that this waste is part of the highway. But if the owners for the time being of the adjoining land have for a long period used and enjoyed the waste, and exercised acts of ownership over it, that presumption might be rebutted (see *Countess of Belmore* v. *Kent County Council*, 1901, 1 Ch., 873). Assuming that the waste is part of the highway, then (*a*) if the manure is placed within 15 ft. of the centre of the highway, or within 30 ft. from the opposite fence, proceedings can be taken under sec. 51 of the Highway Act, 1864; (*b*) if the manure is an injury to the highway or an injury, interruption or personal danger to any person travelling thereon, proceedings can be taken under sec. 72 of the Highway Act, 1835; (*c*) if the manure is a nuisance proceedings can be taken under sec. 73 of the same Act.

SURFACE-WATER SEWER: POWERS OF LOCAL AUTHORITY.—"Treblaw" writes: A surface-water sewer along a main road empties itself into a ditch which runs along a field into a pool. Formerly by some unknown means the water found an outlet from the pool and thus got away, but of late this outlet has been, accidentally or otherwise, stopped up, with the result that the pool and ditch are troublesome to the owner of the field. As it seems impossible to discover how the water has been getting away, it is thought advisable to connect this small pool to a larger one which is short of water, and lies at a lower level some distance away. (1) Have the council any right to take the sewer across the field? (2) Have the council any right to drain into the larger pool? (3) What is the correct procedure? The pool and proposed sewer are just outside of the boundary of the district.

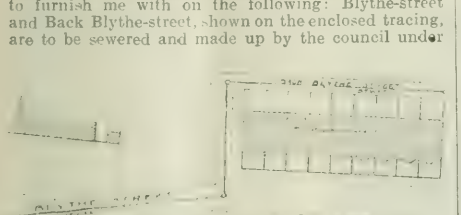
(1) In my opinion the council have no such right. The existing sewer being one for surface water only, it would appear that the last clause of sec. 16 of the Public Health Act, 1875, does not apply, inasmuch as the proposed sewer would not be used "for the purpose of outfall or distribution of sewage." (2) No, I think not. The implied power given by sec. 17 to convey purified sewage, or water free from noxious matter, into a stream or pool [illegible], 1897, 2 Ch. 29), must, I think, be exercised within the council's own district. See [illegible] v. [illegible] Freehold Land Society, 1906, 1 K.B., 21. (3) There does not appear to be any method by which the proposed arrangement can be carried out.

HOUSING AND TOWN PLANNING, &c., ACT, 1909.—"W. D." writes: My council have decided on the pre-

paration of a town planning scheme with respect to a part of their district, and in accordance with their instructions I have prepared the necessary plans details, notices, &c. Before proceeding any further in the matter, I shall be glad if you will inform me which of the following two courses is the right one to adopt—viz.: (*a*) To serve the necessary notices in accordance with the Act and Local Government Board Regulations, and subsequently confer with the owners of the land concerned, and other persons affected by the proposed scheme; or (*b*) to hold conferences with the owners and other persons concerned as to the council's proposals before serving the notices on them?

According to my reading of the Town Planning Procedure Regulations (England and Wales), 1910, issued by the Local Government Board under the Housing, &c., Act, 1909, it would appear that the right course is first to serve notices on owners, lessees, and occupiers (as provided by Article 1 of those Regulations), and then to consider any objections made by owners, &c., and endeavour by conferences to secure their co-operation (as provided by Article 3).

Private Street Works: Sewer.—"H. F." writes: I should be glad of any information you may be able to furnish me with on the following: Blythe-street and Back Blythe-street, shown on the enclosed tracing, are to be sewered and made up by the council under



sec. 150 of the Public Health Act, 1875. Mr. A has a frontage on Blythe-street and one on Back Blythe-street. The sewer only passes Mr. A's frontage on Back Blythe-street. Is Mr. A liable to be apportioned for the portion of sewering in Blythe-street, in addition to his apportionment of the sewer in Back Blythe-street?

No, unless he is the owner of any premises abutting on that portion of Blythe-street along which the sewer passes.

Breaking Up Streets: Restoration.—"Magna" writes: In our urban district the water and gas companies, sometimes after the usual notice, but often without giving preliminary notice, open up the roadways for connections, and when filling in leave the road in an unsound condition. My council have asked who is liable should an accident happen to someone lawfully using the road before the roadway is restored to a proper condition. The gas company have made an arrangement with the council for them to repair at a fixed rate per lineal yard, but even then there is an interval between their advising us and our getting to the work. The water company do their own work of repair.

Gas and water companies who break up streets are under a statutory obligation to reinstate the streets with all convenient speed and keep them in repair for three months, failing which they are liable to continuing penalties. (See the Gasworks Clauses Act, 1847, secs. 10 and 11, and the Waterworks Clauses Act 1847, secs. 32 and 33.) If an accident occurred in consequence of a company failing to carry out this obligation, or carrying it out negligently or defectively, they would, in my opinion, be liable. (See *Stanbury* v. *Exeter Gas Co.*, 1905, 2 K.B., 838; *Longbottom, Limited*, 60 J.P., 585.) I think it is doubtful whether a company could avoid liability by delegating their statutory duties to the council. The council would not, in my opinion, be liable except in a case where, having undertaken the reinstatement, they or their workmen were guilty of negligence in the execution of the work, and such negligence was the cause of the accident.

National Insurance Act, 1911: Unemployment.—"Kloffus" writes: The staff of workmen employed by a council includes engine drivers, stokers, steam-roller driver, horsemen, general labourers and scavengers. Of these, stokers, horsemen and scavengers are doubtless exempt from the unemployment insurance under Part II. of the National Insurance Act of 1911. Are the following also exempt: (*a*) An engine driver who does his own running repairs, and (*b*) a labourer whose work covers excavation for gas and water mains, sewers, &c., road repairs, construction of footpaths, and similar work?

The insured trades for the purposes of Part II. of the Act relating to unemployment are seven in number, as set out in the 4th Schedule—viz., building, construction of works, shipbuilding, mechanical engineering, iron-founding, construction of vehicles, and sawmilling. The schedule does not define either "mechanical engineering" or "iron-founding," but it would appear that the repair of engines might possibly fall under one or the other if not both, of these heads. "Construction of works" is defined as the construction, reconstruction or alteration of railroads and other specified works "or other works of construction," and I think this definition is probably sufficiently wide to include the works specified in the query, clause (*b*). Of course, this is a brand new Act, and it is impossible to say what decisions may await us in the future on the many knotty points that will doubtless come up in connection with it.

Housing and Town Planning Act, 1909.—"Frome" writes: I should esteem it a favour if you would advise on the following interesting legal point that has arisen in my district: A notice was served on the owner of certain cottages, under the Housing and Town Planning Act, secs. 14-17, to do certain repairs that were very necessary. A solicitor has replied that "these sections only apply to houses the tenants of which have only gone into occupation since December 3, 1909." Looking at the first words of sec. 14—"in any contract made after the passing of this Act"—it looks almost as if his contention were correct, but it makes the Act practically worthless if it is so.

Sections 14 and 15 apply only to contracts made after December 3, 1909. It is not strictly accurate, however, to say that they apply only to houses the tenants of which have gone into occupation since that date. On the one hand a tenant who had previously gone into occupation might have entered into a new agreement after that date, in which case the sections would apply. And on the other hand a prospective tenant might have entered into an agreement before, but not gone into occupation until after that date, in which case the sections would not apply. Sections 16 and 17 apply irrespective of any contract.

Paving of Yards.—"A. M. O. K." writes: In this urban district there are several unpaved courtyards common to a number of cottages. (1) Can the council compel the various owners to pave a certain portion of such courtyards, there being no by-laws in force respecting them? (2) A large number of self-contained cottages are also without any yard paving. My contention is that paving is a necessity in each case; but I am informed it is not compulsory without I can prove the absence of paving to be a nuisance, injurious to health. Your kind reply in The Surveyor will greatly oblige.

By-laws can be made under sec. 90 of the Public Health Act, 1875, for the paving of courts or courtyards of houses let in lodgings or occupied by more than one family. And in districts where Part III. of the Public Health Acts Amendment Act, 1890, has been adopted by-laws can be made under sec. 23 of that Act with respect to the paving of yards and open spaces in connection with dwelling-houses. In the absence of any by-laws there does not appear to be any power to enforce the paving of courtyards, whether used in common or otherwise.

Housing and Town Planning Act, 1909, Sec. 17, Sub-sec. (4).—"W. B. D." writes: An order by a court of summary jurisdiction was, on my application, made on certain persons to quit a dwelling-house within fourteen days. How is the order to be enforced? I shall be glad of a reply by post as well as in your valuable paper.

By virtue of sec. 75 and Schedule VI. of this Act, sec. 10 of the Housing of the Working Classes Act, 1903, would appear to apply where default has been made in obeying a closing order under the Act of 1909, that is to say possession of the house may be obtained under secs. 138 to 145 of the County Courts Act, 1888, or under the Small Tenements Recovery Act, 1838. Under the County Courts Act a summons is issued in the County Court, and on judgment being obtained the bailiff evicts the tenants and gives possession. Under the Small Tenements Act a magistrate's warrant is applied for (after notice to the tenants of intention to make the application), and on the warrant being granted the eviction is carried out by the constables. There appears to be nothing in the Act of 1909 providing for any other mode of enforcing a magistrate's order under sec. 17, subsec. (4).

Injury to Gas and Water Mains.—"Acrtex" writes: What liability attaches to a local authority with reference to the breaking of either water or gas mains by the steam roller? If a main is very small, or is placed very near the surface, will it relieve the authority from any liability as to damages?

If the pipes are sufficiently below the surface not to be injured by the repair of the road without the use of a steam roller, the local authority will be liable for any injury to the pipes resulting from the use of the roller (*Goodson and Cole Company* v. *St. Mary Abbots Kensington*, 1 Q.B.D., 1).

Private Street Works Act, 1892: "Owner."—"Trunot" writes: I should be much obliged if you would give me your opinion as to who is the owner under the above Act where a piece of land is leased for 99 years, the lessee or the lessor?

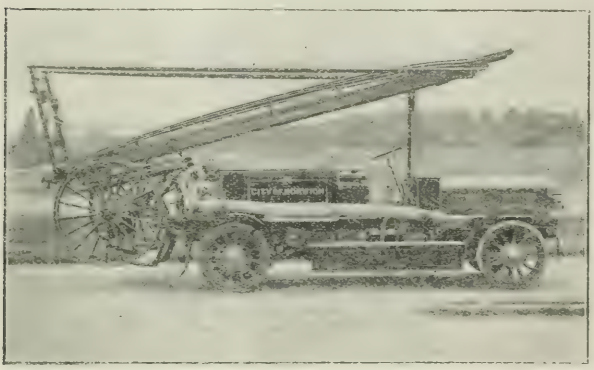
The term "owner" has the same meaning in this Act as in the Public Health Act, 1875—viz., the person for the time receiving the rack-rent, whether on his own account or as agent or trustee for any other person, or who would receive it if the premises were let at a rack-rent. If, therefore, the rent reserved by the 99 years' lease is a rack-rent, the lessor is the owner for the purposes of the Act, otherwise the lessee is the owner.

We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.

MOTOR FIRE ENGINE FOR NORWICH.

The accompanying illustration shows a powerful new motor fire engine which has just been added to the equipment of the Norwich Fire Brigade. It is of the Merryweather petrol "Hatfield" design, with reciprocating pump capable of delivering 500 gallons per minute and upwards. It also carries a detachable fire escape to reach 50 ft., as well as 2,000 ft. of hose, and affords accommodation for a dozen firemen. The "Hatfield" type was chosen by the city engineer, Mr. A. E. Collins, M.INST.C.E., after he had fully investigated the merits of several other kinds of motor pumps.

Among the many advantages that an engine of this kind possesses over the ordinary horsed steam fire engine is that it enables the site of a fire to be reached with greater promptitude, and can be brought into action almost immediately. The greater alacrity with which the one could be used as compared with the other was demonstrated at tests which recently took place at Norwich. Although simultaneous preparations were made for starting the steam engine and the motor engine, the latter was in full action several minutes ahead of the former. The suction pipe of the motor had simply to be dropped into the water for pumping operations to be immediately begun.



"Hatfield" Motor Fire Engine at Norwich.

London County Council Chief Engineership.—Applications are to be invited by advertisement for the position of chief engineer to the London County Council, which will shortly become vacant by the resignation of Sir Maurice Fitzmaurice, C.M.G., M.INST.C.E. The salary offered is £2 000 a year.

The Proposed Western Approach Road.—The Highways Committee of the Middlesex County Council reported recently that they had had an interview with the Improvements Sub-Committee of the London County Council. The chairman of the London County Council Improvements Committee, Mr. W. Whitaker-Thompson, stated that his committee were desirous of ascertaining the views of the Middlesex County Council as regards the proposed new western approach road suggested by the Road Board, and particularly whether the Middlesex County Council had decided that they were in favour of the actual route proposed by the board. Mr. County Alderman Pinkham stated that the Middlesex County Council, with regard to the question of a new western approach road, felt that [illegible] approval of the advisability, on general grounds, of the construction of a western approach road to London through Middlesex, provided satisfactory terms and arrangements could be made; that the scheme for the construction of such a road should be one between the London and Middlesex County Councils and the Road Board in the first instance; that in view of the fact that a road of this character [illegible] Road Board should be asked [illegible] a [illegible] a portion of the cost [illegible] that a general scheme for [illegible] could not be entertained. After some discussion the chairman of the London County Council Improvements Committee stated that the resolutions adopted by the Middlesex County Council would receive consideration.

ENGLISH GARDEN CITY AND HOUSING SCHEMES

GERMAN COUNCILLORS' VISIT.

The Garden Cities and Town Planning Association, of 3 Gray's Inn-place, W.C., are arranging for another visit of members of German municipalities to inspect English garden city and housing schemes, under the guidance of Mr. Culpin, the secretary.

The party, which will number about 100, will arrive in England on August 18th, and the next fortnight will be spent in visits to practically every housing scheme of importance in the country.

Among other places which will be seen are the Garden Villages of Hull, Earswick, Port Sunlight, Bournville and Knebworth, the Garden Suburbs of Wavertree (Liverpool), Harborne (Birmingham), Hampstead, Ealing, Ilford, &c., while special interest will be taken in the Garden City at Letchworth, where more nearly than any other place in this country the question has been solved of the provision of labourers' dwellings at an economical rate.

Municipal housing will be studied in the various towns visited, and the estates of the London County Council will be visited.

Among the party will be some of the prominent town planners and architects of Germany and Austria, while the town of Riga will send a number of officers to investigate.

The visit affords an excellent opportunity for town planners in England to rub shoulders with those who have actually done such work in Germany, and any students and others who would like to join the party at any point, or to meet at their social gatherings, are invited to communicate with Mr. Culpin at the above address.

Fifeshire Roads.—In his annual report and estimates for the present year, Mr. A. Forbes, county road surveyor, Dunfermline District Committee, says his estimates are based on the actual requirements for keeping and maintaining the roads in proper order. The quantity required is less than last year, but it is his intention to spend a little more on certain roads in the way of preserving existing good surfaces and minimising dust and wear. An allowance has been made for the purchase of bituminous tar for that purpose, and Mr. Forbes has also provided for the purchase from the Municipal Appliances Company of two tar boilers of 320 gallons capacity, with spraying attachments.

Road Construction and Maintenance in Perthshire.—Mr. W. L. Gibson, county surveyor of the Western District of Perthshire, in submitting his estimates for the year, remarks that the pitch grouting system under the Road Board scheme for 1911, while showing that it withstands all kinds of traffic, including heavy traction engines, gives a longer life to the metal bed compared with the water-bound system—which in his opinion is now an obsolete one on roads subjected to fast-moving traffic. Apart from the durability of the tar system, it gives off comparatively little dust, is easily cleansed, and is not affected by atmospherical changes, and Mr. Gibson notes with pleasure that he has not had one single complaint about its slipperiness during frosty weather. He emphasises the fact that often following a frost many horses are allowed to go on the road with frost studs or nails still in their shoes, doing damage to the surface by picking out the stones and leaving cavities for water to settle in, on pitch-grouted and water-bound surfaces alike, and expresses the view that if surfaces are to be made and maintained at the high state of efficiency which necessity demands, legislation will require to be introduced to obviate this evil. Mr. Gibson has included a sum of £135 in his estimate for tar-spraying lengths of road which were tar-grouted two to four years ago. He thinks it is necessary that tar-treated portions should be painted at least every second year; by doing so, he points out, it puts a fresh film or armour on the stone, thereby making the road more waterproof and extending its durability, and at the same time mitigating the dust nuisance.

Association of Managers of Sewage Disposal Works.

ANNUAL SUMMER MEETING AT WOLVERHAMPTON.

The annual general summer meeting of the above-named association took place on Saturday at Wolverhampton, and was well attended by members. After the meeting of the council, which was held in one of the committee-rooms of the Town Hall, the members were received in the council chamber by Alderman Berrington, in the unavoidable absence of the Mayor of Wolverhampton (Councillor T. W. Dickinson, J.P.). Those present included Colonel A. S. Jones, V.C., M.INST.C.E., Messrs. John D. Watson, M.INST.C.E. (President), A. B. Ogden, M.R.S.I. (chairman of the council), Alfred S. Sikes (Finchampstead, Berks), Gilbert J. Fowler (Manchester), H. W. Stafford (Dukinfield), E. Stamp (Ashton-under-Lyne), H. D. Bell (Stratford-on-Avon), D. Bradbury (Brownhills), C. Allsop (Brownhills), H. C. Cooper (Brownhills), W. J. Ashley (Oldbury), W. Tomlinson (Chesterfield), A. Stone (Nottingham), J. H. Edmonson (Manchester), J. B. Ogden (Manchester), Jas. Edmondson (Moss Side, Manchester), B. Otter (Leicester), T. Chettle (Reading), P. Gaunt (Macclesfield), E. Ardern (Manchester), W. H. Duckworth (Salford), R. Eaton (Southport), Joseph Sheard (Failsworth), H. Edwards (Gorton, Manchester), W. E. Speight (Bolton), R. J. Andrews (Stockport), J. H. Abbott (Chiswick), M. Dinsdale (Bedford), F. R. O'Shaughnessy (Birmingham), J. Clifford (Nuneaton), J. Shepherd (Foleshill), A. V. Reynolds (Longton), R. Giles (Burton-on-Trent), W. Tomlinson (Chesterfield), J. Ashton (late of Bolton), F. Hambleton (Newcastle, Staffs), G. G. Andrew (Walsall), J. Smith Westerley (Liverpool), Jas. Barron (Warwick), W. H. Makepeace (Stoke-on-Trent), H. A. Hines (Codestanton), J. Cookson (Yarmouth, near Bolton), E. Lewis (Yarmouth, near Bolton), and Chas. H. Ball (hon. secretary).

AN OFFICIAL WELCOME.

ALDERMAN BERRINGTON, in the name of the Mayor and Corporation, extended a hearty welcome to the visitors, and said the Mayor would have been delighted to be present, but they were aware that he led a busy life, and Saturday was an extremely busy day with him. The Mayor asked him to state that he trusted the visit of the association would be interesting and instructive to the members, and to add that he would meet them later in the day. Alderman Berrington proceeded to say that he was delighted to be present himself, and especially to welcome as their president his dear friend Mr. John D. Watson. They were also glad to see Colonel Jones with them. It was upwards of 35 years since he first met Colonel Jones in connection with sewage disposal at Leigh. He had met him on many occasions since then, and he ventured to think they were largely indebted to that gentleman for the interest he had always taken in the subject of sewage disposal. Wolverhampton, as they knew, was a smoky town in the Black Country, but when they got out to Tattenhall they would see a very beautiful country, and if they could only spend a day or two with them they would find they had something worth seeing, such as the art gallery and other institutions. With their sewage manager, Mr. W. Clifford, the Corporation were more than satisfied; if they were dissatisfied with him at all it was that he continued to be an old bachelor. (Laughter.) He was glad to hear of the progress of their association, and he trusted they had still more prosperous times before them. Those who gave service at sewage works were not, or had not been up to now, so well appreciated as they deserved, especially considering the important part they played in protecting the public health of the nation. The works they attended to were generally placed in the outskirts of the town, and they led a quiet, country life, doing some shooting, and that kind of thing—(laughter)—and did not come so much to the front as the people of the town. As regarded the reduction of the death-rate they scarcely ever heard of the important part played by the managers of sewage works. He only hoped they would continue to give their services to the community, and that the prosperity of their association would continue to increase.

The PRESIDENT observed that nothing he could say could possibly exaggerate the appreciation they had of the very hearty welcome they had received from Alderman Berrington on behalf of the Mayor and Corporation of Wolverhampton. It was satisfactory to know that Alderman Berrington appreciated the object of their visit. They as managers of sewage works were not banded together for any selfish purpose, but for the purpose of mutual improvement. They found considerable benefit in meeting together as they had on the present occasion. They learned a great deal from such meetings, and they were sometimes able to impart a hint to those whom they met that might be of some use in the particular town in which they happened to assemble. In this way, the benefits conferred by the association might be described as mutual, and they trusted that such meetings would continue to be advantageous to all concerned. He need scarcely say that they were conscious of their own ignorance, and that some of them felt less inclined to give advice on matters of sewage disposal to-day than was the case ten or fifteen years ago. Not that they knew less; but whether they knew less or more they were reluctant to venture to give advice. They had met for the purpose of visiting the Wolverhampton sewage works, of which they had heard so much. He had no doubt they were works which were well worthy of a visit, and of their closest attention, and it was to be hoped they would prove of the greatest possible benefit to Wolverhampton. They hoped by such visits to glean information, exchange ideas, and to profit by mutual intercourse. He had not the least doubt that when they saw the works they would feel that the corporation had done wisely in entrusting themselves to Mr. G. Green, the borough engineer, and to Mr. W. Clifford, manager of the sewage works; he had no doubt also they would be able to observe many things that would appeal to them, and which had been carried out by the advice Mr. Green had given as engineer, while the works had been in progress.

The meeting then proceeded to the consideration of the papers prepared for the occasion, one of these being:

PREVENTION OF AERIAL NUISANCE FROM SEWAGE CONTAINING BREWERY WASTE. DEODORISATION METHODS IN USE AT STRATFORD-UPON-AVON.

By HERBERT D. BELL,
Manager and Chemist.

Sewage disposal works have for many years had a somewhat evil reputation, in some cases justifiable and in others due to prejudice, owing to the odours emitted during the processes of purification from time to time. In some instances the methods of treatment have increased the smell from a sewage, which otherwise might have been dealt with without cause for complaint, whereas other types of sewage have puzzled the brains of experts to devise a process whereby the aerial nuisance, as it is now called, can be prevented.

The works which I have the honour to control at Stratford-upon-Avon deal with a sewage whose peculiarities are perhaps unique. Some of the main sewers in the town are old, have bad gradients, are leaky, and in some cases the roots of lime trees penetrate right through the walls. During the winter months when the river becomes swollen owing to heavy rains, the subsoil becomes saturated, and water percolates into the sewers. This increase to the daily flow continues for several weeks after the river has subsided. During the summer months this increase does not take place, and, consequently, in the hot, dry weather the sewage is in its strongest state. The constituents of the sewage include brewery waste from one large brewery and two or three very small ones, fellmonger's waste, liquors from a suction gas plant and gasworks, butcher's offal, together with a strong domestic sewage. As Stratford-upon-Avon is an agricultural centre there is also a certain amount of liquor from cattle pens.

The water supply from the waterworks averages about 11·0 gallons per head of population, the average daily dry weather flow from April 1st to November 28th, and from November 29th to March 31st, being made up to 26·1 and 44·6 gallons respectively per head by wells, canal, and infiltration water. During the summer months there is a considerable increase in the population due to visitors, which reduces the former volume to approximately 20 gallons per head.

The sewage is delivered to the disposal works by

pumping, the total lift being 100 feet, and the length of the rising main is some 2,200 yards. With one pumping operation at the present rate the time taken for the passage of the sewage up to the works from the pumping station is about 3½ hours. Each of the pumps, three in number, was designed to deal with the whole daily dry weather flow in 12 hours, which of course makes it impossible to keep a steady flow through the tanks all day. The revolutions per minute of the pumps have been reduced in order to extend the period for pumping the dry weather flow to 18 to 20 hours, but even this does not tend to make the conditions ideal. The stoppage of tank treatment and the quiescent state of the sewage in the rising main owing to the cessation of pumping until sufficient sewage arrives at the pumping station helps to produce objectionable odours by rendering the sewage more or less septic before its arrival at the works. If the number of revolutions were further reduced it is questionable whether the diminished velocity would not have the same effect in converting this particular class of sewage into a septic state. The volume of the brewery waste present is more than 10 per cent. of the average daily dry weather flow, and therefore in a sewage of this kind, hot dry weather rapidly renders the whole sewage into a very "active" state; consequently the more rapidly the daily flow of sewage can be passed through its process of purification, the more likely will be the chance of success, in so far as aerial nuisance is concerned. The units for treatment on reaching the works are tanks, contact beds and circular percolating filters, and final passage through land for the average dry-weather flow.

The works were designed for open septic tank treatment, and were opened on November 1st, 1906, and the tank treatment was started on septic lines.

Open septic tank treatment without chemicals continued until November, 1908, when an addition of lime to the sewage was made for a ten weeks' experiment The results of this experiment justified a trial with lime during the year 1909-10. The addition of lime certainly reduced the volume of odour emitted, although I considered that if there was a long period of hot, dry weather there would be great difficulty in preventing a nuisance, owing to the over-septic state of the tank effluent. During 1910-11, closed septic tank treatment with sodium hypochlorite as a deodorant was compared with open septic tank treatment, the sewage entering the latter being treated with lime. The conclusion I drew from the tank treatment from November 1st, 1906, to March 31st, 1911, was that septic tank treatment, for a sewage containing the percentage of brewery waste present at Stratford-upon-Avon was unsuitable, because septic treatment had taken place in the town sewers and in the rising main to such an extent that the tank effluent showed unmistakable signs of being over-septic, being consequently just in the right condition for liberating hydrogen sulphide and other offensive odours. The addition of lime before septic tank treatment appeared to have a retarding influence on the sewage as it arrived at the pumping station, consequently there was a greater reduction of the organic portion of the sludge under those conditions than when the alkali was absent. But, it was extremely difficult to prevent the septic tank effluent from becoming over-septic after the tank had been in operation six or eight weeks, even with lime treatment, the addition of lime increasing in grains per gallon with every week that the tank was kept in operation.

EXPERIENCE OF SEPTIC TANK TREATMENT.

The experience of the results of septic tank treatment strongly supported a theory which I held a few weeks after my appointment, namely, that septic treatment was not the right method for sewage containing brewery waste, and in April, 1911, I commenced sedimentation tank treatment, continuing this until April 23rd, when I recommenced using lime, but this time with precipitation and not septic tank treatment. Tanks which previous to March 31st, 1911, had been in operation from three to six months, and which required three to four days to remove the sludge, now were in operation from six to ten days, the sludge being removed in less than seven hours.

Since April, 1911, chemical precipitation with lime added at the pumping station, and subsequent deodorisation, when necessary, with calcium hypochlorite solution obtained from chloride of lime or bleaching powder, has been in use. The addition of both lime and bleaching powder was carried out on an experimental basis, the milk of lime being added by manual labour, one gallon every five minutes during the day and every ten minutes during the night. Alternate tanks were in operation during the summer months, and one or more tanks in winter, the average period of operation in the colder weather being 20-28 days.

The sludge on removal from the tank was run into lagoons whose average depth is about five to six feet. Each lagoon has a system for drawing off the top water which settles out from the sludge, and after the removal of the sludge from the tank, the top water was drawn off after about one to two hours' settlement, the thicker sludge being covered with a mixture of peat stable litter and slaked lime. The addition of this mixture apparently absorbs hydrogen sulphide as the sludge digests, also the lime in the covering mixture has a further precipitating action on the sludge, which rapidly settles, more top liquor being produced and drawn off, leaving the sludge more dense, so that the surface rapidly dries and becomes inoffensive.

The sludge contents of the next tank to be emptied were run on to the top of the sludge in the lagoon, the covering operation repeated, and so on until the lagoon was full, at which time another drying bed was commenced. The average period of the drying of the sludge for removal by farmers, previous to March 31st, 1911, was from 10 to 15 months, whereas since chemical precipitation tank treatment has been in operation the drying period appears to be about four to eight months. The area of the lagoons, six in number, which deal with all the sludge, is approximately half an acre and the total capacity is about 3,760 cubic yards. There are three large lagoons, whose average length is 144 ft., 30 ft. wide, and 6 ft. deep, each of which are divided into three compartments. The three other lagoons are 132 ft. long, and the average width and depth are 12 ft. and 5 ft. respectively. At the present time (June, 1912) there are 1,600 cubic yards occupied by wet sludge, 1,227 cubic yards of sludge ready for removal, and 933 cubic yards of space ready for more wet sludge.

Each compartment of a large lagoon, approximately 320 cubic yards, takes from five to seven weeks' sludge from the tanks. The lagoons are simply earth banked, and, consequently, more can be made if required on another half-acre of land which is at liberty for the purpose. I am hoping that the lagoons at present in use will be sufficient for the volume of sludge even under precipitation tank treatment, as the increase in sludge for 1911-12 does not appear to be very much in comparison with that of 1910-11, and previous years, showing that septic tank treatment did not remove a very high percentage of the organic matter in the sludge.

DEODORISATION RESULTS.

I will now proceed with the results obtained by deodorisation. The method of addition of lime has been already described, and it was mixed in a trough containing two hours' supply, the weight of raw lime for each two hours varying with the time of day or night and the period of the year.

For the bleaching powder treatment, two wooden vats, each capable of holding approximately 1,100 gallons, were fixed on two platforms, so that the contents of one would discharge into the other. The one at the higher elevation was used as a storage tank for the town's water, which was used for preparing the solution. The vat at the lower level was divided into two compartments, so that, alternately, one portion could be used for preparing the deodorising solution whilst the other contained the prepared liquor, which was being distributed to the tank for deodorising purposes. The bleaching powder was mixed into a cream in buckets and then poured into the vat, and water run in, until the compartment was full, mixing being continued during the diluting operation, two to three hours being required for settlement. Each compartment of the vat was so constructed that the solution could be distributed for deodorising purposes, and also that the sediment could be drawn off when required.

The addition of the lime intermittently (every five or ten minutes) made it very difficult to prevent the fermentative action of the brewery waste from reforming its acid products. On several occasions during the long drought free alkali was absent in the tank effluent, although 37 grains per gallon of lime, as calcium oxide, had been added. This proved that if no alkali had been used the sewage would have been strongly acid before reaching the works, and under septic tank conditions the consequent evolution of hydrogen sulphide would have

required an almost prohibitive addition (as far as costs are concerned) of bleaching powder, or other oxidising agent, to prevent aerial nuisance arising. When the tank effluent showed the presence of hydrogen sulphide bleaching powder solution was run in, the volume being adjusted so that this gas would be oxidised and thereby prevent aerial nuisance arising. This deodorising liquid, however, was not always to be obtained, owing to the shortage of town's water, and on one or two occasions a slight aerial nuisance was unpreventable.

Lime treatment was continued during the winter because (1) the sludge produced by lime was found to settle more rapidly in the lagoons; (2) the tank emptying operations were accompanied by less odour; (3) the resultant sludge dried more quickly; (4) the tank effluent produced was less impure, and (5) there was a greater percentage purification of the tank effluent by the circular filters than when the alkali was absent.

The total weight of lime used was 104 tons 16 cwt. Ninety-eight tons 16 cwt. were used at the pumping station for treating the sewage, and 6 tons were used with peat stable litter for covering the sludge in the drying trenches. The lime added to the sewage was equivalent to 11·8 grains per gallon calcium oxide from April 22nd, 1911, to March 30th, 1912, at which date lime treatment was suspended, because lime could not be obtained owing to the coal strike. The volume of sewage treated was 119,828,340 gallons. The weight of bleaching powder purchased was 3 tons 17 cwt. 1 qr., and 15 cwt. remain in stock for the present year (1912-13). The equivalent weight of available chlorine obtained from the bleaching powder was 2,069 lb., or 29·6 per cent. The weights of available chlorine added were 1,006 lb. in rising main chamber, 793 lbs. to the tank effluent, and 270 lb. during sludging operations.

The rising main chamber is the chamber which contains the end of the rising main, and, consequently, is the first point which the sewage reaches after treatment with lime on its arrival at the works. The total volume dealt with was 31,879,440 gallons, and the weight of bleaching powder added was equivalent to ·395 grains per gallon of available chlorine.

The deodorising solution was added on 112 days, the total number of hours being equal to 75 days. The average weight per day (112 days) was 16·06 lb. available chlorine, and the average weight per hour (75 days) was ·99 lb. available chlorine.

The estimate which I laid before the General Purposes Committee in March, 1911, was 42 lb. of available chlorine per day for 63 days, which would have been 2,646 lb., whereas the total amount used including sludge disposal was only 2,069 lb.

In order to add the deodorising liquid to the tank effluent the Town Council decided to purchase the patent rights from Oxychlorides Ltd., but from the above it will be seen that the addition of a larger amount of available chlorine at the rising main chamber would have obviated the necessity of taking over the patent rights.

If septic tank treatment had been adopted there is no doubt whatever that the estimated amount of 2,646 lb. of available chlorine would have been very much exceeded, as under the conditions of last summer's hot weather, the sewage arriving at the works had already become septic on very many occasions. The mean temperature of the sewage from July 22nd to September 15th, 1911, was 67° F., the average daily dry weather flow for the sewage from April 1st to November 28th, 1911, was 223,204 gallons, 26 per cent below the average daily dry weather flow for the same period in the previous year, and the mean temperature for the air from July 22nd to September 15th was 72·7° F. All these conditions of high temperature, dry weather, very strong sewage—the last-named of a very fermentative nature—combined to make it almost impossible, under experimental control, to prevent aerial nuisance arising, but for all this, written information was obtained from residents in the neighbourhood that the change of treatment was an improvement on past years, taking into consideration also the very trying season, and no complaint has been received by the Sewage Disposal Committee since September, 1910.

It is a practical impossibility to make the treatment of this sewage absolutely inodorous, but I believe that the treatment will be even more successful next year, if all my recommendations are carried out.

The result of the deodorisation experimental treatment under the most trying conditions of last summer has met with the approval of the Sewage Disposal Committee, who have decided to adopt this scheme. A mechanical lime mixer has been purchased, and the building to enclose this, with storage and slaking pits, has been let out to contract and is nearing completion.

With regard to the bleaching powder treatment, I have recommended the use of circular filter effluent instead of town's water, because this liquid can be obtained at very little cost by pumping and in a much larger volume. A weaker solution of the deodorant can be used with better effect and thus save the use of town's water.

COSTS.

With regard to costs I do not propose to give the actual cost of lime treatment, as the latter will be useless for other work, because it was carried out entirely by manual labour—both the mixing and adding of the milk of lime. I will give the actual cost of all the lime used including haulage, both for the treatment of the sewage and the covering of the sludge, and also the costs of the whole treatment by bleaching powder including town's water, haulage and incidental expenses.

The cost of lime and haulage for the treatment of the sewage was £81 10s., or 13s. 7·2d. per million gallons dealt with, and for the covering of the sludge the cost was £5 5s., or ·44 pence per ton of wet sludge or nearly 2·96d. per ton of dry sludge. The cost of bleaching powder used from 1911-12 together with haulage to the works was £15 17s., equivalent to 1·84d. per lb. of available chlorine. The cost of labour (entirely manual) for preparing the solution, together with the town's water and incidental expenses, was equal to 1·13d. per lb. available chlorine, making a total cost for bleaching powder treatment equivalent to 2·973d. per lb. of available chlorine, or 16s. 1d. per million gallons deodorised.

CONCLUSIONS.

The conclusions drawn from the results of last year's treatment are (1) that the slight increase of sludge per million gallons is more than compensated for by the large reduction of aerial nuisance, by the substitution of lime treatment and precipitation tank methods, for septic tank treatment and any other form of subsequent deodorisation, and (2) that bleaching powder is the most economical form of oxidising agent which can be used as a deodorant. The success which this treatment met with last year, led to my being consulted in conjunction with Dr. Barwise, Medical Officer of Health for Derbyshire, by the Town Council of Tiverton. The brewery waste in the sewage of that town gave rise to odours similar to those which had been found at Stratford-upon-Avon, and we advised a similar scheme of deodorisation with lime and bleaching powder to the one adopted here last year. The scheme has met with approval of the Tiverton Town Council, who have decided to carry out the treatment on an experimental basis on the same lines as at Stratford-upon-Avon last year.

DISCUSSION OF PAPERS.

The PRESIDENT (Mr. J. D. Watson) congratulated the authors upon their papers, remarking that they gave food for thought, and—he was referring particularly to the paper by Dr. Fowler and Mr. Clifford—might have important results when the scientific tests were carried further.

Mr. W. H. MAKEPIECE observed that Dr. Fowler and Mr. Clifford had dealt excellently with a subject as to which they were to a great extent working in the dark. He would like to know whether when the experiments were carried out the various soils contained the same amount of moisture, and whether experiments had been conducted with respect to the porosity of the same soil under different conditions. With respect to Mr. Bell's paper, it seemed that there was an enormous difference in the rate of flow coming into the works. It was stated in the paper that 11 gallons was the waterworks supply, and that the average flow in the summer months was 36 gallons per head, and 44 in the winter. This perhaps would explain why in the summer the sewage became more septic.

Mr. F. R. O'SHAUGHNESSY recalled the evidence given by Alderman Mechi before the Royal Commission in 1838, with respect to the treatment of the soil, and said that that gentleman's plan was that of spraying the crops with sewage. He foretold that they would one day see the sewage of London distributed upon the soil by means of spray jets, but it appeared that the alderman was a long way ahead of his time.

Mr. E. ARDERN remarked that the closer and more thoroughly the investigations of Dr. Fowler were carried

out the greater would be the help given to those who had the management of sewage farms, and he considered they could not be too grateful to gentlemen who devoted their time and attention to the elucidation of natural phenomena.

Mr. J. H. Abbott said that the investigations of Dr. Fowler were extremely interesting, but the results were only tentative, as nothing like a final stage had yet been reached. The method pursued of forcing air was, of course, more or less arbitrary, but he thought that any one who had had experience of peat soil would appreciate the peculiarities with respect to it that had been pointed out in the paper. The method of Dr. Fowler, however, could hardly apply to a large area of land unless it was split up into small plots, because, as they knew, they found astonishing variations in particular tracts of land. It was not possible to get rid completely of the colloidal matter, as there would be always a layer on the surface when the process was carried out rapidly, whatever might be the nature of the subsoil. He considered that Mr. Bell was to be congratulated on the manner in which he had worked out the figures in his paper.

Colonel Jones remarked that the last time he saw the Wolverhampton farm he said the whole aspect had changed, a result due to the careful manner in which Mr. Clifford had dealt with the sewage. He thought Mr. Clifford had succeeded most admirably; in fact he (Colonel Jones) had come to the conclusion that the land was coming to the front once more. (Laughter.)

The President, alluding to a suggestion that Dr. Fowler's paper was largely scientific and speculative, said he was reminded of a speech once made by Mr. Arthur J. Balfour, who was asked, with reference to the recommendations of the Royal Commission on Sewage Disposal, whether he was in favour of indicating that there should be something in the nature of a central authority. He asked for information, and when it was put to him that a great deal of money might be saved by communities who were to an extent working in the dark, he replied: "That is exactly what the English people like to do. They don't want a cut-and-dried scheme; they don't want a Government department to lay down rules, but are much better pleased to spend their money, though it is misspent, in finding out for themselves what they would like to do."

Dr. Fowler, in reply to the discussion, said he desired to emphasise what he had stated at the beginning, that his object was only to arrive at some quantitative method of differentiating soils. They spoke vaguely at present, but whether it was good or not, at any rate they tried to measure what could be done. He trusted others would follow up and see whether the process of investigation could be carried out on a larger scale.

Mr. W. Clifford also replied, and stated with respect to the question as to moisture that this was shown in tables that would appear in the printed paper.

Mr. Herbert D. Bell said, as regarded the question with respect to the difference between the number of gallons per day from the waterworks and the number dealt with at the sewage works, that there were a large number of wells in use in the town of Stratford-on-Avon. The town water was not connected to all the houses, and the brewery used its own water supply. That made up the difference between the number of gallons of water and the number of gallons of sewage. The increase of the flow in winter was due to the higher level of the river.

An adjournment took place to the "Star and Garter" Hotel, where lunch was served and complimentary toasts proposed and acknowledged. The sewage works and farms were then visited, and finally the Sewage Works Committee entertained the visitors to tea.

A paper by Dr. G. J. Fowler, [illegible] and Mr. W. Clifford, Assoc.M.Inst.C.E., entitled "Notes on Methods of Differentiating Soils for Sewage Purification," will appear in a future issue.

Poisonous Street Dust. At an inquest held on Monday at Cardiff with respect to the death of William Bennett, Dr. Harris, medical officer of health, stated that Prof. Delepine, of Manchester, had made an investigation by the deceased's brother in which were the cause of the illness. Every article [illegible] and Dr. Harris gave it as his opinion that the [illegible] at the house [illegible] which it was obtained.

THE ROAD BOARD.

SEVENTH LIST OF GRANTS TO HIGHWAY AUTHORITIES.

During the months of April, May and June, 1912, the Road Board, with the approval of the Treasury, have made advances amounting to £123,315 from the Road Improvement Fund to county councils and other highway authorities, as follows:—

	£
For the improvement of road crusts (including grants towards tar-macadam, &c., and surface tarring)	105,186
For road widenings and improvement of curves and corners	13,258
For road diversions	2,523
For construction and improvement of bridges	2,347
For construction of new roads	*Nil.*

The total grants up to June 30, 1912, after deducting grants cancelled, are as follows:—

	£
For the improvement of road crusts	525,980
For road widenings and improvement of curves and corners	69,838
For road diversions	20,799
For construction and improvement of bridges	17,475
For construction of new roads	4,928

Advances by way of loan have also been made to the sum of £88,958.

In addition, further advances amounting in the aggregate to about £594,000 have been indicated to highway authorities towards works of improvement, of which the details are still under consideration and discussion.

The board have also intimated that they are prepared to contribute, subject to the approval of the Treasury, £875,000 towards the construction of a new western approach road to London

July 4, 1912.

Authority.	Improvement of road crusts.	Widenings, corners and diversions.	Reconstruction of bridges.	Total.
England.	£	£	£	£
Cambridge C.C. ...	816	—	—	816
Cheshire C.C.	9,500	1,205	—	10,705
Cornwall C.C.	6,000	—	—	6,000
Cumberland C.C. ...	1,260	100	—	1,360
Dorset C.C.	705	—	—	705
Essex C.C.	—	2,400	—	2,400
Gloucester C.C. ...	5,976	367	—	6,343
Isle of Ely C.C. ...	1,048	52	—	1,100
Kent C.C.	15,525	4,100	375	20,000
Lincolnshire (Holland) C.C. ...	800	200	—	1,000
Lincolnshire (Kesteven) C.C.	121	—	—	121
Norfolk C.C. ...	6,515	215	—	6,730
Northampton C.C. ...	4,825	375	—	5,200
Oxford C.C.	3,212	—	—	3,212
Somerset C.C. ...	2,450	—	—	2,450
Southampton C.C. ...	4,143	—	—	4,143
Staffordshire C.C. ...	3,861	1,590	385	5,836
East Suffolk C.C. ...	600	—	—	600
East Sussex C.C. ...	4,500	—	—	4,500
West Sussex C.C. ...	5,000	280	—	5,280
Westmorland C.C. ...	—	246	—	246
Wiltshire C.C.	2,159	—	—	2,159
Yorkshire (North Riding) C.C. ...	1,877	—	—	1,877
Yorkshire (West Riding) C.C.	7,350	817	1,520	9,667
Wales.				
Flint C.C.	1,950	282	—	2,232
Merioneth C.C. ...	21	—	—	21
Pembroke C.C. ...	—	1,423	—	1,423
Scotland.				
Banff C.C.	600	—	—	600
Dumfries T.C.	150	—	—	150
Dumbarton C.C. ...	4,254	317	87	4,658
Forfar C.C.	3,000	—	—	3,000
Inverness C.C.	—	1,813	—	1,813
Perth C.C.	1,036	—	—	1,036
Ross and Cromarty C.C.	750	—	—	750
Ireland.				
Armagh C.C.	1,200	—	—	1,200
Cavan C.C.	1,630	—	—	1,630
Down C.C.	2,401	—	—	2,401
Tyrone C.C.	345	—	—	345
Westmeath C.C. ...	1,386	—	—	1,386

Northwich Improvements. It has been decided by the Northwich Urban District Council to apply for sanction to borrow about £14,000 for sewage outfall works, public baths, private street works, sett-paving, and the erection of twenty-four houses for the working [illegible].

STOURBRIDGE AND DISTRICT WATER BOARD'S UNDERTAKING.

RECENT BORING OPERATIONS AT THE COALBOURNBROOK STATION.*

By WILLIAM FIDDIAN,
Consulting Engineer to the Board.

A little over two years ago the Stourbridge and District Water Board acquired by Parliamentary authority the undertaking of the Stourbridge Waterworks Company. The population served is about 40,000, and the present consumption of water about 1¼ million gallons per day. The supply is obtained from three pumping stations, known as Mill Meadow, Coalbournbrook, and The Tack, with wells and boreholes in the Bunter measures of the new red sandstone. These stations are in the valley of the river Stour, Mill Meadow being about three-quarters of a mile above Coalbournbrook, and The Tack a similar distance below. The waters obtained from Mill Meadow and Coalbournbrook have each 25 deg. of hardness, while that of The Tack has only 12 deg. This difference appears to be due to The Tack borings being in the lower sections of the Bunter sandstone, where they outcrop at the lip of the basin in which the water is impounded. Coalbournbrook pumping station is situated on the deepest portion of this basin.

In a recent report presented to the Board by the author it was recommended that, for purposes of economy in pumping and the securing of an improved supply, both as to quantity and softness, Coalbournbrook station should be adopted as the main source of future supply, that the existing 20-in. borehole should be deepened from 200 ft. as then to 400 ft. or more, and a new engine-house with high-duty pumping plant erected, also an additional reservoir for the low-level service (in more suitable position and at 40 ft. higher level than the present one) should be provided with the requisite pumping and distributing mains for the rearrangement of the high and low level areas. Great economies are expected from—(*a*) The concentration of the pumping at one station; (*b*) the use of high-duty pumping plant on all but extraordinary occasions; and (*c*) a better division of the two areas, which will reduce the supply required by the high level to about one half of that at present.

The works are now in progress.

The main purpose of this paper is to describe the work done in deepening the 20-in. boring at Coalbournbrook, and particularly the separation of the upper and harder water of this borehole from the softer water met with in its deepened portion.

It should be explained that the original supply was taken from a well about 50 ft. deep with a 7-in. borehole to a depth of 140 ft. from the surface. At this depth a large quantity of water was met with, and further boring was considered unnecessary. In later years, after the erection of additional pumping plant, the late waterworks company desired to increase the supply from this station, and it was then that the 20-in. borehole was put down at a point some 60 ft. distant from the well. At 138 ft. from the surface the boring operations caused a marked discoloration of the water in the well, and, as a supply from this source had to be kept up, could only be carried on intermittently; so that, presumably on this account and because of the increase of water already obtained, operations were stopped when a depth of 200 ft. was reached. From a knowledge of these and other facts, it became evident that a horizontal parting in the sandstone of considerable water-carrying capacity existed between the 20-in. borehole and the bottom of the 7-in. bore from the well, and that the bulk of the water supply was obtained from this parting.

When considering the problem of obtaining increased and improved supply of water for the undertaking on its acquirement by the board, the author found it practicable to make alterations at The Tack pumping station, by which Coalbournbrook station could be shut down during periods of ordinary consumption of water so as to allow of the 20-in. boring being continued without discoloration of the water supply.

Starting from the existing depth of 200 ft., the New England Boring Company, the contractors for the work, carried the 20-in. bore at its full diameter through the pebble beds, and about 85 ft. into the lower bed of the Bunter sandstone, making the total depth 500 ft. This work was done by the method described in a paper read at the Guildford meeting ("Proceedings," 1910-11, pp. 258, 259), and with considerable rapidity except when passing through layers of marl and loose pebbles, some 10 ft. of which were encountered at the base of the pebble beds. For marl or such-like strata the older percussion method of boring is undoubtedly the better, but in this instance the layers were thin and did not warrant a change of method. The loose pebbles gave considerable trouble, and had to be ground away by the revolving tool. A few pebbles came to the surface uninjured by the tool, but they must have fallen from the side of the borehole into the receptacle for *débris* on the top of the tool after it had passed below the bed of pebbles. It is very probable that a change to percussion methods would not have improved matters, as there would be a liability of disturbing and having to deal with a larger quantity of pebbles.

Tests were made at intervals during the boring operations (by means of the existing permanent pumping plant) to find as far as possible, the extent to which the supply of water had been increased, and samples were taken of the water obtained below 200 ft. from the surface during pumping to ascertain the character of the new water. By means of a comparison of the records of the levels of water in the well and the 20-in. borehole respectively before the boring commenced with those taken at the several stages of its progress, the conclusion was arrived at that a total quantity of above 2,500,000 gallons of water per day would be obtainable at this station.

The quantity of water coming from the lower portion only of the 20-in. borehole having been estimated to be more than the board's present requirements, and its hardness found to be 12 deg., or about one half that of the upper water, and its quality excellent, it was decided to attempt to make a controllable separation of the two waters. This was most successfully effected in the manner now to be described.

The 20-in. borehole as originally put down was lined with 20-in. steel tubes to a depth of 110 ft. This lining has now been extended some 45 ft. with 16-in. tubes. It was sealed at the bottom to the side of the borehole by being lowered into 6 ft. of liquid cement held up by a plug temporarily formed in the borehole. When the cement had set the portion projected inside the tube and a similar portion of the plug below were cut away. The joint at the connection of the 20-in. and 16-in. tubes was also made with liquid cement, a packing ring between the two tubes about 6 ft. from the top of the smaller tube preventing the cement grout passing down below it. By this means an annular space was left between the 16-in. tube and the rock side of the borehole from 110 ft. to 155 ft. from the surface, between which points (at 138 ft.) the before-mentioned parting gives communication with the well borehole. When this work was complete it was found that the object aimed at had been realised, as the lowering of the water level in the well 40 ft. only slightly affected the level of that in the 20-in. borehole.

The 20-in. borehole has been connected to the well by a 15-in. cast-iron pipe controlled by two sluices. The level of this connection is 35 ft. below the top of the borehole, and the standing water level is 2 ft. below the top. To make the connection a shaft was sunk between the borehole and the well (some 10 ft. from the former), and a heading driven in the sandstone rock in both directions. The method of attaching the 15-in. branch to the 20-in. bore tube while under a head of 33 ft. of water was that used for water mains by Messrs. J. Ruscoe & Co., of Manchester, from whom the necessary cutting tool was hired. The suction pipes of the pumping plant to be erected will be taken down this shaft and connected to the 15-in. horizontal pipe between the two sluices before mentioned. By this arrangement water can be obtained from the 20-in. borehole only, from the well only, or from a combination of both sources of supply in such proportions as may be desired.

Upon the connection of the 20-in. borehole to the well by a pipe it became possible to make a direct pumping test of the yield of the former. This proved to be practically what it was estimated at before the upper and lower waters were separated, namely, over 1,500,000 gallons per day.

The new plant will consist of a triple expansion rotative steam engine with vertical and inverted cylinders and direct single acting ram pumps, capable of pumping 1,500,000 gallons per day with a lift of about 300 ft. This will be used for low level requirements. For high level service it is intended later on to remove and instal here the high-duty Worthington engine at present at Mill Meadow station, the capacity

* Paper read at the meeting of the Institution of Municipal and County Engineers at Stourbridge last Saturday.

of which is 500,000 gallons per day against a head of about 450 ft.

When the whole of the new works are complete, the demand for the low level area is expected to be about 1,000,000 gallons per day, and for the high level area about 300,000 gallons per day.

The advantage of having all the pumping at Coalbournbrook instead of being spread over three stations is unquestionable. The plants at Mill Meadow and The Tack and the existing pumping engines at Coalbournbrook will in future be maintained for ordinary stand-by purposes, and for use in case of exceptional demand for water.

MUNICIPAL WORK IN CANADA.

(From a Surveyor *Canadian Correspondent.)*

The question of furnishing quantities in connection with building has been vigorously discussed in one of the technical journals. The merits and demerits of the Canadian plan as opposed to the British system have been exclusively debated, one of the biggest contractors in Canada, Mr. C. E. Deakin, of Montreal, championing Canadian practice. Under this every contractor tendering on a job takes off his own quantities, and the arguments in favour of this are that the work involved is not worth considering, that each man should be responsible for his own work, and that it is unsafe to take quantities from outsiders, no matter how accurate they may be. Mr. Deakin states that in cases where he has tendered on jobs where the quantities have been furnished he has been asked to pay from 2 to 2½ per cent on the amount of the contract for the quantities, and in no case has he found a quantity surveyor who was willing to be responsible for any mistakes he might make by omitting any quantities of material.

The British plan found considerable support, instances being given of the practice in tendering for municipal work. The chief ground in favour of Old Country practice is that it saves duplication of the work, is done by trained men, and that it effects an all-round saving. The chance of errors is met by a special clause, and Mr. S. H. Penlington, A.R.I.B.A, of Toronto, declares that the difference between the two systems is that between a guessing competition in a contractor's office at midnight and the steady work of a quantity surveyor. The furnishing of quantities upon a business-like basis practically eliminates the element of chance. It is admitted by some correspondents that the British plan, on the surface, looks economical, and is an assistance to contractors, but there is a disinclination to break away from a practice which has been so long in operation here.

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In Canada, with a small population scattered over an immense area, the supply of pure water is a very serious problem. The difficulty in isolated places is to obtain water fit to drink, or to secure economical means of purification. Mr. M. H. McCready, the chemist of the Quebec Provincial Board of Health, has, after months of experimenting, perfected a device by which the proper quantity of hypochlorite solution is automatically introduced into the water as the latter courses into a miniature reservoir. All that is needed is a galvanised-iron or wooden tank or tub, a few pieces of glass tubing, with rubber attachments, a 3-litre bottle with rubber cork, and a ball stop-cock connection. The whole apparatus costs from £1 to £1 5s. The tank is 30 in. long, 18 in. wide, and 24 in. deep. This is sufficient to meet the requirements of an ordinary household, and the 3-litre bottle containing the sterilising solution will suffice for three or four days' water supply. One of the problems was to secure an appliance which would automatically measure out the proper dosage of hypochlorite, and a plan has been hit on by making use of the water pressure and the air pressure created by the latter. A scale has been set by which the quantity of hypochlorite allowed to percolate from the container is regulated according to the size of the various tubes and the containing reservoir. The Board of Health has information regarding the character and quality of water in every watercourse in the province, and those desiring to use the appliance will have to write to the [illegible] the solution jar proposed to be used. The board will [illegible] what quantities [illegible] to be employed. A trial will show [illegible] 1 [illegible] per [illegible] 20,000 = 240

CONSTRUCTION AND MAINTENANCE OF AMERICAN HIGHWAYS.

THE USE OF BITUMINOUS MATERIALS DURING 1911.*

By Arthur H. Blanchard, M.Am.Soc.C.E.,
Professor of Highway Engineering, Columbia University, New York City.

In December, 1910, the writer presented before the American Association for the Advancement of Science a paper entitled "The Present Status of the Use of Bituminous Materials in the Construction and Maintenance of Roads in the United States," which treated of the status of the art and science of this branch of highway engineering during 1908, 1909 and 1910. The development during 1911 of the use of bituminous materials is worthy of consideration.

That more permanent forms of construction are favoured by our State Commissions is clearly shown by the marked decrease in the use of light oils for surface treatment of roads, and the decided increase in the surface treatment of roads with heavy asphaltic oils and asphalt cements. As showing the general increase in the use of bituminous material in the construction of bituminous surfaces and bituminous pavements from 1908 to 1911, the total figures for the four years are given. The total number of square yards for each of the above years is: 1908, 416,700; 1909, 7,735,100; 1910, 18,244,600; 1911, 21,514,600. These totals include the yardage of road surface treated with light asphaltic oils. A comparison of more value and representing material progress along the lines of improved methods of construction and maintenance should be based on totals from which the yardage of road surface treated with light asphaltic oils is omitted. On this basis the total yardage is as follows: 1908, 416,700; 1909, 3,609,200; 1910, 8,327,700; 1911, 17,749,400.

A marked development under "bituminous surfaces" is in the increased use of various types of pressure and gravity distributors which have been specially designed for this work. The consequent abandonment of the use of pouring cans and ordinary watering carts for this work is to be commended. Many types of these machines have been used during the past year for this kind of work. It has been unfortunate that sufficient information has not been at hand covering the use of these various machines, so that an engineer might know the limitations of a machine before purchasing. Extravagant claims have been made by the designers and manufacturers of distributors. In a certain instance it has been claimed that materials, ranging in character from light oil to an asphalt cement of a consistency suitable for use in the construction of sheet-asphalt pavements, could all be distributed by a given machine in amounts per square yard varying from ⅛ gallon to 2 gallons.

During 1911 bituminous surfaces have not only been used extensively on macadam and gravel roads, but they have also been used to a considerable degree on cement concrete pavements. The improvement of the concrete pavement by the addition of the bituminous surface is marked, as, if the proper kind of bituminous material is used, the pavement is non-productive of dust, is not slippery, and is less noisy than the ordinary concrete pavement. There is no apparent reason why the results accruing from the use of bituminous surfaces on brick pavements would not be equally good. Especially would such be the case where bituminous fillers are used, thus combining many of the advantages of bituminous fillers and bituminous surfaces with the inherent good qualities of brick pavements.

In all the methods the construction is completed by the application of a thin coat of sand, stone chips or screenings.

Type A.—For the upper course broken stone is used containing sufficient small-sized particles to materially reduce the voids, as, for instance, crusher-run stone, which passes a 1½-in. screen, and is supposed to be retained on a ½-in. screen. In this method, after the upper course is laid, the bituminous material is applied either before or after the surface is rolled, some favouring the former, because of the greater depth of penetration secured. When the upper course is rolled after the application of the bituminous material, a coat of mineral matter has usually been spread over the surface before rolling. [illegible] for a second application or seal coat

* Extracts from a paper presented at the Washington meeting of Section D of the American Association for the Advancement of Science.

of bituminous materials is determined by traffic conditions in many cases, although standard practice in some departments is responsible for the use of one or the other method, independent of the traffic.

Type B.—In case the metal of the upper course is a uniform product of about 1 in. or 1½ in. in size, the bituminous material is applied after the course has been lightly rolled. Stone chips are then spread upon the surface and thoroughly rolled. After the surface is broomed, another coat of bituminous material is applied. The above method is also used when the road metal varies from 1½ in. to 2½ in., in which case ¾-in. stone is usually employed in place of chips.

Type C.—The foundation courses are filled to a certain extent with sand or small-sized broken stone, and after the course is rolled, excess mineral matter is swept off. After the upper course of road metal is applied, its voids are filled to within about 1 in. of the surface, and the bituminous material applied. The road is finished with a coat of sand or chips, which is rolled, although in some cases a second application of bituminous material and chips is used.

Type D.—A closely packed foundation or a concrete base is used, and large and uniform-sized stone employed for the wearing course. In this method a layer of sand, ¾ in. thick, is placed on the bottom course, and bituminous material distributed, using about 1 gallon per square yard. The upper course of metalling is applied, and the upper course thoroughly rolled, the bituminous mastic tending to fill the voids of the upper course. Another coat of bituminous material is applied, and the surface finished by the application of a coat or two or three applications of bituminous material are made, using likewise two coats of sand or chips.

Type E.—The upper course is constructed in the usual manner, and in place of sand or stone chips a bituminous mastic is applied to the surface, being rolled into the voids and forming the finished surface of the road.

Bituminous concrete pavements, in the aggregate of which broken stone forms an integral part, may be divided into three groups, as follows, the classification being based upon the character of the mineral aggregate:

Type A.—One-size aggregate, stone that . . . may be passed of a crushing plant.

Type B.—Combination of one-size coarse stone and fine mineral matter, such as sand, stone screenings and fine gravel.

Type C.—Evenly graded aggregate of broken stone and sand, or other mineral matter.

Naturally type A has been very popular, due to its inherent simplicity. During the past year the writer has seen excellent pavements constructed by this method where the aggregate was a one-size crusher-run stone, having the following characteristics based upon a mechanical analysis: all the stone passed a 1¼-in. sieve, not over 25 per cent passed a 1-in. sieve, and was retained on a ¾-in. sieve, and not over 5 per cent passed a ¼-in. sieve. Descriptions of such pavements of this type are legion.

The State Board of Public Roads of Rhode Island has used Type A since 1906. A mechanical analysis of a typical product used in Rhode Island may be of interest, and hence is given, below. Per cent passing 10-mesh sieve, 1·0; ¼-in. sieve, 2·5; ½-in. sieve, 30·8; ¾-in. sieve, 34·2; 1-in. sieve, 23·4; 1¼-in. sieve, 8·1. As deputy-engineer for the State Board of Public Roads of Rhode Island, the writer had charge of the construction and maintenance of bituminous surfaces and bituminous pavements for a number of years, and hence had the opportunity to inspect on numerous occasions the first section of bituminous concrete pavement constructed in 1906, under the above specification. This section has needed no repairs, although subjected to high-speed motor-car traffic of the heavy passenger type. Without doubt broad-minded judges would admit that this type of pavement has inherent stability.

During 1911 Type B was popular in various quarters. In Washington, D.C., under the jurisdiction of Captain Mark Brooke, of the office of the Engineer-Commissioner, bituminous concrete pavements were constructed under the following specifications, covering mineral aggregate: "The paving materials shall be composed of crushed trap-rock screenings, concrete, sand and mineral dust, in the following proportions: Trap-rock screenings, two parts; concrete sand, one part; and mineral dust, at least 5 per cent of the above aggregate, mixed with asphaltic cement." The trap-rock screenings referred to above varied in size from 1 in. to screenings, and were devoid of dust. Detailed specifications were also given with reference to the character of the sand and the mineral dust. The writer has had the good fortune to examine various streets paved under the above specifications. In his humble opinion, these pavements possess inherent stability under commercial traffic.

During 1911 many thousands of yards of a pavement of Type C have been laid. In the borough of Richmond, New York City, over 40,000 sq. yds. were laid on a total of eighteen streets last year under the direction of Theodor S. Oxholm, M.AM.SOC.C.E. The mineral aggregate used conformed to the now famous Topeka specifications.

Mention should be made of the effect of the introduction of various types of low-priced mixing machines during 1911. The economical and satisfactory results accruing from the use of these machines for mixing certain types of aggregates with bituminous cements has caused the introduction of the mixing method in many localities, where only the penetration method has formerly been used. During the season of 1912 many new machines of this type will be used with the consequent increase in the construction of the various types of bituminous concrete pavements outlined above.

During 1911 considerable thought has been devoted to the methods and materials employed in the construction of sheet-asphalt pavements. Notable work has been done by a Special Committee of the American Society for Municipal Improvements and the Committee of the Association for Standardising Paving Specifications. Throughout the United States there appears to be crystallising a firm belief that specifications for materials should be opened to admit such asphalt cements as "Bermudez," "California," "Pioneer," "Texaco," and "Trinidad," for instance, which have shown by service tests that excellent pavements may be constructed by their use. This tendency is commendable as thus competition is increased, and the high quality of the asphalt cement is maintained.

THE SEWERAGE OF FLEET, HANTS.

£30,000 SCHEME RECOMMENDED.

Mr. H. Percy Boulnois, M.INST.C.E., Westminster, who was retained to adjudicate upon three competitive schemes of sewerage for the urban district of Fleet, Hants, has recommended the carrying out of the one prepared by Mr. Moss-Flower, the cost being estimated at £29,732. The district is described by Mr. Boulnois as "somewhat difficult," and the scheme which he favours is regarded by him as the best and most practicable of those submitted. In his report Mr. Boulnois says it is evident that any attempt to obtain a cheap scheme of gravitation would result in failure, and asserts unhesitatingly that a scheme of that nature could not be carried out. In his view Mr. Moss-Flower has very wisely decided against a central pumping station, and has split up the district into various ejector lift areas, thus minimising the difficulties and expense of deep pump wells and tanks. He also thus lessens the depths of his proposed sewers, which, Mr. Boulnois points out, is another very important advantage both in cost of construction and availability.

Road Work in America. It is estimated that the expenditure on road work in the United States during the last twenty years has reached the colossal sum of £280,000,000. The State and local expenditures for 1911 aggregate £28,000,000, of which about £4,000,000 was devoted to highway improvements in the State of New York. In 1906 the Legislature at Albany appropriated for this purpose £10,000,000, of which about £200,000 has to be spent, but a Bill is now pending to borrow another £10,000,000 to continue the work. For the purpose of interesting the public generally in good roads, the Government took up the question officially in 1909, when an exhibit was formed and sent to the Seattle Exhibition, where it attracted so much attention that it has since been shown at several other cities. The railways then showed a keen interest in the matter, and operated road-improvement trains fitted for carrying exhibits and for lecturing purposes. The Government now maintains four exhibits showing the various methods of road construction, and these are shown at the State fairs and land and real-estate exhibitions.

Institution of Municipal Engineers.

JOINT EASTERN AND NORTH-EASTERN DISTRICT MEETING.

A joint meeting of these districts was held at Peterborough on Wednesday, July 3rd. Among the members present were Messrs. W. T. Unwin (chairman of the Eastern District of the institution), Philip S. Bennett (Ramsey), John S. Parrott (Downham Market), Robert Nelson (Norfolk), G. A. Penwill (Peterborough), Solden Hipwell (Chatteris), J. J. Howard (King's Lynn), John Bailey (Spalding), Robert Gibson (Norfolk), J. Kennedy (Norfolk), W. R. Bailey (Holbeach), G. Belson Chilvers (Oundle), N. E. Dixon (Oundle), G. F. Mayfield (Godmanchester), and R. G. Coates (honorary secretary of the Eastern District) and B. Wyand (secretary of the institution).

The party assembled at Peterborough Station, whence train was taken to Yaxley, where are situated the Fletton brick-making works of Messrs. Eastwood & Co., Limited. Arrived at the works, the members were met by Messrs. James F. Wyllie and H. K. Rolfe, representing the firm of Messrs. Eastwood & Co., and were conducted by them and the works manager (Mr. Dickinson) round the works, where the whole of the processes of brick manufacture by the dry process, including quarrying, grinding and screening of the raw material, and the subsequent moulding, pressing, drying and burning were seen. The following notes on the Fletton brick industry were furnished.

NOTES ON FLETTON BRICK MANUFACTURE.

The Fletton bricks as they are now known were first manufactured in 1880. Previous to this they were made largely by hand, much in the same way as in the time of the Pharaohs.

The wire-cut machine, now practically obsolete, in use about five years earlier, was only capable of working the top or plastic clay; this process entailed considerable time and labour, the clay alone taking some months to get properly weathered. The era of the "semi-dry" process simply revolutionised the industry.

The clay—of a shaley nature, which had hitherto been left as worse than useless—was found to have potentialities before undreamed of, both for economy of production and quality of the finished article, while the large percentage of natural gas which it contained made for further economy in the cost of burning. Clay grinding, elevating and pressing machinery (by Messrs. Scholfield, of Leeds) were first installed, and for some years these answered all purposes for speculative building, but responsible architects and others had during this time looked askance at the new brick, which from some standpoints certainly had imperfections. To meet their requirements, machinery by Messrs. Whittaker & Co., Accrington, and Messrs. Platts Bros. & Co., Oldham, was put in, with good results, and the bricks thus improved rapidly gained favour; but it was some years after the start that Messrs. Whittaker & Co. brought out their "re-press" or "four pressed" machine.

Messrs. Eastwood & Co. were among the first to recognise the superiority of this machine over its predecessors, and they installed a full four-pressed plant, with most gratifying results. Leading London and provincial architects and surveyors at once realised the marked improvement in quality, and found no hesitation in specifying these bricks to be used in their best contracts, especially where a large crushing strain was involved. Numerous improvements in the process of burning and manufacture have from time to time been added, not the least of these having been the utilisation of heat from burning bricks to dry other bricks in course of burning, known as the "hot air" process. New departures have also been made in the manner of grinding, screening and conveying the clay.

It might be mentioned, incidentally, that when the kilns were first erected it was thought necessary to line the internal walls with fire-bricks, but it was afterwards found that the Fletton bricks withstood the intense heat better than the fire-bricks.

The industry has increased to enormous proportions. Leaving out the comparatively new works at [illegible] Yaxley, Ecc Green, and Whittlesea, the Fletton firms are able to turn out about 6,000,000 bricks per week.

The process of manufacture of a four-pressed brick is briefly as follows:

The top soil and underclay or plastic clay is removed to within 2 ft. to 3 ft. of the "Knotts" or Oxford clay, which is approximately 40 ft. to 50 ft. deep. Being of a shaley nature, the clay is easily detached by bars and put into wagons, the various layers being alternately removed so as to obtain a good mixture, this being necessary in view of the varying shrinkage qualities of the several layers.

The wagons are conveyed on tram lines, either by manual labour or by endless chain up to the grinding mills, where the clay is tipped into the revolving perforated pans. Heavy rollers grind the clay to almost a powder, which passes into a receiver under the pan, and is then caught up by the elevator buckets and deposited on steel wire screens, through which the fine clay finds its way on to an endless conveyor belt, the tailings passing down another spout back into the grinding pans. From the conveyor the machines are fed direct. By an arrangement of "ploughs" across the belt, enough material is automatically detached to feed each separate machine, when it passes down a sack hopper and thence by means of a sliding feed-box into the first mould. The amount of material received into each mould can be regulated instantly, so that, as the material varies in point of dampness from time to time, more or less can be taken into the mould, the bricks being uniform throughout. After being subjected to a double nip pressure in the first mould the brick is automatically fed into a second mould, where it is again twice pressed, thus having some 80 tons pressure put on it four distinct times. For the first time during the process the material is touched by hand, and the finished brick is taken from the press and put on to barrows for removal to the kilns, where it remains drying and burning for from twelve to sixteen days, being then drawn and delivered straight into railway trucks. The kilns are of the continuous type, and hold from 250,000 to 300,000 bricks.

Something must be said, in conclusion, as to the effect of the change on the locality. What was only a comparatively short time ago a peaceful village with a few scattered houses is now a flourishing community, linked to Peterborough without a break with well-built houses, good roads and footpaths, well-lighted streets, a separate drainage scheme with sewage disposal works, and a water supply second to none in the kingdom. The death-rate is low—11·6, compared with 14·6 for England and Wales. The birth-rate is high—26·6, as against 24·4 for England and Wales. There are also large elementary schools, with 650 scholars, and secondary schools. The locality, comprising Fletton and the neighbouring parishes of Stanground and Woodston, is controlled by an urban district council.

At the subsequent meeting the chair was taken by Mr. W. T. Unwin, the chairman of the Eastern District, and a vote of thanks to Messrs. Wyllie, Rolfe and Dickinson, and to Messrs. Eastwood & Co., for the courtesy extended to the members, was passed.

The minutes of the last meeting of the Eastern District and the North-Eastern District respectively were then read and approved.

The next item on the agenda was the election of officers for the Eastern District for the current financial year, and it was proposed by Mr. P. S. Bennett (Ramsey), and seconded by Mr. J. S. Parrott (Downham Market), that the present chairman be re-appointed.

The Chairman said that he had had the honour of occupying the position for the past two years, and he thought it would be wiser to distribute these appointments more. He had been very pleased to hold the office, although pressure of work had prevented him latterly from doing as much as he had wished. A change would in every way be better; of that he was convinced. Others were equally competent to carry out the duties of chairman, and by distribution interest would be increased. He would propose, therefore, that the reins of office be placed in the hands of Mr. Hipwell, and all would agree that no more suitable man than Mr. Hipwell could be found. He (Mr. Unwin) would be pleased to render Mr. Hipwell every possible assistance.

Mr. Solden Hipwell (Chatteris) thanked Mr. Unwin for bringing his name forward, but he felt that he could not carry out the duties as Mr. Unwin had done.

He quite agreed as to the chair being passed round as far as possible; none the less Mr. Unwin was doing very well, and he would like to see him retain it for another year at least.

Mr. R. G. COATES (Norfolk) hoped that Mr. Hipwell's dissent was not a refusal, and that he would leave the final election to the meeting. He (the speaker) also agreed as to the principle of distribution, as it would certainly add zest to their proceedings. Fresh blood was good, and he could say, without casting any reflection upon their present chairman, that it must always be to their benefit to change.

Mr. G. B. CHILVERS (Oundle) seconded Mr. Unwin's proposition, but, Mr. Hipwell remaining obdurate and no other proposition being forthcoming, Mr. Bennett's motion was carried unanimously.

The CHAIRMAN, in returning thanks for his re-election, expressed the hope that the district would confer the honour elsewhere when this his third year of office was up. He would do all he could to further the interests of the institution, and he would add his share to the excellent work that was being done by the institution in the direction of obtaining superannuation and security of tenure for the members of the profession. They were all now in possession of their full vigour—who should say what to-morrow might bring forth! They ought to be recognised precisely as were the Poor-law officers. Meetings such as their meeting that day were very well in their way, and very necessary; but there were matters of equal importance to technical improvement. No effort must be spared to the desired end, and their institution was *par excellence* the body to move in the matter. As regards the future of the institution, that was, of course, long since assured; but none the less each must contribute his share to the general work, with the inevitable result that it would rank second to none among the professional bodies of the country. To come down to the business in hand, however—*viz.*, the appointment of their honorary district secretary—he felt that they could not do better than re-elect Mr. Coates, who had done so excellently in the past.

Mr. J. KENNEDY (Norfolk) then proposed, and Mr. HIPWELL seconded, that Mr. Coates be re-elected honorary district secretary for the current financial year.

Mr. COATES was of the opinion that the remarks as to distribution referred equally to his own office. He had originally undertaken the duties simply to start the district, and he had been in office ever since! He had wished to retire last year, and had only continued under great persuasion. There had been few meetings, but meetings of interest such as the one held that day were difficult to arrange. To meet and merely to read the minutes of the last meeting was not an attractive programme. As those present would know, he was a member of the council, and he could assure them that superannuation and security of tenure were by no means being lost sight of in London. They were being energetically pursued, and might safely be left in the hands of the council. He would retain his office as honorary district secretary if they pressed it upon him, but he hoped they would make a change, and he would suggest the election of Mr. P. S. Bennett.

Mr. R. GIBSON (Norfolk) then proposed, and Mr. COATES formally seconded, the election of Mr. Bennett, and the proposition was carried unanimously.

Owing to the length of the proceedings, the election of officers for the North-Eastern district had to be postponed, only just sufficient time being left to catch the train back to Peterborough.

On the return to Peterborough a visit was paid to the Cathedral, and later, after tea, those members whom train services permitted to remain were conducted round the town by Mr. G. A. Penwill, who had kindly arranged the local programme.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangement well suited for easy reference.—*The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By Sydney G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

STOURBRIDGE GASWORKS.*

By C. H. WEBB, M.SC., ASSOC.M.INST.C.E., Gas Engineer.

The works were established in 1835 by a company of six shareholders, but it was not until twenty years later that they were incorporated by the Stourbridge Gas Act of 1855. The maximum price of gas mentioned in the Act is 6s. per 1,000 cub. ft., and there is included a purchase clause in favour of the local authority. In all other respects the Act is in the usual form. The undertaking was purchased by the Urban District Council of Stourbridge, as and from December 31, 1892, at a price of about £100,000. The works are not situated in the area of the Stourbridge Urban District Council, but immediately over the boundary in Amblecote parish, Staffordshire. The present district supplied comprises Stourbridge, Amblecote, Lye, Wollescote, Pedmore, Hagley, Clent, Belbroughton, and part of Wordsley, with an area of 15,308 acres and a population of 39,915. The output of gas is high in proportion to the population, the area having, in addition to residential parts, large manufacturing districts with a working-class population. A large percentage of the gas is supplied for power and other trade uses, and there is also a heavy consumption by prepayment meters, gas fires and cookers. The following comparison will show the progress made in the period that the works have been the property of the urban district council:—

	1892.	1911-12.
Annual make of gas	96,000,000 c. ft.	231,182,000 c. ft
Main mileage	37	60
No. of consumers	1,340	ordinary 2,243; prepayment 5,363
Public lamps	676	825
Tons of coal carbonised	8,457	21,136
Capital	£47,500	(balance of loan) £95,172
Gross profit	£4,787	£11,366
Price of gas	2/8	2/8, 2/6, 2/-, 1/9, and 1/6 (according to quantity and use)
Gas cookers in use	nil	2,634
Slot meters	nil	5,363

The plant comprises: Retort-house, containing eight beds of eight retorts (21 ft. by 22 in. by 16 in.), with Klonne regenerative furnaces, and worked with West's manual machinery; vertical water-cooled tubular condenser; two steam-driven exhausters; Livesey washer; rotary washer; five purifiers, 30 ft. by 20 ft.; station meter; three gasholders, combined capacity 1,100,000 cub. ft.; pressure-raising or boosting plant and station governors (20-in., 16-in., 12-in., and 12-in. safety governor). Humphreys and Glasgow carburetted water-gas plant, of 500,000 cub. ft., is now being erected, and two Lancashire boilers (24 ft. by 8 ft. diameter), to replace old egg-ended ones now in use, are being installed.

The works are served by a high-level railway siding connected with the Great Western Railway for delivery of coal, sulphuric acid for the manufacture of sulphate of ammonia, for stores to cooker repairing and fitting shops, and the removal of sulphate of ammonia, oxide of iron, &c. There is also a low-level railway siding for loading coke, and the tar produced can be loaded into boats on the canal adjoining the works by gravity from the sales tank. In view of the demand for tar for road purposes, Wilton's tar-dehydrating plant has recently been installed, and a description of this will perhaps be of interest. The special feature of this particular plant is that it is on the enclosed system, the tar being dealt with in a slow, continuous stream instead of in bulk.

By this means the constancy of the finished product is more readily assured, and this is an important point when working to the Road Board's specification, which can be done with this plant. The principle of the process is that the tar is heated (to about 160 deg. Cent.) when under pressure (about 30 lb. per square inch), and then released, when the water and light oils, being at a temperature higher than their respective boiling points, are evaporated, and leave the dehydrated and acid-free tar behind. The plant at Stourbridge is capable of dealing with 100 gallons of crude tar per hour. The tar is supplied from the land-sale tank by gravity into a suction or feed tank, from which it is continuously pumped through a preheater or economiser, the coils of which are surrounded by hot dehydrated tar. After absorbing some of the heat in this, the crude tar then passes to the still, which is a brick structure containing about twelve laps of coiled piping, heated by a small breeze furnace with forced draught. The crude tar when passing through the coil is still further heated, and

* Paper read at the meeting of the Institution of Municipal and County Engineers at Stourbridge last Saturday.

on leaving the still the pressure is suddenly reduced in the vapour box, where there is a free space provided. The water and light oils, being at a high temperature, are vaporised, and leave the tar, which latter flows away through the preheater, where it parts with some of its heat, on to the store tank for sale. From the top of the vapour box the vapours pass through a coiled condenser surrounded by cold water, and thence to the receiver, where the ammoniacal liquor and light oils separate by gravity. The liquor is run back to the works well, while the light oils are barrelled and sold. The plant is simple, easily worked, and, from the reports received from other works where the process has been carried on for extended periods, gives very little trouble. It is necessary to obtain a certificate of registration under the Alkali, &c., Works Regulation Act, 1906, and the plant is regularly examined by the Government inspector.

As the greater portion of the dehydrated tar will probably be required in the summer months, when the gasworks output is at a minimum, it is essential that there should be ample storage for crude tar, and also to allow for rushes of work on the roads when the weather is fine, there should be good storage for the finished product. As road engineers, you are doubtless most keenly interested in keeping the cost of the dehydrated tar as low as possible, and consequently your attention should be directed towards ensuring that the barrels used for packing should be treated by your men with the greatest care, and returned promptly. To pack a ton of dehydrated tar five barrels are required; cost at present prices, 5s. each. As the cost of these barrels has to be charged in the price of the tar, it will be seen that if the barrels can be made to last an increased number of journeys, say eight instead of six, before being scrapped, the cost of packing per ton is reduced from 4s. 2d. to 3s. 1½d., or over 1s. per ton.

SOME RECENT PUBLICATIONS.*

Everybody's Guide to the National Insurance Act, 1911. By Thomas Smith, Barrister-at-Law. Price 1s. London: Chas. Knight & Co., Limited.

So many people are affected by the National Insurance Act—which brings within its provisions some 14,000,000 persons—that it is by no means surprising to find this is the second edition of Mr. Smith's "Guide." His labours have thus borne good fruit, not undeservedly so, as it would appear that the work has successfully achieved its purpose of guidance with respect to a subject whose complications are as notorious as, in a sense, they are also unavoidable. The regulations of the National Insurance Commissioners and the Board of Trade are explained so clearly as to bring them within range of the ordinary human understanding, and those who are affected by the National Insurance scheme may consult this authority not merely with profit but likewise with some degree of interest.

We have also received Messrs. Charles Knight's "Householder's Cabinet," which is designed to facilitate the carrying out the provisions of the National Insurance Act by mistresses of households. The cabinet is divided into three compartments, one containing a copy of "Knight's Householder's Help," while the second is designed for the servants' contribution cards, and the third for emergency cards. In addition the lid is furnished with a pocket for in[illegible] stamps.

Practical Method of Sewage Disposal. By Ogden and Cleveland. Price 6s. 6d. nett. New York: John Wiley & Sons.

This book treats entirely of methods of sewage disposal for residences, hotels and institutions. These methods are adaptations of the well-known principles of the septic tank, sub-surface irrigation, sand filtration and broad irrigation to plants of small size. No new principles are developed, and the various chapters are concerned chiefly with details of construction.

To engineers familiar with the author's previous books on sewer design and sewer construction this book will be regarded as merely a supplement but to the general reader not familiar with the subject it will prove of interest. It is not, however, a sufficient guide for a layman attending to local work, and in some respects may prove misleading to him. For example, the chapter on Estimation of Costs describes methods of estimating, but gives no idea of what an actual plant is likely to cost. Nothing is said in regard to the operation of plant after construction, and this is one of the most important features of the subject, and one almost universally ignored by the owner. The author assumes that cesspools are not to be recognised as a proper method of sewage disposal, yet many competent sanitarians believe that under proper conditions and with proper care they furnish a method of disposal quite as satisfactory as a more elaborate plant that is not well taken care of.

Public Works and Engineering Review of Reviews, No. 3 of Vol. xii. (Civil Engineering Press. Price 5s. per annum).—The current quarterly issue of this magazine, dated July, shows a marked improvement by comparison of its literary contents with those of the preceding issue. Among its chief contents are the editorial notes, which might, we think, be extended beyond the two pages they fill; some information as to the new premises of the Institution of Civil Engineers, with summaries of the two papers as to Madras Harbour, recently read before that body; the conclusions of papers on "Engineering Plant in Institutions," and "Water and Petroleum Boring and Machinery;" details of recent extensions of the Singapore waterworks; and the "Review of Reviews" section, which is a record of the principal articles in recent issues of the leading engineering journals. *Public Works* is certainly the most sumptuous of such journals in its typographical excellence.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. Thomas, M.Inst.C.E., County Surveyor, Buckinghamshire.

THIRTY-NINTH ANNUAL GENERAL MEETING.

The annual meeting of the institution, which opened yesterday in the Council Chamber, Caxton Hall, Westminster, will be continued there to-day, and conclude to-morrow at the County Hall, Aylesbury.

To-day's Programme.

10 a.m.—Discussion on the following papers (to be taken as read):

(6) "Maintenance of Sewers in Hampstead," by O. E. Winter.

(7) "Bituminous-bound Carriageways," by J. S. Brodie.

(8) "Road Maintenance in County Armagh," by R. H. Dorman.

(9) "Scottish Roads," by Allan Stevenson.

(10) "How the New District Committees may Promote the Progress of the Institution," by A. H. Campbell.

1 p.m. Adjournment for lunch.

Programme of Visits.

Party "A"—Norwood.

2.30 p.m.—The party will assemble at Victoria Station (London, Brighton and South Coast Railway). Members will book independently.

2.43 p.m.—Depart for Crystal Palace (change).

3.20 p.m.—Arrive Norwood Junction.

Proceed to inspect reinforced concrete subway, 9 ft. 6 in. diameter, by invitation of Mr. G. F. Carter, who will kindly conduct the party over the work.

Party "B"—Sideup.

2.40 p.m.—The party will assemble at Charing Cross Station (South-Eastern and Chatham Railway). Members will book independently to New Eltham.

2.50 p.m.—Train leaves for New Eltham, where members will alight on the outward journey.

3.32 p.m.—Inspection of sections of road, of various materials, laid for testing by the Kent County Council, for the Road Board, *en route* to Sideup.

Party "C"—Hampstead.

2.45 p.m.—The party will assemble at Golder's Green Station. Guides will meet the party to conduct them through the Hampstead Garden City. Members will travel independently.

Party "D"—Westminster.

2.45 p.m.—The party will assemble at Westminster Bridge (south side) at the London County Council County Hall, in course of erection by Mr. Ralph Knott and Mr. W. E. Riley, and proceed to inspect the works, by kind invitation.

TO-MORROW'S PROGRAMME.

Visit to Aylesbury, Tring, &c.

9.15 a.m.—The members will assemble at Marylebone (Great Central Railway).

9.25 a.m.—Depart for Aylesbury.

10.45 a.m.—Arrive Aylesbury. Proceed to the County Hall. The members will be received by Mr. Tonman Mosley, C.B., chairman of the Buckinghamshire County Council, and Mr. H. L. Nippin, J.P., chairman of the Aylesbury Urban District Council.

Discussion on the following paper (to be taken as read):—

(11) "Municipality Work in Aylesbury," by W. H. Taylor.

Proceed by conveyances along roads bituminously bound, tar-painted, &c., to the Chiltern Hills Spring Water Company's works, near St. Leonards (by kind permission of the chairman and directors), where members will be received by Mr. H. A. Callon, assistant manager.

1.45 p.m.—Leave for Tring.

2 p.m.—Luncheon at the "Rose and Crown" Hotel.

3 p.m.—The Honourable Walter Rothschild will receive the members at his museum, over which he has kindly consented to conduct the party.

It is hoped that arrangements can be made for affording members an opportunity of seeing the grounds of Tring Park.

4 p.m.—Leave for Aylesbury.

4.45 p.m.—Arrive at Aylesbury, where tea will be provided at "The Chantry" by the president.

Members attending the annual meeting are invited to use the Municipal County Club as hon. members.

CHAS. JONES, M.INST.C.E.,
Hon. Secretary.

EXAMINATION.

The October, 1912, examination will be held in Birmingham on the 10th, 11th and 12th of that month.

THOMAS CAIN,
11 Victoria-street, S.W. *Secretary.*

ROYAL SANITARY INSTITUTE.

ANNUAL CONGRESS AND EXHIBITION AT YORK.

The annual congress of the Royal Sanitary Institute, which is to take place this year at York, will open on July 29th. The proceedings will commence with a reception of the members and delegates in the Mansion House by the Lord Mayor, a public luncheon following, and in the evening the inaugural address to the congress will be delivered by the Archbishop of York.

On Tuesday, July 30th, a conference of municipal representatives and of engineers and surveyors will be held in the Exhibition Buildings, and on Friday, August 2nd, and the following day, the Engineering and Architecture Section will meet in the Museum. Mr. A. D. Greatorex, M.INST.C.E., borough engineer and surveyor of West Bromwich, will preside at the conference of engineers and surveyors, and the section devoted to engineering and architecture will have as its chairman Mr. J. Walker Smith, M.INST.C.E., chief engineering inspector to the Local Government Board for Scotland.

At the conference of engineers and surveyors discussions will take place on, among others, the subjects of Housing and Town Planning Progress, to be opened by Mr. H. Gilbert Whyatt, ASSOC.M.INST.C.E., borough engineer and surveyor, Grimsby, and Sewage Disposal in Rural Districts, to be opened by Mr. Ascough Rodwell, surveyor to the Skipton Rural District Council. The question of the modification of the Model Building By-laws from the rural point of view will be considered in the Engineering and Architecture Section.

The opening of the Health Exhibition arranged in connection with the congress has been fixed for Saturday, July 27th.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. E. A. STICKLAND, ASSOC.M.INST.C.E., Borough Surveyor, Windsor.

NORTHERN DISTRICT.

A meeting of the above will be held at Keswick to-morrow (Saturday).

PROGRAMME.

10.15 a.m.—Meet at town hall. Short paper by Mr. P. M. Hope, on "Keswick and its Municipal Undertakings."

11 a.m.—Leave town hall for Thirlmere waterworks (Manchester supply).

Light refreshments at Nag's Head Hotel, Wythburn, after inspecting waterworks.

1.30 p.m.—Drive to top of Dunnail Raise to inspect new road made by the Cumberland County Council.

2 p.m.—Drive west side of Thirlmere Lake (over road made and maintained by the Manchester Corporation) to inspect dam and valve house.

2.30 p.m.—Inspect Smaithwaite Bridge and drive through Vale of St. John's to Threlkeld.

3 p.m.—Inspect Threlkeld Granite Quarries with the kind permission of the Threlkeld Granite Company.

4 p.m.—Return journey to Keswick.

7.0 p.m.—Dinner at Keswick.

The return train leaves Keswick on Saturday evening at 6.29, arriving in Newcastle at 11.5.

JOHN ROBINSON,
Union Offices, *Hon. District Secretary.*
Darlington.
July 4, 1912.

CLITHEROE MEETING.

This meeting has been postponed until Saturday, 27th inst., owing to the meeting arranged at Keswick for the 13th, the original date fixed upon for the Clitheroe meeting. Full programme of the meeting will be issued within a few days.

B. WYAND,
39 Victoria-street, S.W. *Secretary.*

ROYAL INSTITUTE OF PUBLIC HEALTH CONGRESS IN BERLIN.

THE MUNICIPAL ENGINEERING, ARCHITECTURE AND TOWN PLANNING SECTION.

The Congress of the Royal Institute of Public Health, which opens on Thursday, July 25th, in Berlin, and extends over three days, will be conducted in five sections, the one of special interest to our readers being that devoted to Municipal Engineering, Architecture and Town Planning—over which Mr. P. C. Cowan, D.SC., M.INST.C.E., chief engineer of the Local Government Board of Ireland, will preside, among the vice-presidents being Prof. Henry Adams, M.INST.C.E., Sir Alexander R. Binnie, M.INST.C.E., Mr. John A. Brodie, M.INST.C.E. (city engineer of Liverpool), Mr. W. B. Bryan, M.INST.C.E. (chief engineer of the Metropolitan Water Board), Mr. A. D. Greatorex, M.INST.C.E. (borough engineer of West Bromwich), Sir James Lemon, M.INST.C.E., Mr. T. de Courcy Meade, M.INST.C.E. (city engineer of Manchester), Prof. W. C. Unwin, F.R.S. (president of the Institution of Civil Engineers), Mr. G. W. Willcocks, C.B., M.INST.C.E. (chief engineer to the Local Government Board), and Sir John Wolfe-Barry, K.C.B., F.R.S. Mr. A. J. Martin, M.INST.C.E., is one of the secretaries of the section.

The papers to be read during the three days on which the section will meet include:—

"Water Supply in London," by W. A. Richardson, ASSOC.M.INST.C.E., assistant engineer to the Metropolitan Water Board.

"British Practice in Sewage Disposal," by A. J. Martin, M.INST.C.E.

"Sewer Ventilation," by T. de Courcy Meade, M.INST.C.E.

"Building By-Laws," by J. D. Cassewell.

"Town Planning," by Thos. Adams, town planning assistant to the Local Government Board.

"Legal Aspects of Town Planning," by R. E. Willcocks.

"Use of Reinforced Concrete in Architecture," by Prof. Henry Adams, M.INST.C.E.

"The Use of Reinforced Concrete in Engineering," by J. H. Waller.

Papers dealing with the sewage arrangements of Berlin, water sterilisation and street cleaning will be contributed by German delegates to the congress.

Visits to a large number of public institutions in and around Berlin have been arranged in connection with the gathering.

INSTITUTE OF SANITARY ENGINEERS.

President—Mr. A. J. Martin, M.INST.C.E., F.G.S., F.R.SAN.I.

SUMMER VISIT TO BIRMINGHAM.

Arrangements have been made for a week-end visit to Birmingham, starting to-day. The Midland Hotel, where a private sitting-room will be set apart for the party, and where the reception dinner attended by the Lord Mayor, will be held, has been selected for headquarters.

Friday, July 12th.

9.10 a.m.—Train leaves Paddington.

11.10 a.m.—Arrive in Birmingham and proceed to Midland Hotel.

1 p.m.—Reception by the Lord Mayor, Alderman Bowater, at the Council House.

Sessional meeting in the afternoon, discussion on papers.

7 p.m.—Dinner, the president in the chair.

Saturday, July 13th.

10 a.m.—Leave hotel by coaches to visit sewage farm, filter-beds, &c., and return to hotel.

Visits to University and other places of interest.

P. N. Hasluck,
Secretary.

120 and 122 Victoria-street, S.W.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1339 Holborn), subject to later confirmation by letter.*

SURVEYOR AND INSPECTOR OF NUISANCES.—July 13th.—Newport Pagnell Rural District Council. £200—£240.—Mr. Charles W. Powell, clerk.

SURVEYOR OF HIGHWAYS.—July 13th.—Whittington and Newbold Urban District Council.—Mr. H. J. Watson, clerk, 32 Gluman-gate, Chesterfield.

INSPECTOR OF NUISANCES.—July 13th.—Corporation of Chester. £90—£110 per annum.—Mr. J. H. Dickson, town clerk.

CITY SURVEYOR.—July 15th.—Corporation of Ripon. £150—£200.—Mr. M. Kirkley, town clerk.

CLERK OF WORKS.—July 16th.—Willesden Urban District Council. £175 per annum.—Mr. S. W. Ball, Municipal Offices, Dyne-road, Kilburn.

ASSISTANT SURVEYOR IN BOROUGH ESTATE OFFICE.—July 18th.—Corporation of Swansea. 30s. per week.—Borough Estate Agent, 3 Prospect-place, Swansea.

CLERK OF WORKS.—July 17th.—Godstone Rural District Council. £3 per week.—Mr. E. Alston Head, clerk, East Grinstead.

CLERK OF WORKS.—July 18th.—Walsingham Rural District Council. £3 3s. per week.—Mr. R. S. Butcher, clerk, Fakenham.

SUPERVISING ROAD FOREMAN.—July 19th.—Corporation of Grimsby. £2 15s. per week.—Mr. H. Gilbert Whyatt, borough engineer and surveyor.

BUILDING INSPECTOR.—July 20th.—Corporation of Bradford. £120 per annum.—Mr. Frederick Stevens, town clerk.

INSPECTOR OF NUISANCES.—July 22nd.—Mynyddislwyn Urban District Council. £80 £100.—Mr. F. C. Griffiths, clerk, Blackwood, Mon.

HIGHWAY SURVEYOR.—July 26th.—Newbury (Berks) Rural District Council.—£100 per annum.—Mr. S. V. Pinniger, clerk, Market-place, Newbury.

ASSISTANTS TO COUNTY SURVEYOR.—July 27th.—West Sussex County Council. £130—£150.—Mr. H. W. Bowen, county surveyor, 23 North-street, Horsham.

CLERK OF WORKS.—About middle of July.—Essex County Council. £3 3s. per week.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

HIGHWAY SURVEYOR AND INSPECTOR.—July 27th.—Wantage Urban District Council. £140 per annum.—Mr. E. B. Ormond, clerk.

CHIEF ASSISTANT.—July 29th.—Corporation of Clydebank. £120 per annum.—The Town Clerk, Municipal Buildings, Clydebank.

INSPECTOR OF NUISANCES.—July 29th.—Elham Rural District Council. £120 per annum.—Mr. B. C. Drake, clerk, Hythe, Kent.

ASSISTANT ENGINEER.—August 31st.—Darjeeling Municipality, India. 150 rupees monthly.—The Chairman.

MUNICIPAL COMPETITIONS OPEN.

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CARDIFF.—August 6th.—Designs and estimates for fire station.—The Town Clerk.

GOOLE.—September 1st.—Competitive designs and estimates for municipal offices, for the urban district council. Two premiums (£30 and £15).—Mr. R. Tyson, clerk.

CHORLEY.—September 9th.—Designs for a school, for the corporation.—Mr. J. Mills, town clerk.

HUDDERSFIELD.—October 31st.—Designs for laying out certain areas as a town planning scheme, for the corporation. Premiums of 100, 50, and 25 guineas.—Mr. J. Henry Field, town clerk.

MUNICIPAL CONTRACTS OPEN.

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Buildings.

BRIDLINGTON.—July 13th.—For the erection of twenty-five workmen's dwellings, for the corporation.—Mr. E. R. Matthews, borough surveyor.

WEDNESBURY.—July 13th—31st.—For alterations and additions to public baths and municipal offices, for the corporation.—Mr. T. Jones, town clerk.

ESSEX.—July 13th.—For additions to a school, for the Education Committee.—Mr. W. Adams, clerk, 14 Church-street, Saffron Walden.

WALSALL.—July 13th.—For alterations to a school, for the corporation.—Borough Surveyor.

DERBYSHIRE.—July 15th.—For the erection of a school, for the Education Committee.—Mr. G. H. Widdows, architect, St. Mary's Gate, Derby.

WHITLEY AND MONKSEATON.—July 15th.—For the erection of boundary wall, gate piers and gates, for the urban district council.—Mr. A. J. Rousell, surveyor.

BARROW-IN-FURNESS.—July 15th.—For the extension of the electricity works, for the corporation.—Borough Engineer and Surveyor.

HANTS.—July 15th.—For the construction of two culverts and other works, for the county council.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

FINCHLEY.—July 15th.—For the construction of an underground convenience, for the urban district council.—Mr. E. H. Lister, clerk.

DEWSBURY.—July 15th.—For the erection of a fire station, for the corporation.—Borough Surveyor.

WOOLWICH.—July 15th.—For the erection of a waiting-room and sanitary convenience, for the borough council.—Mr. Arthur B. Bryceson, town clerk.

PEMBROKE (Co. Dublin).—July 15th.—For the erection of forty-three dwellings, for the urban district council.—Mr. J. H. Middleton, surveyor.

KENT.—July 15th.—For extensions to technical institute, for the Education Committee.—Dr. J. Lister, Technical Institute, Tunbridge Wells.

HORBURY.—July 16th.—For the erection of boundary wall and asphalting playgrounds, for the Education Committee.—Education Offices, Northgate, Wakefield.

COVENTRY.—July 16th.—For the erection of a shoeing and repair shop, for the corporation.—Mr. J. E. Swindlehurst, city engineer.

WOOD GREEN.—July 16th.—For additions and repairs to schools, for the Education Committee.—Mr. W. P. Harding, clerk, Town Hall.

DURHAM.—July 16th.—For alterations and additions at council schools, for the Education Committee.—Mr. W. Rushworth, Shire Hall, Durham.

LEEDS.—July 16th.—For the erection of two dwellings, for the corporation.—Mr. W. T. Lancashire, city engineer.

CLONAKILTY.—July 16th.—For the erection of five houses, for the urban district council.—Mr. J. Donovan, town clerk.

KINSALE.—July 17th.—For the erection of cottages and fencing of plots, for the rural district council.—Mr. J. Murphy, clerk.

HEREFORD.—July 17th.—For the erection of new roof on the butter market, for the corporation.—City Surveyor.

POOLE.—July 17th.—For supply and driving oak piles, and repairing oak sill of quay, for the corporation.—Mr. J. Elford, estate surveyor, Municipal Offices.

FULHAM.—July 17th.—For repairs to economiser-house, and sinking two additional piers for foundations, for the borough council.—Mr. J. Percy Shuter, town clerk.

KENT.—July 18th.—For repairs and painting at a council school, for the Education Committee.—Mr. W. J. Spicer, 19 Bank-street, Ashford.

LANCASHIRE.—July 18th.—For the erection of an infants' school, for the Education Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

CROYDON.—July 18th.—For extensions and painting at the South Norwood school, for the Education Committee.—Mr. J. Smyth, clerk, Education Office, Katherine-street, Croydon.

WEST RIDING.—July 19th.—For alterations to playground entrance, and rebuilding walls of school, for the Education Committee.—Mr. Francis Alvey Darwin, clerk.

CARDIFF.—July 19th.—For the erection of a ferro-concrete boat shelter, for the corporation.—Mr. W. Harpur, city engineer.

RUNCORN.—July 19th.—For the construction of an underground reservoir, for the rural district council.—Mr. G. F. Ashton, clerk.

GLASGOW.—July 20th.—For relining chimney stalk with firebrick, for the corporation.—Mr. J. Lindsay, town clerk.

KENT.—July 20th.—For works of painting and repairs at a council school, for the Education Committee.—Mr. H. Fielding, 15 Burgate-street, Canterbury.

WILLITON.—July 20th.—For the construction of a seawall about 50 yds. long, timber groyne, and other incidental works, for the rural district council.—Mr. Frank Risdon, clerk, Williton, Somerset.

EVESHAM.—July 22nd.—For alterations and additions to a cottage, for the corporation.—Borough Surveyor.

NORTHAMPTON.—July 22nd.—For the masonry and other works required in the widening of the South Bridge over the river Nene in three arched spans, for the corporation.—Mr. Herbert Hankinson, town clerk.

BECKENHAM.—July 22nd.—For the erection of caretaker's lodge and public conveniences, for the urban district council.—Mr. J. A. Angell, surveyor.

BERWICK-UPON-TWEED.—July 23rd.—For the construction of a service reservoir to hold about 700,000 gallons, for the sanitary authority.—Mr. W. Weatherhead, clerk.

DERBYSHIRE.—July 24th.—For the erection of a lock-up, courthouse and residence, for the Standing Joint Committee.—Mr. N. J. Hughes-Hallett, clerk, County Offices, Derby.

STOURBRIDGE.—July 25th.—For the construction of a covered service reservoir of a capacity of 500,000 gallons, and other works, for the District Water Board.—Mr. J. Donaldson Harward, clerk, High-street, Stourbridge.

BEDFORD.—July 25th.—For repairs to council schools, for the County Education Committee.—County Surveyor, Shire Hall, Bedford.

BURNLEY.—July 27th.—For the concrete work in the repair of the sewage tanks, for the rural district council.—Mr. H. Pritchard, engineer.

ST. HELENS.—July 31st.—For the erection of a public library, for the corporation.—Mr. A. W. Bradley, borough engineer.

Iron and Steel.

SWINDON.—July 13th.—For the supply of unclimbable wrought-iron fencing, gate and posts, for the corporation.—Mr. H. J. Hamp, borough surveyor.

BOURNE.—July 15th.—For the supply of cast-iron pipes and valves, for the rural district council.—Mr. T. Lake, district surveyor.

WEST BROMWICH.—July 16th.—For the removal of the existing centre tramway poles, and the supply and erection of additional poles and other works, for the corporation.—Mr. A. D. Greatorex, borough engineer and surveyor.

ISLINGTON.—July 24th.—For the supply of 3,000-kw. steam turbine alternator, exciter, condensing plant, switch gear, and circulating and steam piping, for the borough council.—Mr. W. F. Dewey, town clerk.

STOURBRIDGE.—July 25th.—For the supply and delivery of about 857 tons of cast-iron pipes, for the District Water Board.—Mr. J. Donaldson Harward, clerk.

Roads.

STOCKPORT.—July 13th.—For street-making work, for the corporation.—Mr. J. Atkinson, borough surveyor.

FLINT.—July 15th.—For making up certain streets, for the corporation.—Mr. Hugh Owen, borough surveyor.

HALTWHISTLE.—July 15th.—For making up several streets, for the rural district council.—Mr. Thos. Dryden, clerk.

CHESHUNT.—July 15th.—For providing and laying about 1,800 super. yds. of artificial paving slabs, for the urban district council.—Mr. J. E. Sharpe, engineer and surveyor.

WEST HAMPNETT.—July 15th.—For steam rolling work, for the rural district council.—Mr. W. O. Rasell, acting clerk, Council Offices, South-street, Chichester.

GOOLE.—July 15th.—Making up a street, for the urban district council.—Mr. Robert Tyson, clerk.

PEMBROKE (Co. Dublin).—July 15th.—For the construction of roads and sewers, for the urban district council.—The Clerk.

BLACKBURN.—July 15th.—For making up certain streets, for the corporation.—Mr. W. Stubbs, borough engineer.

STANLEY.—July 15th.—For works of making up, for the urban district council.—Mr. A. Routledge, surveyor.

KENDAL.—July 16th.—For work of making up, for the corporation.—Mr. F. W. Oxberry, borough surveyor.

TOTTENHAM.—July 16th.—For making up a road, for the urban district council.—Mr. W. H. Prescott, engineer.

GLAMORGAN.—July 17th.—For kerbing and widening, for the county council.—Mr. T. Mansel Franklin, clerk, County Council Offices, Cardiff.

TAMWORTH.—July 17th.—For works of paving, kerbing and channelling, for the corporation.—Mr. F. E. G. Bradshaw, borough surveyor.

DUNDEE.—July 17th.—For the supply of 1,000 tons of road metal, and 400 tons of causeway setts, for the Harbour Trustees.—Mr. J. Hannay Thomson, general manager and engineer.

BACUP.—July 17th.—For granite paving work, for the corporation.—Mr. W. H. Elce, borough engineer.

OLDHAM, July 18th.—For making up several passages, for the corporation.—Chairman of the Surveyor's Committee.

WANDSWORTH.—July 20th.—For the purchase of a Leyland patent steam motor wagon, fitted with interchangeable tipping body and 1,000-gallon tank for street watering, for the borough council.—Mr. P. Dodd, borough engineer.

CHELTENHAM.—July 20th.—For providing and laying 5,000 sq. yds. of creosoted deal block pavements, for the corporation.—Mr. J. S. Pickering, borough engineer.

HALIFAX.—July 20th.—For carrying out private improvement works, for the corporation.—Mr. J. Lord, borough engineer.

ST. ANNES-ON-THE-SEA.—July 22nd.—For making up certain streets, for the urban district council.—The Surveyor.

SOUTHAMPTON.—July 22nd.—For works of slab paving, for the corporation.—Borough Engineer.

BECKENHAM.—July 22nd.—For the supply of binding materials for Wickham-road, Hayes-road and Thesiger-road, for the urban district council.—Mr. F. Stevens, clerk.

SOUTHALL-NORWOOD.—July 23rd.—For works of paving, channelling and kerbing, for the urban district council.—Mr. R. Brown, engineer and surveyor.

EALING. — July 23rd. — For making up private gardens, Warwick-place, and back alleys of the West Elers estate, for the corporation.—Mr. Geo. E. Brydges, town clerk.

HORNSEY.—July 23rd.—For making up a thoroughfare, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor.

NEATH.—July 23rd.—For supplies of granite or syenite and limestone metalling, for the corporation. —Mr. D. M. Jenkins, borough engineer.

EALING.—July 23rd.—For laying about 8,850 super. yds. of tarred slag macadam and other works, for the corporation.—Mr. Geo. E. Brydges, town clerk.

BURNLEY.—July 27th.—For the execution of a road improvement, for the rural district council.—Mr. H. Pritchard, surveyor.

WITHAM.—July 29th.—For the use per day of steam roller and scarifier, for the urban district council.—Mr. W. P. Perkins, surveyor.

WITHAM.—July 29th.—For the supply of granite, for the urban district council.—Mr. W. P. Perkins, surveyor.

NEW SARUM.—July 29th.—For works of making up, for the corporation.—Mr. Francis Hodding, clerk.

CHESTER-LE-STREET.—July 29th.—For the construction of a new road, for the rural and urban councils.—Mr. W. Ayton, highway surveyor.

SALISBURY.—July 29th.—For making-up work, for the corporation.—Mr. W. J. Goodwin, city engineer and surveyor.

Sanitary.

LUTON.—July 13th.—For the removal of household refuse, for the rural district council.—Mr. W. Austin, clerk.

FINCHLEY.—July 15th.—For the construction of four clinker sewage filters, for the urban district council.—Mr. E. H. Lister, clerk.

NEW ROMNEY.—July 15th.—For alterations to outfall sewer, for the commissioners.—Mr. H. W. Stringer, clerk, New Romney.

CHURCH.—July 15th.—For the construction of a main sewer, for the urban district council.—Mr. W. E. Wood, surveyor.

KEIGHLEY.—July 15th.—For surface-water drainage, channelling, and sewers extension, for the rural district council.—Mr. J. N. Clarkson, clerk.

GOSFORTH.—July 16th.—For cleansing ashpits, for the urban district council.—Mr. R. Sheriton Holmes, clerk.

HAYES (Middlesex).—July 16th.—For laying 1,400 yds. of cast-iron rising main, and steel tube compressed-air main, for the urban district council.—Mr. D. C. Fidler, engineer.

TIPTON.—July 16th.—For the construction of sewerage, for the urban district council.—Mr. W. H. Jukes, engineer and surveyor.

TEWKESBURY.—July 15th.—For the supply of two cow-tea ventilation shafts, for the corporation.—Borough Surveyor.

UPTON-ON-SEVERN.—July 20th.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. G. H. T. Foster, clerk.

MILFORD.—July 20th.—For scavenging work, for the corporation.—Mr. T. Aneuryn Rees, clerk.

ST. LEONARDS.—July 22nd.—For laying stoneware pipe sewer, for the corporation.—Mr. P. H. Palmer, borough engineer.

NORWICH.—July 22nd.—For the removal and disposal of nightsoil, ashes and other refuse, for the corporation.—Mr. A. H. Miller, town clerk.

SWINTON. — July 24th. — For supplying six sprinklers for percolating filters, and media, for the urban district council.—Mr. H. Entwisle, surveyor.

RUNCORN.—July 24th.—For the removal of nightsoil, for the rural district council.—Mr. Geo. F. Ashton, clerk.

GOOLE.—July 29th.—For the construction of 4 miles of sewers formed with stoneware and cast-iron pipes, concrete tubes and brickwork, pumping station, screen and suction tanks, engine-house, pumping machinery, cast-iron main, and other works, for the urban district council.—Mr. Robert Tyson, clerk.

NOTTINGHAM.—July 29th.—For the supply of sanitary fittings at schools, for the corporation.—Mr. F. B. Lewis, city architect, Guildhall.

BATH.—July 29th.—For the construction of iron and stoneware intercepting sewers, for the corporation.—City Surveyor.

MIDSOMER NORTON.—July 31st.—For the construction of stoneware pipe sewers, for the urban district council.—Mr. C. H. Sunderland, surveyor.

Stores.

KING'S LYNN.—July 15th.—For the supply of 500 tons of coal (hand-picked hards), for the corporation. —Borough Surveyor and Waterworks Engineer.

WHITEHAVEN.—July 22nd.—For the supply of iron castings, wrought iron, ironmongery, cement, brushes, brooms and timber, for the Harbour Commissioners.—Mr. John Tyson, clerk.

Miscellaneous.

LEEDS (Roundhay and Seacroft).—July 16th.—For the supply of 1,600 cub. yds. of broken steel slag, suitable as filtering medium, for the rural district council.—Mr. J. H. Ford, clerk.

LEEDS.—July 16th.—For the hire of horses and carts, for the corporation.—Mr. W. T. Lancashire, city engineer.

ACTON.—July 16th.—For the supply of six large refuse carts, and a steam motor tractor capable of drawing a 10-ton load, for the urban district council. —The Clerk.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BIRKENHEAD.—Accepted for flagging, paving, channelling and sewering, for the corporation.—Mr. J. Fearnley:—
W. H. Ratcliffe, Birkenhead.—Passage Mersey-road, and Bedford-place, £146; passage Mersey-road, £20; passage Willowbank-road and Stuart-road, £70.
R. & J. Evans, Seacombe.—Passage Laird-street, Milner-street, &c., £128.
F. Ireland, Tranmere.—Passage Greenbank-road, South-road, &c., £79.

BUSHEY.—For making up a street, for the urban district council.—Mr. E. E. Ryder, engineer:—

Free & Sons, Maidenhead	£491
G. Jaggard, Bushey	480
P. P. Bliss, Bushey	439
W. Bailey & Sons, Bushey *	416

Engineer's estimate, £421.

COSELEY.—Accepted for the erection of a council school, for the Education Committee:—
S. Pugh, Sutton Coldfield, £2,156.

DEVONPORT.—For making up a road, for the corporation.—Mr. J. F. Burns, borough surveyor:—
Making up of carriageway and footways in Elphinstone-road.

J. Shaddock, Plymouth	£557
T. Shaddock, Plymouth	416
Pethick Brothers, Plymouth	403
J. H. Stone, Plymouth	384
C. L. Duke, Plymouth *	326

FINSBURY.—For the erection of a house for the schoolkeeper on the Baltic-street school site, and the adaption of the schoolkeeper's old house as a housewifery centre, for the London County Council:—

T. W. Heath & Sons, Cromwell-road	£1,708
Lenn Thornton & Co., Camden Town	1,658
McLaughlin & Harvey, Limited, Brecknock-road	1,649
Woodward & Co., Finsbury	1,597
J. Garrett & Son, Balham-hill	1,594
H. & E. Lea, Brewer-street	1,563
W. F. Blay, Limited, Cannon-street	1,489
L. H. & R. Roberts, Islington	1,434
C. P. Roberts & Co., Limited, Dalston †	1,324

Architect's estimate, £1,375.

HIPPERHOLME.—For the supply of macadam, for the urban district council.—Mr. G. W. Thompson, engineer and surveyor:—
T. Feather, Mirfield. 12s. 9d. per ton.
Bold Venture Lime Company, Limited, Clitheroe.—6s. 3d. per ton; 5s. 9d. per ton.
Penmaenmawr and Welsh Granite Company, Limited, Penmaenmawr.—12s. per ton; 11s. 3d. per ton.

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

The Design of Masonry Dams.

The paper on Masonry Reservoir Dams read at the annual meeting of the Institution of Municipal and County Engineers by Mr. F. C. Uren, Surveyor to the Aldershot Urban District Council, is a striking example of the fact that it is possible to write a very short paper on a very big subject in a manner which is satisfactory as regards the matter actually dealt with, and is at the same time suggestive of the issues which have to be faced in a deeper study of the subject. Mr. Uren dealt only with the design of the typical profile of the mass gravity dam, and explained briefly three formulæ—those of Sir Guildford Molesworth, Dr. Brightmore, and Colonel Pennycuick—and he put forward some simple rules which he himself regards as sufficient to ensure the design of a reasonable section. In comparing Mr. Uren's designs with the sections found for a dam of the same height by the Molesworth and Brightmore formulas, it is apparent that while there is some saving of material in both cases by Mr. Uren's method, either of the other formulas would give us a better start for the design of a dam of considerably greater depth. A serious objection to all these methods is that, since they do not take into account differences of specific gravity—that is, the actual specific gravity in a given case—they cannot be used for the design of the section of dam of such height that the exact specific gravity is a matter of importance. Dr. Brightmore's formula does take the specific gravity into account, but only, as Mr. Uren shows, to a small extent, whereas it is, however small its effect, an all-pervading element in the design. It is an important advantage of the mathematical formula that it maintains a definite relation between the theory and the dimension at any depth. For depths considerably over 150 feet the amount of the offset on the upstream side is a matter of much importance, though it depends not only on the theory but upon the lowest water-level, or silt-level, in the future reservoir. The proper slope for the downstream face cannot be determined by any set of considerations generally applicable within even a moderate range of variations in the local conditions and the nature of the materials.

We will not do Mr. Uren the injustice of bringing up specific matters which *might* have been included in his admirably lucid paper, the scope of which is strictly defined; but we may direct attention to the important work in the field of dam design with plain masonry, some of the results of which were put before the Concrete Institute in a paper read by Mr. Reginald Ryves, ASSOC.M.INST.C.E. (see THE SURVEYOR, March 22nd, 1912), and in an article which he contributed to the *Engineer* in February, 1911, before the engineering public generally. Mr. Ryves' investigation of precedents and principles as applying to dams of great height and length, and his type design for a dam of arches 200 ft. high, or with suitable materials 300 ft. high, clear of the rock, should not be missed by any engineer who wants to keep in touch with the development of this important subject.

Generally, Mr. Uren's paper suggests that, although, as he points out, "both the theorist and the practical engineer have their proper place in the design and execution" of masonry dams, an important work of this kind should be, from inception to completion, under the direction of a competent consulting engineer. The best of such men are, unfortunately, liable to be belied, because the theorists think them too "practical" to be sound in theory, and the practical men regard them as too "theoretical" to be sound in practice. It is difficult to please all parties.

* * *

Methods for Differentiating Soils for Sewage Purification.

A brief description of the sewage farms in this country where sewage purification by treatment on land has proved a failure would fill a very large volume, and if it were possible to ascertain the total amount of money which has been spent in the past upon such failures, it would probably reach an enormous sum. The original error appears to have been due to the assumption that, because certain kinds of soil were capable of properly purifying a certain volume of sewage of a certain strength, any kind of soil would do the same. At the present time the general trend of opinion seems to be towards the other extreme, and it is seldom that any land is now considered suitable for dealing with crude sewage, even of a purely domestic character. At no time does the question of the suitability of any particular kind of soil ever appear to have been considered upon a proper scientific basis. Methods of "rule of thumb" and "trial and error" led to failure in the past, and it is quite possible that it is a mistake to go to the other extreme as we are doing at present. Dr. G. J. Fowler and Mr. W. Clifford have thus conferred a benefit upon engineers and surveyors by showing how the various kinds of soil can be differentiated in respect to their suitability for the purification of sewage. In their paper which was read at the annual summer meeting of the Association of Managers of Sewage Disposal Works, and which we print on another page, they describe and illustrate the very simple apparatus they have designed for the purpose of ascertaining the porosity of any particular kind of soil under varying conditions and of measuring the volume contraction of different soils. They also describe a number of tests which have been made with these appliances, and the results given in tabular form deserve careful study.

Not the least valuable feature of the apparatus in question is that it is extremely simple and easily prepared at very little cost by any ordinary mechanic working under the instructions of an engineer. The authors rightly insist that further investigation on these lines is needed, and that physical data should be obtained and collected with regard to soils which possess a known capacity for filtering and purifying sewage, for purposes of comparison. Now that means for carrying out such investigations upon a proper scientific basis are available, it is to be hoped that a large number of surveyors and sewage works managers will take advantage of the opportunity to obtain the necessary data with regard to the soil on their own sewage works, and if to these results they will add the volume and an analysis of the sewage or sewage effluent which can be satisfactorily purified by each separate plot of ground which is tested, a valuable set of figures will be accumulated for future comparison. From the few tests already made by the authors we note that peaty soils were shown to be less porous than clayey soils, and this to some extent justifies the conclusions of the Royal Commission on Sewage Disposal, in which they classify these two types of soil as equally unsuitable for the purification of sewage. These methods of examination may even prove useful to managers of existing sewage farms by enabling them to compare the various methods in use of working and irrigating the land, and altogether we consider that the authors deserve much credit for the excellent manner in which they have approached the subject and for the time and attention they have devoted to the investigations, and the Association of Managers of Sewage Disposal Works are to be congratulated on having been so fortunate as to have secured such an important and valuable paper for their meeting.

* * *

A Dangerous Turning and an Important Improvement.

A very important highway improvement has been carried out at Dorking, where the T road which is the meeting place of the London and Reigate roads with the east end of Dorking High-street has been widened out by the removal of a building, which has allowed of the making of a fair curve joining the London and Reigate roads, and at the same time permits of more space for the far larger amount of traffic round the other corner. This traffic consists mainly of three elements—the local traffic generally, which is well distributed; the traffic to and from the London and Brighton railway station, which is of course concentrated about the times when important trains are due; and, in addition to these, a fairly heavy through traffic, well distributed as regards delivery vans and merchant vehicles generally, but concentrated to a steady stream of motor-cars and motor-cycles at certain times—on Saturdays and Sundays, and more especially during holiday seasons. Since the boundary of the road at this corner is a high wall with no margin of safety of any kind, the turning is (or rather was) a dangerous one, the danger having been removed by the erection of a lamp-post and small island, with a notice board directing the drivers of vehicles to "Keep to the left" of the island when taking the right-hand turning from the London road into Dorking. Mr. W. A. Clegg, surveyor to the urban district council, is to be congratulated on having succeeded in placing this lamp-post and refuge at the first attempt in exactly the right spot. There is no interference whatever with other traffic, and the result of this important improvement is that vehicles turning from the London road into Dorking swing out to a position where they can be seen plainly from both the other roads, and can enter the end of Dorking High-street at a flat angle instead of coming round a blind corner. The only further improvements that suggest themselves are that the lantern should be provided with ground-glass panes, so that no beam of direct light is thrown along the London or Reigate roads, and with clear glass panes opposite to the walls which bound the space, and these walls should, if possible, be kept whitewashed. This, however, is a matter that will not be of importance till the days get shorter.

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A Thin Carpet Layer of Bitumen and Sand.

Up to the present time three kinds of paving have been used for city streets in this country on the carpeting system, the wearing layer being in all cases laid upon a strength crust of concrete. In the case of asphalt the carpet layer provides no additional resistance to the shocks of traffic, but accommodates itself to local disturbance of the crust better than stone setts and wood blocks. The "mass" of the wood blocks, and still more of the stone setts, and the greater or less efficiency of the joints in spreading shocks and loads over a number of the blocks, are factors which have some value, though it is now understood that the concrete crust should in itself have sufficient strength for the heaviest loads. In any case, the depth of the wearing carpet must be sufficient to prevent the blocks from being shaken loose, and the quantity of material put down is therefore considerably in excess of that which is actually worn away.

In the case of a bituminous layer used for a street the thickness may be sufficient to provide strength in addition to that of the sub-crust or concrete foundation; or, on the other hand, the wearing layer may be treated as a true carpet layer, and be put down on a concrete strength crust of ample thickness. This method seems to offer special advantages for residential streets with very little traffic, and our readers will find in our issue of November 10th, 1911, some account of such pavements as laid down in Ann Arbor, Michigan. The kind of street on which a bituminous carpet is most likely to be successful is one provided with good shade trees and flanked by side footways and gardens. We note, however, that at Ann Arbor this kind of paving is now being used on "main streets and alleys," and the results will be awaited with interest. The concrete crust is usually 6 inches thick, and the carpet layer is made with sand and tar, or sand and a prepared "bitumen," being only $\frac{1}{4}$ inch or $\frac{3}{8}$ inch thick. Such a carpet is not likely to be efficient in streets with any considerable traffic, but it should be noted that it may prove cheap and reasonably efficient where it is intended to go on using the concrete surface after the carpet has worn away, and so long as the concrete remains tarry enough to prevent the development of the hard smoothness of the concrete itself. It may be suggested that where it is tried for streets with traffic the method will develop into the provision of a roughish concrete crust tar-painted and sanded from time to time. The concrete roads of Mayne County, Michigan, have in some cases been treated in this way.

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Institution of Municipal and County Engineers: The Annual Meeting.

Inasmuch as our last issue appeared on the day following the opening of the annual meeting of the Institution of Municipal and County Engineers, it is evident that any observations which we then made had to be confined to the bare contents of the annual report which had been printed and circulated, and the address of Mr. R. J. Thomas, M.INST.C.E., the new president, an advance copy of which had been courteously supplied to us. Now that the meeting is *un fait accompli*, it is our pleasant duty to congratulate Mr. Thomas on a very successful inauguration of his term of office. The character of the speeches which were made by the proposer and supporters of the vote of thanks which was unanimously and enthusiastically accorded to Mr. Greatorex, the retiring president, clearly shows that the vote was not merely a formal one. Members appeared anxious to voice their keen appreciation of the yeoman service which Mr. Greatorex has rendered the Institution during

his strenuous year of office as its official head. The past year may truly be described as a record one from many points of view. The inauguration of the new constitution, the visit to Paris, and the establishment of the Mutual Defence Fund are some of the outstanding features. The ex-president's untiring zeal and energy certainly stand out as an example which his successors will find it no easy matter to follow. Personal attendance at eleven out of twelve district meetings, and the devotion of no fewer than forty days to the business of the Institution are services which thoroughly merit the gratitude which was so heartily expressed in the vote of thanks.

We have already commented on the matters which are specificially dealt with in the annual report of the council, and we only desire to add a word now in regard to the criticisms which were made in the course of the discussion which ensued on the motion for its adoption. Such criticisms are, in our view, to be encouraged so long as they are not brought forward in any carping spirit. Sound criticism indeed is necessary if the highest degree of efficiency is to be attained. But we agree with the observation of Mr. Willis that the real keynote of the discussion was that the members—while speaking their minds freely and fully—should give thorough and ungrudging support to the council for the time being in office. The meeting showed that the Institution is thoroughly alive, and we cordially wish Mr. Thomas as successful a year of office as that which was enjoyed by his predecessor.

* * *

Dangerous Tramway Poles.

An important and rather peculiar case, having special interest for local authorities and tramway engineers, was recently decided at the Newcastle Assizes. It appears that in one of the roads leading into the city the tramway has side poles for a certain distance only, the remainder of the route being worked with centre standards. One night a motorist driving into the city collided with the first of these centre poles, and he sued the corporation for the damages he sustained through their alleged negligence in leaving the standard in a dangerous position and unlighted. It was urged on behalf of the defendants that the Board of Trade had passed the route as safe, that the pole was sufficiently lighted by the ordinary street lamps, and that the plaintiff drove carelessly. The jury, however, found for the plaintiff, who recovered substantial damages.

We call the attention of our readers to this case because it once more impresses upon tramway authorities that their common law liabilities are not in any way affected by their special privileges. It should be remembered that as a general rule the grant of the privilege to encumber the highway with dangerous electric apparatus imposes a corresponding duty not to injure persons lawfully on the highway, and to make the highway substantially as safe for them as it was before. The plea that the apparatus has been erected in pursuance of statutory powers only avails in the absence of negligence, and it has always been held that a man who suffers damage owing to the *negligent* exercise of statutory powers has a right of action. In the Newcastle case the abrupt change from side to centre poles without adequate warning was held to be negligent on the part of the corporation, and the jury were further of opinion that the plaintiff was not guilty of contributory negligence in carelessly driving the car. Hence the success of the plaintiff, which should be noted as a warning by other tramway authorities who may be similarly situated.

* * *

Newcastle City Engineer's Report.

The report of Mr. W. J. Steele, the city engineer of Newcastle, on the work of his department for the year ended March 31, 1912, is a record of considerable activity and steady progress. Among the many matters of interest with which it deals we may mention the opinion which Mr. Steele expresses that the land required for the provision of back streets would in most cases be put to much better use if it formed part of the open space at the rear of the houses. Of course, some kind of secondary means of access is necessary, but we agree that this can usually be sufficiently and conveniently provided by means of passages if the number of houses in a terrace is limited. It is interesting, too, to notice that the Local Government Board have sanctioned the preparation of a scheme under the Housing, Town Planning, &c., Act, 1909, for the Crag Hall Dene area, while a further scheme to deal with an area of 1,540 acres on the eastern side of the city is under consideration by the committee. The report shows very satisfactory statistics in regard to such matters as highway maintenance and refuse disposal. With regard to snow removal, however, it is pointed out that it is impossible to make anything like an accurate provision for this service in the annual estimates—a difficulty which will be appreciated by every municipal engineer. We have pleasure in publishing in another column some extracts from the report, dealing with the most generally interesting matters.

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Asphalt-Macadam.

In an article which appears on another page Mr. Cecil Nathan leads up to an advocacy of asphalt as a binder for broken-stone roads, and makes an interesting comparison between the penetration and mixing methods. Asphalt-bound macadam was the subject of a paper presented to the Irish Road Congress last year (see our issue of April 28th, 1911), and with reference to this paper the following sentence appeared in our last special annual issue:—"The idea may require some development in practice, as the possible effect of the asphalt in holding the stones too rigidly, with resulting slipperiness, seems to have been overlooked." In addition, it may be pointed out that in order to avail ourselves of the resiliency of the asphalt there must be some body of that material in the crust. If, as Mr. Nathan proposes, the crust be made with the minimum of voids, where is the body of asphalt capable of giving effect to the property of resiliency? We by no means hold the opinion that asphalt is not in the running as a binder for broken-stone roads, but much more than familiarity with the material itself is necessary in order to apply it successfully in the making of road crusts, and in this matter a knowledge of chemistry is not so important as a competent knowledge of physics.

"Much food is in the tillage of the poor: but there is that is destroyed for want of judgment."

* * *

The Waste of Water.

The recollection of the drought of last summer, and the ever-present possibility of the recurrence of a period of abnormally dry weather, serve to emphasise the importance of using every available means to guard against any waste of the public water supplies. A great step in the right direction was taken a few years ago, when the Incorporated Joint Committee on Water Regulations was formed. This committee issued a model code as long ago as 1908. Up to the present, however, the Local Government Board, while fully recognising the value of the work of the committee, have not seen their way clear to sanction the adoption of the model code by those water authorities who are dependent upon the sanction of the Board for their regulations. The code has, however, been adopted by many authorities who do not require the sanction of the Board, and signs are not wanting that some arrangement may be come to whereby the objections of that body to the model code may be removed. We are convinced that the best line of progress is in the direction of securing uniformity of practice, and that in this way the evils of waste, misuse and contamination will best be overcome.

Institution of Municipal and County Engineers.

ANNUAL GENERAL MEETING IN LONDON.

To meet the exigencies of time and space we were compelled last week to give an abbreviated report of the discussion on the report and statement of accounts at the annual meeting of the institution. This week we are enabled to do fuller justice to the matter.

DISCUSSION OF ANNUAL REPORT.

The Chairman (Mr. A. D. Greatorex) said he proposed to add nothing. He moved that the report be received and approved.

Mr. W. H. Prescott (Tottenham) seconded. He would like to say he had a very decided sympathy with the general scope and object of the recommendation with reference to the Mutual Defence Fund. The scheme for the establishment of a fund came before the members for the first time, though a long overdue proposal, and he was glad indeed that an energetic and determined step was at last being taken as a counterstroke against the scandal of the unjust treatment of members in the honourable discharge of their public duties. He ventured with some amount of confidence to lay down the principle that the healthy vitality of an institution such as this was not to be estimated by the mere number of its members, but chiefly on account of the protection it was prepared to give to any members who found themselves, by libellous or slanderous imputation, being wrongfully dismissed, or subject to other unjust treatment. On previous occasions he had not hesitated to criticise in a friendly way the work of the council, but so far as this proposal was concerned, it must be accounted a conspicuous part of the good work done during the past twelve months, and he congratulated Mr. Greatorex and his colleagues on having taken such an important step. He thought it ought to be made clear that the setting up of this question of a defence fund did not mean that the subject of superannuation and security of tenure would be thrown into a secondary place. Those were undoubtedly the questions of all questions, and he was quite sure from what he knew of them that every member of the council would continue to toil for the consummation of such worthy objects. There was, of course, no use blinking the fact that there were tremendous difficulties in the way, and for the moment he could not see how they could be effectually overcome. Powerful obstacles were interposed against these reforms being achieved in municipal service, and that was why the defence fund was being set up, and he trusted it would receive the support of every member of the institution.

Mr. T. Henry (East Retford) was glad to hear from the last speaker that superannuation and security of tenure were not to be thrown into the background by the establishment of the defence fund. They had waited very long for superannuation and security of tenure, and they had occasionally worked—more often than they ought—under very great hardship arising from the want of these objects. Only recently the case had occurred in connection with a large Midland town of a rural surveyor being deprived of office with poor compensation. Instead of being based upon twelve years' service, this should have been based upon the whole of his service. He hoped Mr. Scorgie would continue to pursue the objects which he had in view in reference to this matter. Mr. Scorgie stated in his report that one of the greatest difficulties they had to contend with was to educate their employers—the authorities—to realise that the officer would not alone benefit by a proper scheme of national superannuation. In regard to that he (the speaker) would say it was surprising how things differed. It might be so with regard to London authorities, but he might say that a member of his own council with whom he was conversing was astounded to think he was not entitled to superannuation and compensation as others were. It appeared, therefore, that intelligence with respect to the matter was not so much needed in the provinces as elsewhere. Probably the feeling on this question was never more forcibly expressed than in a letter written by the late town clerk of Nottingham, in which he said: "There is a more insistent cry year after year for the municipality to undertake wider work, while those who are most urgent in this demand are those who cry out most loudly about the salaries paid to the men who are entrusted with the work they deem most important to the public weal. At election times the streets ring with abuse of officials who are receiving certainly no more than, if as much as, they would gain for equal efforts in private affairs. The anxieties of official life, the constant strain, the feeling that a well-earned income is grudged by many of those who think they pay it, make the position of an official difficult indeed. For me it is intolerable, and I prefer to take the chances of, as it were, beginning life again to continuing in a career where my health was being seriously affected." When an important official like the town clerk of Nottingham wrote a letter like that, it behoved every one of them to use all their efforts to obtain superannuation, and the more difficult object of security of tenure, and he therefore trusted that Mr. Scorgie would continue to do everything in his power to attain the desired end.

Mr. C. Vawser (East Barnet) said he accepted the invitation to raise several points in the report. According to the last report the institution had a membership of 1,257, and this year the number was 1 360. This was undoubtedly a flattering increase, but he wished to call attention to the fact that, according to the latest records of the institution, the members represented only 639 public authorities, and from the figures given in the official Directory for 1910 there were still 1,441 authorities unrepresented. Many officials holding these 1,441 appointments were undoubtedly valuable men in the profession, and would be valuable assets as members of the institution, and he trusted that now the new council had come into being they would seek to make increased efforts to add to the membership, and thus enhance the value of the institution. The next question he had to refer to was the question of the examination. The report of the council once more pressed upon members the desirability of acquiring the testamur of the institution, or an equivalent examination granted by a representative body. It was to be regretted that such a recommendation was not carried out. Why did not the council ask public authorities when vacancies arose to consider the question of the examination?

The Chairman stated that during the last twelve months the council sent to every authority that advertised, or before they advertised, informing them of the examination, and asking the council to consider the question.

Mr. Vawser: Then there was the question of the new offices. The council said they were looking out for premises. It was a great pity the council could not find better official accommodation, because the country members when they came to town would like to make appointments at the headquarters of the institution. The present state of things was a disgrace. He thought everybody would sympathise with the cases of hardship mentioned in the report. Persecution was the correct word to use to describe these when the antagonism of individual members of a council was exercised against an official for no reason whatever. He had been particularly asked to call attention to the council "book." According to the Articles of Association the institution was established for the improvement of the professional status of the members, and to assist in enforcing their rights and interests. That did not limit them to taking up the defence fund, and he would call attention to clause 4, where it stated that no money should be paid either as dividend or bonus by way of profit to any member of the institution. He would venture to suggest that the defence fund was not a matter of profit within the Articles of Association, and there were many who did not see eye to eye with the solicitor on that point. It was stated in the report that, "on the motion of Mr. A. D. Greatorex, the council recently referred the matter (the formation of a defence fund) to the chairmen of their Standing Committees, and it was to be hoped that a scheme would shortly be placed before the members for their approval and adoption." This was but recent action, but he could turn up correspondence to prove that this matter was in the air twenty years ago. He knew of the case of a member of the council whose application for assistance was disregarded, and such things, he contended, brought the institution into ill repute. He said this with the

greatest regret. The members in the Eastern District had returned two members with a mandate to see that these things were carried through, to insist that the council should take them into their confidence, and to report when they met with no success. In the report of Mr. Scorgie it was stated that, "in the surveyors' section (of the N.A.L.G.O.) the professional side is not touched, but an examination for clerks in engineers' and surveyors' departments is held." Now, he would like to say that if the National Association of Local Government Officers was for local government officers, why was not the question put of their own certificate being pushed forward? Again, Mr. Scorgie reported that the National Association was not lacking "in efforts to bring about legislation embodying a system of deferred pay for municipal officers." He (Mr. Vawser) was very pleased to hear this. Mr. Scorgie further on said that rapid strides had been made in making an appeal for treating local government officers like other public servants as regarded superannuation, and further that the association had been successful in enlisting the sympathy of the County Councils' Association and the Urban District Councils' Association, and was now in negotiation with the Association of Municipal Corporations. That was all very well, but where was the support of the council of this association? So far as they were concerned they did not report any progress whatever. Then, as regarded security of tenure, that was undoubtedly a question that was full of difficulties, as so many of the public appointments under municipal authorities were made during the council's pleasure. He would have no fault to find with them if the council would take up the defence fund to do away with persecution, for when that was done they practically had security of tenure. They were told that the report of the National Association dealt with large objects, but they did not want objects, but benefits. They were also told that the association had always been of great assistance to a large number of officers in tendering advice. Why should the funds of this institution be used by another authority in giving legal assistance and not used by themselves? They could give money to other associations, it appeared, yet they could not vote money direct to what they themselves said was a most deserving cause.

Mr. W. H. Grieves (Sutton, Surrey) said the remarks of the last speaker showed that the members were already beginning to take an interest in the affairs of the institution under the new constitution. His particular reason for rising was to voice a little complaint he had with regard to the district in which he had the honour to be—*viz.*, the South-Eastern District. They in his district had not yet had so far a meeting of any description called for the purpose of considering the appointment of district chairman and district representatives, or district secretary. He understood that the object of the new constitution was that the district members should be called together in order that they might discuss the question of these appointments as well as general questions that the council had to deal with. To his surprise, in March last he received a long letter signed by his friend Mr. Maybury—he did not know whether that gentleman was present—stating that he had been asked to set the matter in motion, and, incidentally, that at a meeting of the Kent surveyors at Maidstone he put the question of the appointments on the agenda, when it was decided that the honours of the offices should be divided between Surrey, Kent, and Sussex. His complaint was that the Kent surveyors took upon themselves the duties that ought to have been divided between the three counties without asking the other counties to co-operate in the selection. He had no fault to find with the selection made—in fact, he thought a better selection could not have been made; what he complained of was that one county had, he was going to say the audacity, but he did not want to use strong language, to take upon itself the choice of the representatives of the whole three counties. He thought he was right in his contention; certainly he did not think it was fair that such a thing should occur. He noticed that some correspondence had appeared in the technical journals in regard to this matter. He felt inclined to take part in it, but he did not particularly like correspondence in papers concerning the affairs of the institution, and he made up his mind that the constitutional course was to mention the matter at that meeting. He was not at all satisfied with what had been done. Since then there had been no meeting of the district at all. (Voices: "Why?") Why? There was no reason why there should not have been.

A Member: Why should not you?

Mr. Grieves said he did not understand the interruption.

A Member: It is your district.

Mr. Grieves: But he was not in a position to call the district together. He was complaining that no meeting had been called in order that they might discuss the subject. He also resented this sort of procedure. Mr. Maybury might have meant right—probably he did—no doubt he did; but it was not the right way to go about it. He did not give the other counties any opportunity of making suggestions from their own side. If the Surrey and Kent counties had been called together there would have been no cause for complaint, and it would have prevented a member sending out a circular asking that he might be supported in the election. That, he thought, was undignified, and ought not to be. Mr. Maybury's letter alluded to the "apathy of the present council." He did not share he feelings expressed with respect to the apathy of the present council, as he thought the council had made rapid strides since last these questions were talked about. He thought the district members ought to be consulted, that meetings should be called and everyone have an opportunity of discussing the whole matter.

Mr. A. E. Prescott (Eastbourne) remarked that he was somewhat responsible for the correspondence in the technical journals alluded to by the last speaker, and he did not mind saying he should do the same thing again, because the members of the South-Eastern District were not treated fairly in the matter. There was a meeting convened. ("No, no.") Well, if there was not, there ought to have been. They had an association, and it seemed to him the duty of the association to issue instructions so that a representative meeting should be held in the Southern District, in order to give members the opportunity of discussing the business of the suggested representatives. He thought that what had taken place was most unfair. He had nothing whatever to say with regard to the representatives adopted; he believed they would give very good service; what he would like to urge was as to whether instructions were given to organise meetings in the district, and whether instructions were given to write the members to attend, and, if so, why they were not carried out. The members of the South-Eastern District were anxious to work amicably, and he had no doubt that if a satisfactory explanation was forthcoming nothing further would be said. He was sorry Mr. Maybury was not present, as an explanation had been asked for and had not been forthcoming.

Mr. E. Willis (Chiswick) said he rose to bless rather than to curse. Personally he thought the council were to be congratulated on the strong report they had produced. It was full of matter, and he still thought that a lot of the complaints would disappear in course of time. He did not think that complaints were quite deserved at quite so early a stage. He thought there had been mistakes made with regard to the district committees, but it was rather hard to blame the council for them. They (the council) had done a large amount of work, and he felt that the members should support them, and not take too strong an attitude at this juncture. Attention was drawn in the report to the question of the younger members of the association, and this was a question that could not be urged too strictly on the attention of members. They ought to have their pupils and assistants members of the association, because he saw that a number of the junior members were joining another institution, which, although it might have a laudable object, was not so representative as this institution. Unless they were going to amalgamate—and there were numerous difficulties in the way—he thought that this young blood going away would be a loss to the institution. With respect to superannuation and security of tenure, it was not an easy matter, and it was not fair to blame the council with the implication that it was. Last year he had the opportunity of fighting for it, and they did obtain it, and he thought the whole of the kingdom would obtain it before another five or six years passed by. Security of tenure was a much more difficult problem, and although they obtained the support—in the case he alluded to—of every member of the council, and it went forward for the chief officers, the Local Government Board would not give them a hearing. They declared it was not possible to consider, and that it was not likely to be considered. The chairman of the council and the chairmen of committees were present at the Parliamentary Committee, but

they would not hear a word of evidence upon security of tenure, and personally he foresaw serious difficulties in obtaining it, and if they did get it it was not going to be all lavender. They might rely upon it that under such a scheme an official who got into hot water would have to get out of it on his own accord. The Mutual Defence Fund, they might be sure, had his support, and as regarded the Orphan Fund, he was delighted to see it was pushing ahead. He would not remind the members that there was such a fund in connection with the institution. The annual meeting was held that morning, but only a few members were able to be present owing to the early hour at which it took place. It was mentioned that thirteen cases had been dealt with last year, and relieved substantially, and also that £100 had been added to the reserve fund. He thought this was a splendid position to obtain in a period of eleven years. Every year they had been doing more work, and he asked the members to support the fund, even if they only gave 1s. a year. With respect to the representation made to the council by the association of which he had the honour to be president as to further powers being conferred upon local authorities to define the routes of heavy motor traffic, he appreciated the fact that the council gave the matter their closest consideration, and that, in fact, they gave him quite a long hearing, but he still thought that the local authorities of the busier towns should have the power to define the routes of motor traffic. The damage these vehicles did to water-bound macadam roads was immense, and increased the cost of the highways to a great extent. He did not want to bar the use of the motor omnibus—it was no doubt the traffic of the future—but he thought it was proper the local authority should have a veto upon the vehicles going down residential roads, as they emptied the houses and did a great deal of damage.

Mr. G. W. Lacey (Oswestry) said that no doubt one had a certain amount of sympathy with the remarks made as to the district meetings, but it was the exception rather than the rule to call the members together. It was not done in his district, nor, he believed, in many other cases. As a matter of fact, there had been official difficulties which would not exist in the future, for practically there had been no secretaries or other officers to act. It might have been possible for the council in starting the new arrangement to call the members together, but in the absence of chairman or secretary it appeared to him it was almost an impossible thing to do other than had been done. With officials now appointed in the various districts the sort of thing described was not likely to happen again, and the members would have the opportunity of meeting together for the re-election of their officers. In calling attention to the expenditure account, he would remark that he did not know whether it was the first time in the history of the institution that an adverse balance had been shown. The amount spent on printing was £792, an increase of nearly £100, which did not seem to be accounted for by the increased numbers or the printing itself. Perhaps the chief reason for the adverse balance was the expenditure on the conference volume—he presumed so, at any rate. He should like to know whether it was true that the expenditure entailed on the Town Planning Conference volume was likely to result in a profit, as if so they might perchance look forward to a balance on the right side.

Mr. H. T. Wakelam (Middlesex) thought Mr. Willis had struck the keynote of the discussion when he said "Support the council." Some time ago it was his privilege to attend the annual meeting of the Thames Valley Association, when a great deal was said on the subject that had been discussed that day (the defence fund), and it was that meeting that prompted the letters over his signature in the professional papers. The result appeared to be good, because of the many who at once responded and sent contributions. He was not aware at that time that the council of the institution had taken up the matter, and it was only on attending a meeting of the council he was made acquainted with the fact. The president said: "I see you are taking an active interest in the defence fund: the council are also considering the question." He at once replied: "Then I will hand over the letters and contributions I have received to the council." This he did. He was asked by a member of the institution to publish the names of the supporters who had been good enough to send contributions, but this was obviously impossible, for he could not without their consent publish their names in the professional journals. He agreed with the remarks of Mr. Prescott on the subject, and would add that the text of the meeting should be: "Support the council." It was his intention to support them all he could, and do everything he could to help forward the matter on the council. On the question of paving, it should be stated that the Local Government Board gave loans of ten years for creosoted soft wood, five years for non-creosoted. They gave twenty for concrete, which made the repayment of the principal and interest much smaller for that kind of paving. He trusted, in conclusion, that the president would have a successful term of office during the forthcoming twelve months.

Mr. W. Harpur (Cardiff) pointed out, with respect to the discussion on the subject of the district meetings, that as a matter of fact the district committees did not come into active operation until that day, and any meetings held before then were not properly constituted in any sense. There might have been informal meetings—he had had one in his own district which he took upon himself to call—but they were quite informal. He was pleased to hear what Mr. Willis had said with regard to the Orphan Fund, and he would like to add a word to his appeal for more subscriptions. The committee of the fund had done very good work, but with more funds they could, of course, do more, and they hoped in the future to do more. He would earnestly appeal for more subscriptions, however small, for that commendable object. The defence fund was another object to which they could not devote too much attention. It was not a right thing that a member of that institution, or a member of their profession who was not in the institution, should be attacked and not able to defend himself—that they should not be in a position to do something to help. He trusted this would be pushed forward, and that something would be done to help members to defend themselves against scurrilous remarks and attacks by taking such action as might be necessary.

Mr. T. S. Picton (Eccles) wished to support the council for their admirable report. He desired to point out that their respected friend Mr. Brodie had been elected a district representative as well as being a member of the council, and to inquire whether he could hold both positions. As to the remarks of Mr. Prescott and Mr. Grieves, he did not see where they came in, as the members had the papers given them to vote upon, and the membership of the district was therefore according to the wish of the majority of the district. He noticed from the asset side of the accounts that there was a sum of £220 representing subscriptions in arrear. He took it that all municipal officers had a good banking account at their back. (Laughter.) If not, they ought to have. When May came round they ought to notify their bank managers to send on the cheque due to the institution, and in return the secretary would forward a little slip which would make their heart glad, because they would not have their subscription to the institution in arrear.

The Chairman said that before putting the resolution to the meeting he should like to say, as regarded the question put by Mr. Lacey, that the increase in the expenditure for printing was due to the fact that there had been a great deal of printing during the twelve months on account of the alteration of title and the change of the constitution. This had added considerably to the expenditure under that head, and they hoped it would not occur again. He ought to have stated, in moving the adoption of the report, that the final stage in applying to the court had been reached, and that the change of title had been granted; therefore every step in connection with that matter had now been completed. Mr. Harpur had referred to the question of the district committees, and said they did not come into operation until this annual meeting. He (the chairman) intended to mention that. He was sorry Mr. Grieves and others had complaints as to holding informal meetings. He could assure them that every step taken by the council or their officers was properly taken. The district secretaries were asked to hold informal meetings to arrange for the formal meeting, and were supplied with envelopes to summon every member. There were three districts which had no secretaries. He wrote to certain members of the council and asked them to call informal meetings in their areas, and supplied them with envelopes. Some little misunderstanding must have taken place, otherwise there would have been no chance of complaint that was to say, if his instructions had been carried out to the letter. He took it now that

the matter had been ventilated the complaint was entirely done with. The new district committees would meet as soon as possible after this meeting and everyone would work for the benefit of the institution as a whole. Some reference was made by Mr. Picton to subscriptions in arrear. He could assure that gentleman that the Finance Committee had made every effort to reduce the arrears, and they had, in fact, done a considerable amount of work in that direction during last year. He regretted that certain members of the institution could not see their way to pay their subscriptions when they were due. It caused the secretary an immense amount of trouble, and added to the expense of the work. He hoped the hint would be taken, and that in the future the arrears would die out. With respect to the question about the North-Western District, the matter would be dealt with, and Mr. Brodie would have to decide which seat he would occupy.

AN ATTACK ON SURVEYORS.

The Chairman said another matter had been brought before the council, and he had been asked to move a resolution with respect to it at this meeting. They were probably all acquainted with it. It consisted of a nastily-written letter which appeared in one of the professional papers in June dealing with the integrity of surveyors. The council felt they could not allow the matter to go by, or allow this meeting to pass without referring to it, and passing a strong resolution on it. He begged therefore to move, "That the members of the Institution of Municipal and County Engineers now assembled at their annual meeting strongly resent the imputations contained in a letter appearing in June which gravely reflected upon the integrity of municipal surveyors and surveyors in general."

A Member said he would rather that the name of the writer was given.

The Chairman: There is no objection to that, but it was thought better to leave it out.

Mr. W. H. Prescott (Tottenham) seconded. He thought it just as well to make it clear that the writer was a man holding a responsible position who supplied stone-breaking machines to various municipalities. The letter appeared on June 19th, and a more scurrilous and pernicious letter he certainly never read. It contained imputations in express terms upon the integrity and uprightness of municipal engineers as a collective body. Unfortunately the publication was not actionable, as the writer had been careful not to make a specific charge against an individual. Road makers were charged with being bribed by accepting inferior road materials. As they knew, several well-known municipal engineers, all members, had found it necessary to bring actions to clear themselves of libellous imputations upon their character. In every case the charges had utterly failed. There were the cases of Mr. Chambers-Smith, Mr. Essex, and Mr. Jones, of Colwyn Bay. The case of the last-named gentleman was particularly hard, because after pursuing him with unscrupulous mendacity the man libelled, and Mr. Jones had to pay his own costs. They ought to see that he was not a loser of the £250 to which his costs amounted. It appeared to him (Mr. Prescott) that if they could pay money to a local government officers' fund they could contribute something towards the costs of Mr. Jones. Libel and slander were punishable, both civilly and criminally, and if he had anything to do with the Mutual Defence Fund, to which reference had been made that morning, he should be a strong advocate for proceeding by criminal information if there was a doubt of the financial stability of the defendant.

Mr. W. Nisbet Blair (St. Pancras) said it should be understood when the technical Press was mentioned that all the technical papers did not publish this letter. The particular passages in the letter to which Mr. Prescott had referred had been expunged from the other journals, who had thus treated them honourably and fairly, while publishing as much as was useful of the letter.

The resolution was then put and carried unanimously, it being agreed to insert the name of the writer of the letter and the journal in which it appeared.

The annual report and balance-sheet were then adopted.

VOTES OF THANKS.

Mr. J. S. Brodie (Blackpool) next moved, "That the best thanks of the meeting be given to Mr. A. D. Greatorex for his management of the affairs of the institution and his conduct in the chair during the past year." It had been his pleasure, he said, during the past twelve months to meet their president on many occasions, and he must say, with all possible respect to his distinguished predecessors, he considered he came second to none in strenuous devotion to his duty. He found upon inquiry that he had been as far away as Stirling in the North, while he had also been to the East, West, and South, attending meetings with that assiduity which they could only regard as phenomenal on his part. It was therefore with the greatest confidence that he (Mr. Brodie) proposed this resolution to the meeting, and he felt sure it would be passed with the heartiest acclamation.

Mr. W. Harpur (Cardiff) said he had pleasure in seconding the proposition. They knew their president had been a demon for work. He had been here, there, and everywhere, and whatever could be done for the institution had been done by Mr. Greatorex during the past year. He did not think it was possible for a president to be more diligent than theirs had been, or to take more interest in the affairs of the institution than he had done. It was therefore with the greatest pleasure he seconded the resolution.

Sir John Lemon (Southampton) remarked that he should like to support the proposition. He had known Mr. Greatorex for several years, and he had been very pleased to notice the splendid way in which he had carried out the duties of the office from which he retired that day. Out of twelve district meetings he had attended eleven, the only occasion upon which he was absent being when he attended the funeral of Mr. Eayrs. During the year he had devoted about forty days to the business of the institution, and he had been fortunate in having the support of a very good council. He (Sir John) did not know what would happen in some towns if the surveyor gave so much of his time as Mr. Greatorex had given to the institution—he feared there would be a vacancy in the office of borough surveyor. They were specially indebted to Mr. Greatorex because last year happened to be one of the most active in the history of the institution. There had been the negotiations with respect to the institution itself, the Road Congress, the visit to Paris, and other important matters dealt with, making Mr. Greatorex's tenure of office a record one.

A Member remarked that, years ago, when he did his little in connection with the institution as secretary for Yorkshire, he knew their worthy president, and he was delighted to find that he had had such a grand year of office.

Mr. T. W. A. Hayward (Battersea) also supported the resolution, observing that nobody could have entered more heartily into the work of the institution than Mr. Greatorex. At the same time he thought it was right that they should convey to Mrs. Greatorex their appreciation of the great interest she had taken in the institution.

Mr. C. Jones (Ealing) could not—should he say?—dishonour himself by sitting quiet under such circumstances as these. Circumstances had prevented him from taking part in the meetings, but he could endorse everything that had been said because he knew Mr. Greatorex well. He could recall, as a predecessor of Mr. Greatorex, sitting with Sir James Lemon and four others at the formation of their institution. He was glad to be able to say these few words as one deeply interested not only in the prosperity of the institution, but also in the work done by their president.

The President-Elect (Mr. R. J. Thomas) remarked that he was proud indeed that it was his duty to put this resolution, which had been supported by their honoured founder and by others, of thanks to Mr. Greatorex for the admirable service he had rendered to the institution. Those who had the pleasure of going to Paris under the guidance of Mr. Greatorex would never forget as long as they lived the round of work that gentleman put them to. He (the speaker) did not think there ever had been a party of municipal engineers which got through such an enormous amount of work as was got through by those who pioneered them safely through the intricacies of Paris.

The proposition, including an expression of thanks to Mrs. Greatorex, was carried by acclamation.

Mr. Greatorex, who was cheered on rising, returned thanks, and said that the last year had been to him one of pleasure and delight, so much so that he felt a certain amount of regret that it was up. If he had done anything of interest or value to the institution he would be quite well satisfied with the time he had given to it. He was one of those who believed that

if a man took an office of this kind he should do the best he could in the discharge of its duties; and he might add that he had always had a very keen interest in this institution from the day he became a member. He was hoping to see a great increase of its members and its prosperity. He had also to thank the speakers for the kind way in which they had referred to his wife. It was quite true that he had rather, he was afraid, neglected his home in attending to the business of the institution during the past few months; as a matter of fact he had had only one Saturday at home in twelve weeks. Still he could assure them his wife took a very great interest in the work of the institution, and she was quite as pleased and delighted as anybody when he became president, and it had been her wish that he should do everything possible for the benefit of the institution and his duty as president. As regarded his council, when he informed his committee he was elected president he was asked what it meant, and he told them it meant doing the usual business of the institution. He was there and then granted leave to attend the council and district meetings whenever it was necessary during his year of office. He did not think there had been any cause of complaint, because his work had gone on just the same, any arrears having been made up by a little night work. His council were delighted he was elected president, and pleased his year of office had been so successful. He should always look back to that year as one of the happiest in his life. Every member of the council and every member of the institution, the officers—the secretary and assistant secretary—had assisted him in making his presidency a success, and having passed the chair he could assure them his interest in the institution would continue to be quite as keen and quite as good in the future as it had been in the past.

After the new president had delivered his address,

Mr. W. Nisbet Blair (St. Pancras) moved that the best thanks of the institution be given to Mr. Thomas for the address. There was, he said, very much in the address with which they were all in full sympathy. The presidential address was not a subject to be debated, which was almost a pity, because so many things had been stated in this address that might prove useful for discussion. The president had referred to a matter which touched them—*viz.*, the increased cost of maintenance of highways in recent years, and the desirability of obtaining a contribution from road users, such as the promoters of trackless tramways and the owners of motor-omnibuses. The address also dealt with a matter that deserved consideration—*viz.*, the facility with which loans were obtained for work which might not live for the period that the loan continued. His (Mr. Blair's) council were convinced of the mistake of that years ago, and they had taken up no loans for paving since 1900, everything being paid out of revenue. He should emphasise the importance of that question to the members of the institution.

Mr. G. W. Lacey (Oswestry) seconded the vote of thanks. He felt it was a great honour that such an important duty had not, as in the past, been placed in the hands of the aristocracy of the institution—a term which he used with the greatest respect, because they all admired the aristocracy—but in the hands of the democracy. As Sir James Lemon rightly remarked, the past year had been a hard and difficult one for the past-president, but, thanks to his geniality and *bonhomie*, and the amount of energy he possessed, their new president would be prepared for hard work, and prove himself, like his predecessor, a popular chief officer. Their eulogiums upon the presidential address, he was proud to say, had always been merited, and he would content himself with saying that they admired the address of Mr. Thomas, and wished him health and strength to carry out his duties, feeling sure this would be well done, and that he would earn their best thanks for the service he would render to the institution.

The President remarked, in reply, that the preparation of a presidential address was a matter of difficulty because one liked to avoid, if possible, repeating what other presidents had said. When they recollected that there were thirty-eight presidential addresses to refer to, and one did refer to them, it was very difficult to avoid saying what had been already stated in those addresses. He was very much obliged to them for the vote of thanks. He was afraid his address was a very ordinary thing, but one did one's best. With reference to Mr. Lacey's good wishes, he could assure them that there was nothing nearer to his heart than the good of the institution, and that he should do everything he could to promote it. He would remind them of the notice placed upon the pianoforte in the Far West—"Please don't shoot the pianist, he is doing his best!" (Laughter.) He added that a number of letters of apology for non-attendance had been received from, among others, Mr. Barber and Mr. J. A. Brodie. They congratulated the last-named gentleman heartily upon the great honour conferred upon him, and through him upon them, and the confidence placed in him by His Majesty in asking him to take part in the important work at Delhi. They were glad to find he had returned to England, but they knew that necessarily a great deal of work had accumulated during his absence, and that he could not leave Liverpool until he had overtaken a lot of it. Letters had also been received from Messrs. S. S. Platt (Rochdale), T. H. Yabbicom (Bristol), P. H. Palmer (Hastings), H. E. Stilgoe (Birmingham), and Mr. H. P. Maybury (Kent), who was suffering from asthma.

In the afternoon the members proceeded to the consideration of papers, the first to be submitted being:

MASONRY RESERVOIR DAMS: A SIMPLE FORMULA FOR THEIR DESIGN.

By F. C. Uren,
Surveyor, Aldershot Urban District Council.

Mr. Uren is a Constitutional Irishman, was trained for the profession under the late Mr. G. H. Small, Borough surveyor of Penzance, later on acting under him the position of deputy borough surveyor. He then filled assistant's posts at Wrexham and Oxford. In 1900 he was appointed surveyor to the Ely County Council, and in 1904 to his present position. The subject of Mr. Uren's paper is a favourite one with him, as indeed are all matters relating to works of water supply, for he has specialised in this direction for some years. He has had Parliamentary, company, as well as private work experience, and the works with which he has been connected include the sinking of boreholes, artesian, tube, and deep wells, upland reservation and pumping schemes, and the formation of earthen dams, storage and service reservoirs, and water towers. Mr. Uren is a member of the Institution of Civil Engineers (Dublin), and his paper read recently before that body, in which he dealt with earthen, compound and masonry dams, giving an account of some failures, was considered the best paper submitted during that session, with the result that he was awarded the Maguire Silver Medal. In the following year he again contributed to the same body a paper entitled Mains and Pumping Gas and Water Installations. He also possesses the diploma of the Royal Sanitary Institute for Local Surveyors, and is a Licentiate of the Royal Institute of British Architects.

The author has chosen this subject more on account of its intrinsic interest than its novelty, for while a good deal has already been written on the subject and a number of exhaustive and interesting papers have been submitted from time to time, yet, as our experience increases in the design of such structures, we find the subject still retaining its absorbing hold alike upon the academical and the practical engineer.

Every failure gives the mathematician fresh opportunity for further investigation and the propounding of additional theories. The recent disaster at Austin, Pa., is a case in point, and we have as many as four fresh brochures in less than a month as a consequence.

Both the theorist and the practical engineer have their proper place in the design and execution of these important works. Before the practice of the latter can, however, be utilised, it is essential that we should have some framework to base our design upon; so that the solution of the problem must rest in the first place with the mathematician. Then the work of practical men would indicate such alterations as

previous experience and the circumstances of the case may suggest.

The result is a typical design which practical experience accommodates to any given set of variations from the premises in the typical case.

So far as the mathematical side of the question is concerned, however, the author ventures to suggest that engineering is a little overdone with very complicated and elaborate formulæ, and in the course of this paper he will endeavour to show that intricate

FIG. 1.—CHARTRAIN DAM.

calculations for the design of masonry dams are unnecessary.

To the French engineers, Messrs. Sazilly, Graeffe and Delocre, is due the honour of having first discovered the exact method of designing the typical dam. Prior to their investigations, the factors which influenced the dimensions of large dams were somewhat imperfectly known, and all those which had been built were trapezoidal in section. They had been designed to fulfil the condition that their moment of resistance to overturning should be two, three or four times the resultant moment of the forces, tending to overturn them. For a dam to overturn, however, the resultant pressure at the face would have to pass through the edge of the base, and long before that pressure could reach that point the toe of the dam would begin to crush; and in many cases (notably those in Spain) the dams were crushed by the enormous weight of masonry injudiciously placed.

The theory of Graeffe and Delocre was merely the application of mechanical principles to determine a form of dam in which the crushing pressure should not exceed proper limits on the down-stream face when the reservoir was full, and on the up-stream face when the reservoir was empty.

Their methods of calculation, while extremely laborious and involving incidentally such exercises as the solution of equations of the sixth degree, led to a form of dam more economical of material than the trapezoidal form previously adopted—that required, indeed, but one-half of the masonry. To prove that they did not merely deal with theory they erected from the formulæ they expounded several dams which quite startled the engineering world by their boldness; among them were the well-known dams of Ban, Chartrain, De la Terrasse, and the Furens, the latter of which the author saw in 1909 in the Gouffre d'Enfer, near St. Etienne. Compared with the Gileppe dam, near Verviers, which had a section two and a-half times as large as it need have had, it was remarkably watertight. There was no leakage on the outside, although the dam had to sustain a head of water 150 ft. high.

Following Sazilly and Delocre came Sir Guildford Molesworth, who undertook to devise some simpler formulæ, which would give an approximation to the results of the French engineers. His formula, which is of great value, gives results in accordance with that important condition laid down by eminent mathe-

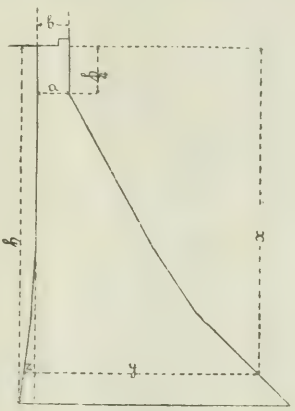

FIG. 2.

maticians and engineers as essential in all structures of this kind—that there should be no tension in the dam—and this law necessitates the resultant pressure reservoir full and empty falling within the middle third of the section.

The formulæ is now well known, and is:—

H = height of dam in feet.
x = any depth below surface of water in feet.
y = offset from vertical line to outer face in feet $= 0{\cdot}6x$ as a minimum.

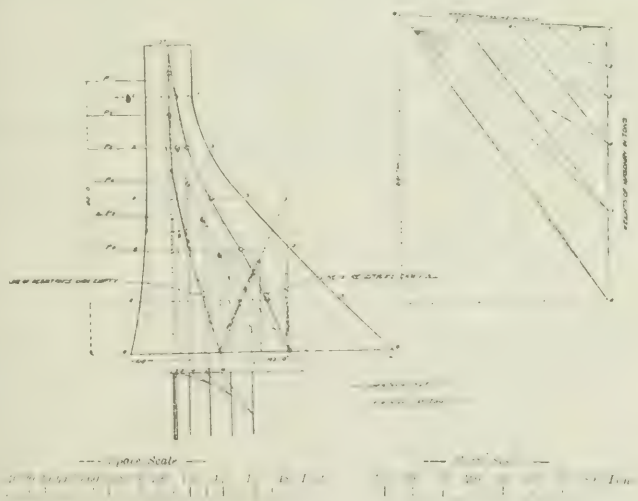

FIG. 3.

z = offset from vertical line to inner face in feet.
b = width of dam at top in feet.
a = width of dam at $\frac{1}{4}H$ from top in feet.
P = limit of pressure on masonry in tons per square feet.

If y as given by the formula be less than $0{\cdot}6x$, it must be increased to $0{\cdot}6x$.

$$\eta = \sqrt{\frac{0{\cdot}05\,r^2}{1^2 + (0{\cdot}03\,r)^2}} \cdot \left(\frac{0{\cdot}09\,r}{1^2}\right)$$

. Assuming the case of a dam 180 ft. high, and divided by four imaginary planes, built of masonry weighing

145·6 lb. per cubic foot, and with a permissible limit of stress equal to 20,000 lb. per square foot, the section obtained by graphic statics is shown in Fig. 2. Whether full or empty, it will be seen that the resultant falls well within the middle third of the thickness of the dam at each place.

Since Messrs. Graeffe and Delocre investigated the problem, at least thirty high masonry dams have been built, and among those there were only two, as far as the author knows, in which Molesworth's form

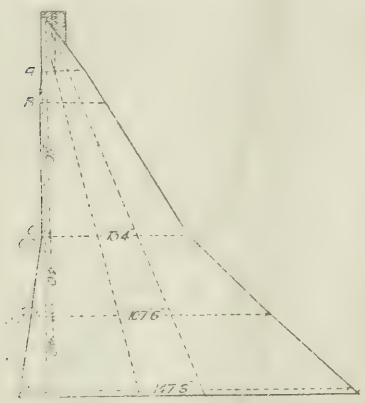

Fig. 4.

was widely departed from. The first of these was the Gileppe dam already mentioned, which had a section at least two and a-half times as large as it need have had; the other was the well-known Vyrnwy dam, which also had a section considerably greater than a purely rational section.

Another excellent formula that does not involve high mathematics which should appeal to engineers is that propounded by Dr. Brightmore:—

$$s = \sqrt{\frac{wh^3}{x}\left(1 + \frac{w^2h^2}{4W^2}\right)}$$

where

w is the breadth at a depth h below the crest

W is the weight of masonry above h, and of the water over the inner face;

w is the weight of unit volume of water, and x is the maximum stress allowable in the dam.

This formula gives the breadth at any depth in terms of that depth, and of W. At first sight it would

Fig. 5.

appear that the presence of the latter factor would render the formula useless, but examination shows that the term containing W is small compared with the first term of the formula in fact it ranges from one-fifth to one-eighth of the other expression between the depths 100 ft. and 190 ft., so that if W is roughly approximated to, the breadth can be found to a sufficient degree of accuracy. From the tendency of this term to become a factor of safety it can be considered successive laminæ, the breadths are simply calculated; and by taking moments about the inner third of the breadth, the projection at the inner face is deduced without either finding the centre of gravity of the dam or of the water over its inner face. The method of calculation, it will be seen from the diagram, applies, with the data given, to a dam up to 190 ft. high."

The conditions upon which the above solution is based are:—

(*a*) A maximum compressive stress on any plane not exceeding in intensity from 6 to 12 tons per square foot.

(*b*) Absence of tension at any point.

(*c*) A greater resistance to shearing than the total horizontal thrust of water.

When the author first wrote upon this subject (see "Transactions Institution of Civil Engineers," Dublin, vol. xxxvi.) he was somewhat sceptical about the necessity for the resultant falling within the middle third, and consequently was far from fixing the condition that there should be no tension anywhere at the faces of the dam.

Any considerable deviation of the line of pressure, reservoir full, from the middle third was undoubtedly a danger, but a sight departure, he thought, would not be inconsistent with good practice, for Rankine had only said "that the line of resistance should be within but a small distance beyond the middle third of the wall."

At that time he preferred the formulæ prepared by

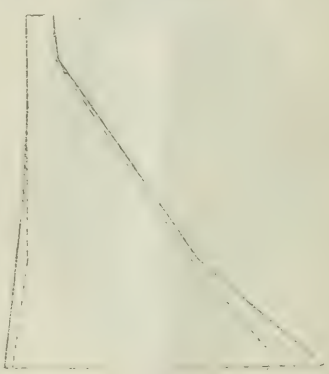

Fig. 6.

Author's Design ————
Dr. Brightmore's Section - - - - - -

[illegible] Crouch, Periyar Dam, C.S.I., M.I.C.E., who designed and executed the great Periyar dam, the highest masonry dam yet constructed. His formulæ are appended:—

In Fig. 5,

$$y = 0{\cdot}37\sqrt{\frac{\frac{1}{2}s^2 + \frac{1}{2}d(s-d)}{p}}$$

p being the limit of pressure in feet of water, or

$$y = 7{\cdot}67\sqrt{\frac{\frac{1}{2}s^2 + \frac{1}{2}d(s-d)}{p}}$$

p being in pounds on the square foot.

If d is greater than $\frac{s}{2}$, $\frac{s}{2}$ should be substituted for d in the formula which then becomes

$$y = 1{\cdot}17\sqrt{\frac{s^2}{p}}$$

or

$$y = 9{\cdot}25\sqrt{\frac{s^2}{p}}$$

according as p is in feet of water or in pounds on the square foot.

It is not easy to give a satisfactory formula for the slope to be used upon the limit of pressure to be allowed, as it is not until a depth of 1200 that any limit likely to be adopted in practice comes into play at all.

Molesworth's formula $s = \frac{1}{10}y$ gives an excessive amount of material at depths of 1500 and under. A vertical face for the first 100 ft., a slope of 1 in 20 for the next 40 ft., 1 in 10 for the third, and so on, increasing one hundredth at every 100 ft., gave satisfactory results within all practical limits.

Later experience and considerations however have

convinced the author that the real danger of failure in a dam built of proper materials on a suitable foundation does not lie in the danger of crushing of the materials (the resistance of which is far greater than had been supposed), but in that of percolation or shearing, and that the dimensions sufficient to guard against these two dangers will amply suffice to meet that of crushing, so that elaborate calculations of the resistance to the latter are waste of labour.

If the following simple rules are observed by those

FIG. 7.

Author's Design ——— ———
Molesworth's Design .....

designing a masonry dam nothing more is really needed, for they will be found to give results so nearly accurate that they may be adopted without risk of error:—

(1) Under no circumstances whatever should there be any risk of tension on either face.

(2) That the total area of the section at any depth x should not be less than $\frac{x^2}{3}$; of course, for convenience of construction and resistance to shocks, it must not be much more than this in the upper part.

(3) That $y = \frac{1}{10}x$ up to 100 ft. in depth, and over 100 ft. $y = \frac{1}{4} \times x^{\frac{1}{2}}$.

(4) z to be calculated as already mentioned—*i.e.*, a vertical face from 0 to 40; 1 in 20 from 40 to 80; 1 in 10 from 80 to 120; $\frac{x}{20}$ from 120, 160, and so on.

Comparisons between the results obtained from the other formulæ given in the paper, and the very simple

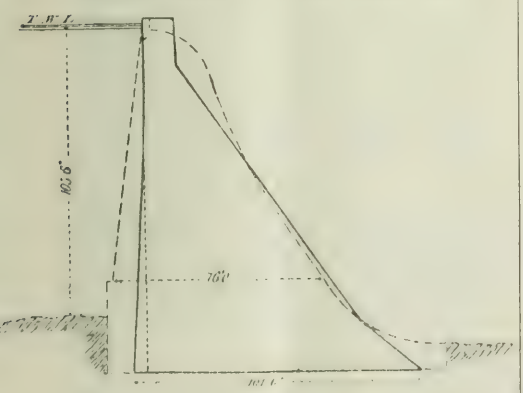

FIG. 8.

Author's Design
Mr. Mansergh's Design for Elan Dam .....

one advocated in rule 3 above may be seen upon reference to the accompanying diagrams, Figs. 6, 7 and 8, for dam 160 ft. in height.

Masonry dams are, of course, very costly, as compared with earth embankments where the latter would cost £100,000, that of a similar dam in masonry would be about £250,000 but they are indispensable where risk of failure must be avoided at all costs. Probably the attention of engineers in designing dams in cases where economy is a matter of prime importance will be more and more directed to those which are curved in plan. Many such have been built of recent years, especially in New South Wales, where considerable economy of cross-section has been obtained by horizontal curvature. In these cases, however, the whole dam has been on one curve, with its abutments secured in the rocky sides of the gorge or valley where the water is impounded. Another and very interesting form of construction is that advocated and carried out with success by Captain A. H. Garrett, R.E., and also (independently) by M. Gaudard, of Lausanne, where the dam consists of a series of horizontal arches abutting against horizontal piers, long enough and strong enough to resist water pressure. This form of design may be said to represent the last word, so far, that science has had to say on the subject, though the application of reinforced concrete may possibly introduce still greater economy. Dams of this nature have been constructed in other countries, but all the reinforced dams constructed up to the present of which the highest the author could find was 65 ft.—had been, so far as he was aware, for power purposes, and not for waterworks.

DISCUSSION OF MR. UREN'S PAPER.

Mr. A. P. I. COTTERILL (Westminster) said the subject was somewhat academical, as there might not be many in the room called upon to design dams. He thought the author would be the first to admit that in designing dams one must have regard to particular constructions which were not very clearly alluded to in the paper. The author dealt with formulæ which he boiled down into four simple rules, but there were other considerations which might upset the rules. He referred to such things as foundations, the materials available, the site, the danger that might attend some forms of construction owing to buildings or villages being below the dam—such, for instance, as they had in the case of the Derby dam, where one of the residences of the Duke of Norfolk was below it. Then there was the question of trouble from flood water. All these things might make some difference apart from the rules. Then it was not possible to say that there never would be any tension in masonry dams. Consider the case of a somewhat yielding foundation. That would get up stress which the mathematical designer could not foresee; or, again, if the soil on which the dam was founded was different in character in one place from what it was in another—soft, say, in one part, and rocky in another—stresses were set up which were outside the designer's calculations. The late Sir Benjamin Baker, a great authority on masonry dams, talked of them as "elastic solids," implying that changes might go on apart from the mass moving. Sir Benjamin got out a model by means of which he showed how slight changes might take place in the structure, and he also held that they must design not only for much heavier compressive stresses than the author mentioned of 9 tons to the square foot, but also be ready for a tensile stress of 10 tons per square foot. At the Croton dam the pressure ran up to 14 or 15 tons to the square foot. Looking through these four simple rules, he had dealt with rule 1. Rule 2 seemed involved in rule 3, which looked like an old rule they would find in any old edition of Molesworth. As to curved dams, no doubt more could be done in that direction, though they must remember that there must be a limit in the radius. Anything outside a radius of 400 ft. made a curve ineffective, and a curved dam was then to all intents and purposes the same as a straight one. As to the suggestion of horizontal arches with deep piers, that was a direction in which progress could be made, but it was not new. He remembered that a former president of the institution designed a retaining wall on these lines to keep back a slip on the hillside near Bristol, and it had been very effective. With regard to reinforced concrete improvement and changes were certain to take place; in fact, there would be constant progress. The field was an enticing one, and he only hoped those who were entering on it would be increasingly successful.

Mr. E. J. ELFORD (Southend-on-Sea), who proposed a vote of thanks to Mr. Uren, said it might not fall to the lot of any of their members to design dams, but none the less a paper of this kind in their Transactions must be useful for reference, especially as the principles of design observed in a dam of the kind described would apply to other structures of a similar character. He suggested, however, that rule 1 would not be applicable to concrete structures. In

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reinforced concrete work it was usual to allow for the tensile strength of the concrete. He had recently been carrying out some important works, and samples of the concrete had been taken at frequent intervals. Only in a single instance had they got a lower tensile stress than 200 lb. after eight weeks. That showed they could not ignore the very valuable quality which concrete possessed.

Mr. J. Julian (Cambridge), who seconded, said the subject was one of great interest, but in practice possibly it would be found that one could not afford the time without the use of amplified formulæ. In rule 3 he thought it would be desirable to substitute 110 ft. in depth for 100 ft.

The President remarked that they had to exercise extraordinary care in designs of this character, bearing in mind the terrible results which were liable to accrue in case of failure. They had instances of this kind in American practice, as they all knew. In English practice they would no doubt all exercise their national caution, and their error, if there was any error at all, would be on the safe side.

The vote of thanks having been passed,

Mr. Uren, in reply, said he appreciated the kind reception accorded to his paper. As this was his first appearance in a *rôle* of this character, he naturally felt considerable diffidence in submitting his theories to so many eminent practical men. It was true that these theories were based upon considerable personal observation, but it was one thing to hold theories and quite another to flaunt them before a critical engineering audience. With regard to Mr. Cotterill's remarks, to have gone fully into those points would have required a more elaborate paper than he had submitted, but he had satisfied himself that the formulæ he had submitted did provide for the points he had raised. It provided, among other things, for ordinary defects of workmanship, the varying quality of stone and cement, and something for differences of temperature arising out of the construction of such massive works all the year round. He thought he might claim that the formulæ were simple, and in cases where the safety of property and life was involved, as was generally the case in valleys below high dams, all the points Mr. Cotterill had raised should be provided for. Mr. Elford took up a position which was practically his own when he first wrote on the subject—that there should be some allowance for tension in all concrete work. To-day he took a different standpoint. He said that the formulæ should be such as to allow for no tension at all in a masonry dam. If they erred at all, they should err on the safe side in an important matter of this character. He would like to say, in conclusion, how desirable it was there should be a standard system of symbolical notation. One engineer employed x for dimension, another employed z. The result was endless confusion, and a waste of considerable time was involved.

Mr. Uren has since amplified his reply as follows: "I scarcely know what reply to make to Mr. Cotterill's remarks, because I am in entire agreement with what he says, and it is because I do agree with him that I submit the equation in its present form, for it allows for most of those contingencies he would provide for. As regards the foundation, however, influencing the design, only judgment or practical experience can decide that; formula would have no bearing in the question at all. No engineer, I imagine, would build a masonry dam upon anything but sound rock; shale, for example, would be unsuitable for any but earthen dams."

(Table continued.)

ANNUAL DINNER.

There was a large gathering, including many ladies, at the Hotel Cecil on Thursday night, when the annual dinner of the institution took place under the chairmanship of the president, Mr. R. J. Thomas, M.Inst.C.E., upon whose right hand was Mrs. Greatorex, wife of the retiring president. The toast of "The King" was proposed from the chair, and

Mr. E. Purnell Hooley gave "The Imperial Forces," and alluded to the possible formation of a technical force in case of need. He believed the War Office were still considering the matter.

Major Otway, in reply observed that engineers of municipalities and counties would of all people be most valuable for an army if it was called upon to take the field, and he felt sure they would be ready to give their services. Without scientific support their army would be like a clock without works—it would not go at all. All the scientific sections—bridging, telegraphy, railways, and "wireless"—required scientific direction.

Alderman Arthur Vernon gave "The Institution of Municipal and County Engineers," and said this was an age of competition and combination—the voice of one was like a voice crying in the wilderness—and their institution, like others, had brought wonders to the notice of the public. It was established in 1873, a year before Lord Beaconsfield proclaimed the doctrine "Sanitas sanitatum omne sanitas," which had produced one of the greatest revolutions in this country. It had resulted in a great saving of life in the last century, and it was to be hoped this saving would be still greater in the coming century under the auspices of this institution. In his experience he had come across three classes of municipal surveyors, one an admirable man who used to get into trouble—as all surveyors did—and who was in the habit of meeting attacks by long observations which were not understood; another, also an admirable man and conscientious, but too sensitive; and yet another, who was still carrying on his work, who said little or nothing, did everything, was always ready, and took trouble with everything. The result was that he was perfectly happy, he enjoyed an enormous amount of esteem, and was satisfied, except, perhaps, on the question of salary. He did not include their president in any of those classes, for he was a class unto himself. If he enjoyed only a small share of the satisfaction which his employers enjoyed, he had much to be thankful for. He was an amiable autocrat who, while making nice suggestions to the committees, invariably did whatever he liked. (Laughter.) In conclusion, he trusted that prosperity might attend the institution in the future even in greater measure than it had in the past.

The President, in response, said he was proud to know that Alderman Vernon had a high opinion of municipal surveyors. These (the surveyors) were undoubtedly doing their best to serve the authorities who employed them, and it was only by the co-operation of gentlemen like Alderman Vernon, who had ability and time, and who devoted a large portion of their leisure to public work, that they were able to do anything at all. They owed a very deep debt of gratitude to the municipal councils of this country for their disinterested labour on behalf of their fellow-men. They were told that professional men of a good class were not understood. He believed there was a good deal in that, and he quoted in connection therewith a story from the "unlimited depths" of Mr. H. Percy Boulnois's repertory—and might he, at the same time, congratulate the institution upon possessing so admirable a poet laureate, for in two languages he had described effectively the recent excursion he paid to Paris, not forgetting his high "appreciation" of the Paris destructor? Proceeding, the president stated that, as they well knew, the work of the municipal engineer was growing enormously. The area covered by municipal and county engineers was expanding by leaps and bounds and if they compared their present work with that of twenty years ago they would find a vast difference, especially in one particular branch to which he had devoted a portion of his life—road construction. Municipal engineers and surveyors had their difficulties and trials, and these would not be reduced, he was sorry to say, by the National Insurance Act, and he thought they would see the point when he stated that they had, unfortunately, a very large number of their members who obtained very inadequate salaries—below the £160 a year under which the Act applied. He did not know any other profession in the world whose members had more trials, more difficulties, and more temptations than theirs. He was proud to think that they could be looked up to and trusted to do their best well and fearlessly.

An interesting incident next occurred in the presentation by the president of a miniature silver cradle to Mrs. Greatorex as a memento of the birth of her daughter Patricia during her husband's term of office as president of the institution. The president enlarged in felicitous terms upon the charming hospitality extended to the members by Mr. and Mrs. Greatorex, and stated that this was the first occasion in the existence of the institution upon which a "little cherub" had appeared to a president and his wife during the former's tenure of office. The gift, he added, had been subscribed by the members of the council.

Mr. Greatorex feelingly returned thanks for the

presentation, and took occasion to congratulate the members upon the presence of ladies at their annual dinner for the first time. It had been reserved, he said, for a bachelor to cause this agreeable innovation to be made.

Mr. W. H. PRESCOTT (Tottenham) proposed "Kindred Institutions," and remarked that the attitude of other institutions towards theirs had been one of cordiality and goodwill, with the idea that they were all linked together for a common object, with identical interests in all that concerned the welfare of engineers, and all measures aiming at the improvement of the public health.

Dr. UNWIN, president of the Institution of Civil Engineers, acknowledged the toast. The oldest society, he said, that dealt with the application of science to practical affairs was the Institution of Civil Engineers. He regarded the Institution of Municipal and County Engineers with the most benevolent attention, and was glad to welcome the members into the ranks of his own society. He wished them success in the great national work they were engaged in.

Mr. T. W. A. HAYWARD (Battersea) submitted "The Guests." For the first time, he remarked they had the mother of the president at their dinner, and for the first time they had a bachelor for president, and thy would agree with him they had a real good fellow in Mr. Thomas. In coupling the toast with the name of Sir George Gibb, chairman of the Road Board, he expressed a hope that that gentleman would prevail upon his board to spend a little of their money upon the roads of London.

Sir GEORGE GIBB, in response, observed that their institution had attained the maximum of efficiency with the minimum of decay. It had all the force and the influence and power of local government, from which all our government proceeded, and its members represented the skill and the science of engineering, two great powers in the national life—the power of force and the power of skill. This country had the best roads in the world, and although the coming of the motor had introduced conditions which were entirely novel, the Englishman had bravely tackled the problem and had made the roads good. He had been asked to adopt the doctrine of the open purse, but he would remind them that he had to be fair all round, and where the sum was very limited the most had to be made of it.

The toast of "The Ladies" was proposed in an excellent speech by Mr. E. WILLIS, and acknowledged by Mr. J. S. KILLICK, assistant engineer to the Road Board.

Finally, the PRESIDENT proposed "The Official Staff," coupled with the names of Mr. Thomas Cole, secretary, and Mr. H. A. Giles, assistant secretary, both of whom replied.

Selections of music were subsequently given by Miss Edith Evans and Messrs. Ivor Foster, Felix Salmond ('cellist), P. Mavon-Ibbs (piano), and Astley Weaver.

Messrs. C. G. Mason (Guildford) and J. Paton (Plymouth) were among those present at the annual meeting. We regret to find that their names were omitted from the attendance list which appeared in last week's issue.

Roman Roads: Roads Improvement Association Investigations.—A special committee of the Roads Improvement Association is now investigating the whole system of the old Roman roads in this country to decide whether, in view of the facilities now afforded by the Imperial Road Improvement Fund, any action can usefully be taken to bring any of the roads now disused into service again. The stability and thoroughness of construction of the old Roman roads are well known, but during the railway era a number of them became obsolete. It has frequently been suggested that, now that traffic is rapidly returning to the roads, many of the old Roman highways might be made up and utilised for cross-country traffic. Many of these roads have been relieved of their metal by adjoining landowners and others, but it is believed there are still a large number which, although grass covered, retain their old foundations. The Secretary to the Roads Improvement Association (Mr. Wallace E. Riche, Caxton House, Westminster, London, S.W.) would be glad to receive, for the information of the committee, any suggestions from tourists and others who have taken an interest in this matter.

ROYAL INSTITUTE OF PUBLIC HEALTH CONGRESS IN BERLIN.

THE MUNICIPAL ENGINEERING, ARCHITECTURE AND TOWN PLANNING SECTION.

The Congress of the Royal Institute of Public Health, which opens on Thursday next, in Berlin, and extends over three days, will be conducted in five sections, the one of special interest to our readers being that devoted to Municipal Engineering, Architecture and Town Planning—over which Mr. P. C. Cowan, D.SC., M.INST.C.E., chief engineer of the Local Government Board of Ireland, will preside, among the vice-presidents being Prof. Henry Adams, M.INST.C.E., Sir Alexander R. Binnie, M.INST.C.E., Mr. John A. Brodie, M.INST.C.E. (city engineer of Liverpool), Mr. W. B. Bryan, M.INST.C.E. (chief engineer of the Metropolitan Water Board), Mr. A. D. Greatorex, M.INST.C.E. (borough engineer of West Bromwich), Sir James Lemon, M.INST.C.E., Mr. T. de Courcy Meade, M.INST.C.E. (city engineer of Manchester), Prof. W. C. Unwin, F.R.S. (president of the Institution of Civil Engineers), Mr. G. W. Willcocks, C.B., M.INST.C.E. (chief engineer to the Local Government Board), and Sir John Wolfe-Barry, K.C.B., F.R.S. Mr. A. J. Martin, M.INST.C.E., is one of the secretaries of the section.

The papers to be read during the three days on which the section will meet include:—

"Water Supply in London," by W. A. Richardson, ASSOC.M.INST.C.E., assistant engineer to the Metropolitan Water Board.

"British Practice in Sewage Disposal," by A. J. Martin, M.INST.C.E.

"Sewer Ventilation," by T. de Courcy Meade, M.INST.C.E.

"Building By-Laws," by J. D. Casswell.

"Town Planning," by Thos. Adams, town planning assistant to the Local Government Board.

"Legal Aspects of Town Planning," by R. E. Willcocks.

"Use of Reinforced Concrete in Architecture," by Prof. Henry Adams, M.INST.C.E.

"The Use of Reinforced Concrete in Engineering," by J. H. Waller.

Papers dealing with the sewage arrangements of Berlin, water sterilisation and street cleaning will be contributed by German delegates to the congress.

Visits to a large number of public institutions in and around Berlin have been arranged in connection with the gathering.

Shopkeeper's Action against Corporation.—The Municipal Corporation of Christchurch, in its capacity as sanitary authority, was held liable by the Court of Appeal last week to pay £23 compensation to Edith Lingke, a furniture dealer, for having injured her business by obstructing the entrance to her shop by a heap of gravel.

Problems in Engineering.*—This reprint from the popular students' section of our contemporary consists chiefly of questions that have been set at the examinations of the Institution of Civil Engineers and of the Institution of Municipal and County Engineers. There is no index to the work, but the matter is classified under the heads of Mechanics and Hydrostatics, Strength and Elasticity of Materials, Theory of Structures, Surveying and Levelling, Water Supply and Hydraulics, Sewerage, Sewage Disposal, Road Making and Tramways, Building Construction and Materials, Law, and Miscellaneous. This book is calculated to be of considerable use to students in these subjects, but it would have been an advantage if the source of the questions could have been stated. The answers have in general been given rather more fully than would be the case at an examination, with the object of explaining the principles to a student without his having to refer to a text-book for them. The price brings the work within the reach of all students, and there is so much useful matter compressed into a small space that even the best-prepared candidate cannot afford to be without it.—*Sanitary Record.*

* "Problems in Engineering, with Solutions." Being Questions and Answers reprinted from the "Assistants' and Student-" Section of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER. First Series, 1909 to 1911. Edited by Sidney G. Turner, ASSOC.M.INST.C.E. Price 6s. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.

Institution of Municipal Engineers.

MEETING AT KESWICK.

From photo by INSTITUTION OF MUNICIPAL ENGINEERS AT KESWICK. *G. P. Abraham, Keswick.*

The annual conference of the Northern District of the Institution of Municipal Engineers was held at Keswick on Saturday, and a most interesting day was spent in the "Metropolis of the Lake District" and its environs. The programme for the day included a visit to the Thirlmere waterworks, on the invitation of the Manchester Corporation, a drive to the top of Dunmail Raise to inspect the new road made by the Cumberland County Council, and a visit on the return journey to Threlkeld granite quarries, on the invitation of the granite company. This is the first time the institution has met as far north as Keswick, but one and all were unanimous in expressing the opinion that the day had been a most enjoyable one.

The conference opened at 10.15 a.m. in the town hall. Mr. J. Davidson (Morpeth) presided, and there were present Messrs. John Robinson (hon. secretary of the Northern District, Darlington), B. Wyand (secretary of the institution, Westminster), W. Finch (county surveyor), D. H. Johnstone and W. H. Baker (Carlisle), P. M. Hope and A. Furness (West Ward, Appleby), Jas. Jardine (town clerk, Morpeth), R. Forster (Alston), F. J. Reilly, S. Grisdale and J. W. Pooley (Cockermouth), W. S. Lythgoe (Penrith), W. Hodgson (Keswick), J. Murray (Longtown), W. Taylor (Kirklinton), W. B. Thomas (Southwick-on-Wear), W. J. Coulson (Cramlington), J. W. Holbrook (Houghton-le-Spring), J. Mole, senr., and J. Mole, junr. (Chester-le-Street), J. T. Pegge (Durham), G. Gregson (Durham), F. Mellor (Newcastle), W. Wallin (Newcastle), J. Harding (Hetton-le-Hole), and G. Symon (Blaydon). Councillors P. Atkinson (chairman), G. P. Abraham and G. Watson represented the Keswick Urban District Council.

When the meeting opened Mr. P. Atkinson (chairman of the Keswick Urban District Council) extended to the delegates, on behalf of the town, a very hearty welcome. He hoped that they would have a pleasant and a profitable time, and that they would go away with recollections of the Lake District that would encourage them to come again.

The Chairman (Mr. J. Davidson) said they were all indebted to the chairman of the Keswick Urban District Council for the kindly welcome extended to them. It was the first meeting the institution had ever held in Cumberland, and, from what they had seen of the neighbourhood so far, he certainly hoped it would not be the last. They were simply delighted with the attractions of the district. They were obliged to the chairman for coming to give them a welcome on a very busy day. They all knew the vast amount of time that was given up to the service of the public on local authorities by the chairmen, and considering the fact that they were mostly business men, with many calls on their time, it was a great credit to them that they should devote so much time to the work. They were all perfectly satisfied with what they had seen so far, and it was almost a sacrilege keeping the members inside with such pleasant drives and so many delightful walks in front of them. He moved that a vote of thanks to the chairman of the Keswick Urban District Council, acknowledging his kindness in coming to give them a welcome, and to the Keswick Urban District Council for allowing them to use that hall, be entered on the minutes.

This motion having been seconded, it was carried with applause.

Mr. P. M. Hope (surveyor to the West Ward Council) then read a paper on "Keswick and its Municipal Undertakings." It was such a model of brevity that it might have been more appropriately headed "Keswick in a Nutshell."

A NOTE ON KESWICK AND ITS MUNICIPAL UNDERTAKINGS.

By P. M. Hope.

Keswick, the Metropolis of the Lake District, is a small but neatly built town standing on the banks of the river Greta, and situate about ½ mile from Lake Derwentwater, "The Queen of the Lakes." It is governed by an urban district council, covers an area of 1,068 acres, and contains 1,093 houses. The present population is 4,403, but this is considerably augmented by visitors during the summer season, notably during the Convention week, when several thousands invade the town. The rateable value is £25,272, and the present debt under the Public Health Acts amounts to £11,505.

As is usual for a town which exists only on account of its natural attractions as a visitors' resort, the local authority have of necessity been very wide awake to bring the sanitary condition obtaining to a very high state of efficiency, and the gravitation water supply obtained from Skiddaw is one of the most constant and pure supplies in England, no restrictions having to be imposed upon any consumers during the long drought of last year. This supply was originally bought from the old Keswick Waterworks Company, and since then a new reservoir, capable of holding 250,000 gallons, has been installed at Millbeck, the engineer of which was James Mansergh, of Westminster, London. The council have in recent years strengthened their position by obtaining a Special Water Act, which empowers them to apply profits from the water towards the reduction of the district rate.

In recent years the council have installed a new sewage disposal works, upon the intermittent filter system, the engineers employed being David Balfour & Sons, Newcastle-on-Tyne. These works are doing the work of purification in a satisfactory manner.

Through the munificence of Messrs. T. & W. Hewitson, the town has a splendidly equipped cottage hospital, and the council have provided a very isolated fever hospital upon Whinlatter, where, I am pleased to say, no death has occurred. A wooden small-pox hospital was also erected during the scare of 1908, but has happily not yet been required for use.

The refuse of the town is collected twice a week, and arrangements have just been concluded for the acquirement of a tip, thus saving the town what at

first appeared to be a capital expenditure of over £1,000 for a two-cell destructor.

The town itself is lit throughout by gas, upon the Bellamy system, the main lamps being served by Keith's compressors. The outskirts of the town are lit by electric light, and the council boasts of having the best lighted town in the North.

There are 3 miles 6 furlongs of county roads in the urban area, kept up by an annual grant from the county council, and 5 miles 2 furlongs of district roads, and the council will in all probability be laying considerable stretches of tar-macadam in the near future in the town.

The Town Planning Act has been found very difficult to carry out in Keswick, on account of the crowding together of the houses of the town, necessitated in olden times by the Border raids, and the council might be criticised for their too literal interpretation of the Act.

The council have been alive to retain for the community those great natural assets which form the attractions to visitors, and when it was mooted that there was a danger of the boat landings at Derwentwater passing into the hands of private enterprise, the council stepped in and secured them for the town, at a perpetual charge of £120 a year, and at present derive as revenue the sum of £180 from this source.

The recreative needs of the visitors have been met by the munificence of Messrs. T. & W. Hewitson, who endowed and presented to the town the two beautiful parks you would note on your way from the station. These are governed by trustees, and provide for cricket, tennis, bowls and croquet, at a very nominal charge, and cost the ratepayers nothing for upkeep.

Keswick exists through its visitors, but, on the other hand, there are several small local industries, such as pencil making, lead mining, granite quarrying, &c., which employ a number of hands, but the one-time staple industry of the town upon which the couplet "God Almighty, grant His aid To Keswick and the woollen trade" was penned has long ceased to exist.

The members of the institution will find that as a visitors' resort Keswick is alive to the necessity of efficient sanitation, and that the urban authority will spare no pains to see that every step is taken to reach this desired end.

At the conclusion of the paper Mr. Robinson asked is the urban council supplied the boats on Derwentwater, and, if not, how did they make such an immense revenue?

Mr. Hope: The boats are put on the lake by permission of the council, and the owners of the boats pay an annual rent of 25s. per boat. The electric launches pay in proportion.

Mr. Wyand proposed a hearty vote of thanks to Mr. Hope for his excellent paper. He had been most commendably brief. It was usual on those occasions to give the number of paving stones in the streets and the gallons of tar used on the roads. Mr. Hope had spared them those details, and had yet given them a concise account of the town.

Mr. J. W. Pooley seconded, and said that what struck him most was that the debt on the town was nearly one half the rateable value. It seemed a lot of money. He complimented Mr. Hope on his brevity but he had made them feel that they would like to have heard a little more. In a place like Keswick, where the town was so alive to the sanitary needs, the water supply and sewerage scheme must be up to date.

The Chairman referred in complimentary terms to the brief but interesting description Mr. Hope had given them, and the vote of thanks was warmly carried.

The meeting was then adjourned to Saturday, August 10th, at Chester-le-Street.

VISIT TO THIRLMERE.

Outside the town hall large motor chars-a-banc, to seat twenty-four each, were in waiting, and the delegates were conveyed to Thirlmere. The day was dull but warm, but by the time Wythburn was reached the sun was shining brilliantly. The scenery all along the route was greatly admired, hill and lake being studies in pearl grey and pastel pink, illumined here and there with iridescent gleams of soft but radiant colour. Leaving Keswick by way of Chestnut Hill, the road lay through a district which has many literary memories. On the way we passed the house where Hall Caine lived; the cottage in the garden of which Shelley played hide and seek with his child wife; Windy Browe, where Calvert, the friend of Southey, Coleridge, and Wordsworth, lived. From the high ground, looking backward, we had magnificent views of Bassenthwaite and Derwentwater, and had the punishment which overtook Lot's wife been in force we should all have been turned into so many pillars of salt. The hedgerows through Naddle were a perpetual consolation. Where they were not made blue as the smoke of a peat fire by the clambering vetches, they were blushing pink under a festoon of wild roses. The light was so actinic that over towards St. John's the cushions of heather made a defined patch of colour, while the foxgloves reared their purple spikes from the bracken by the wayside. After passing the huge rock which Sir Walter Scott has invested with romance in his "Bridal of Triermain," we were soon running along the shores of Thirlmere, that lakeland urn from which Manchester enjoys the felicity of drawing its water supply.

The cars drew up at the entrance gates of the handsome castellated straining well, and here the party were welcomed by Alderman Smethurst, vice-chairman of the Water Committee of the Manchester Corporation; Mr. Benton, the manager of the waterworks; Mr. Sandham, assistant manager; and Mr G. Pattinson, the corporation's agent at Thirlmere. Here Mr. Benton took charge of the party, and explained the engineering features of the straining well. The well, which is practically the conning tower of the whole system, is 65 ft. deep and 37 ft. 6 in. in diameter. Every drop of water on its way to Manchester passes through this well. Everything was spotlessly clean, every piece of brass shining like so many mirrors. The huge hydraulic crane was swung out over the well for the benefit of the visitors, and many of them made the lengthy journey down the spiral stairway to the lower platform. The dam and valve house on the other side of the lake were inspected on the return journey, of which more anon.

The motors were next mounted and the party was taken on to Wythburn, where light refreshments were served at the Nag's Head Hotel. Then the journey was continued to the top of Dunmail Raise, where the party, under the guidance of Mr. W. Finch, the county surveyor for Cumberland, inspected the road made by the Cumberland County Council. This road and the roads made and maintained by the Manchester Corporation were much admired.

The return journey was made on the western shore of Thirlmere, under the scarred face of Raven Crag, which towers magnificently in one sheer precipice from the roadway. Mr. Sandham met the party at the dam and conducted them over the embankment and through the valve house. The level of the lake has been raised by means of this great embankment something like 35 ft., and it can be raised to its full extent of 50 ft. The embankment is 857 ft. long, 104 ft. high from the foundations, and has a width at the top of 18 ft. 6 in. We were then shown how the compensation water is discharged into St. John's Beck.

Briefly, a few facts about the Manchester supply may not be out of place here. The corporation has raised the area of the lake from 330 acres to 690 acres, and when raised to the full extent of 50 ft. it will have an area of 793 acres. The length of main from Thirlmere to Manchester is just over 95 miles. The storage, when all the works are completed, is estimated to provide 50 000,000 gallons per day for 160 days, even if no rain falls during that time, without drawing below the original level of the lake. The cost of the watershed and lake and the works has amounted to about £3,500,000. The third line of pipes is now being laid. When the five lines of pipes have been laid and the lake raised 50 ft., it is estimated that the cost will be about £5,000,000. The length of new roads constructed by the corporation is 8 miles 1,130 yds. Altogether, Thirlmere is a gigantic undertaking, and the visit could not fail to be profitable to so many municipal engineers.

VISIT TO QUARRY.

After leaving Thirlmere, the motors made a quick run to Bram Crag, where the huge quarry of the Threlkeld Granite Company is situated. Here we were met by Mr. Bragg, the courteous managing director of the company, who was accompanied by Mr. Barrow, the company's accountant, and Mr. H. Noon, quarry foreman. This quarry is one of the largest—if not the largest—in Great Britain, for the rock face is 150 ft. high and 750 ft. long, and very soon it will be a ¼ mile. Here the visitors were entertained to a novel sight, three shots having been laid for firing for their benefit. One of the drills would be about 12 ft., and the other two shorter. The first shot went off in about three minutes, the

second in two and a-half minutes, and the last in six minutes. The three shots dislodged something like 500 tons from the rock face.

The sheds where the granite setts are made were next visited, and many processes of interest to road engineers were seen.

Altogether, Mr. Bragg made the visit one of exceptional interest, especially to the representatives of municipal authorities, who were thus able to see in the making much of the material with which they have to deal.

On the return to Keswick, the party assembled at dinner at the Keswick Hotel.

ASPHALT-MACADAM.

By Cecil Nathan, A.I.E.E.

The intelligent use of any material in road construction depends to a great extent upon the knowledge possessed by the user regarding the characteristic properties of the material used. The more comprehensive his knowledge, the greater will be his assurance of success in any work of construction he may undertake. A certain amount of knowledge concerning the properties of materials may always be acquired by practical experience, and with some few types of materials, knowledge thus acquired, if properly applied, will prove sufficient to ensure satisfactory results.

The entire development of the modern macadam road is undoubtedly based upon sound scientific principles, and a number of very able and carefully trained minds played a most important part in this development. The work of such men as McAdam and Telford, as well as a number of their followers who developed and extended their theories, cannot be overvalued, but the principles which they taught were readily grasped by even the untrained mind, and were applied with comparative ease.

With the modern evolution of the ordinary macadam road to the bituminised form, the old situation has entirely changed, and while it is still possible for an engineer with little or no knowledge of the chemistry of road materials to construct a good road, his chances of doing so to-day are far less than they were in the old days of water-bound macadam roads, as the development of a new class of traffic has made it absolutely necessary to utilise some form of binder, other than rock dust, to hold the larger stone fragments forming the road crust in place, and so preserve the integrity of the road. For this purpose the bitumens as a class have given more promise of suitability than any other materials, and their utilisation during the past few years has developed to an enormous extent.

At the present time, however, many very able road engineers know bitumens only as black, more or less sticky substances which range from fluid to semi-solid consistencies. To some they are all tars, or all oils, or all asphalts, the meaning of these terms being at best very vague.

It is, of course, quite evident that the great majority of road engineers cannot also be chemists, nevertheless, they should have some knowledge of the origin, occurrence and production of various types of natural and artificial bitumens. They should have a comprehensive idea of the processes of refining these products, and the methods of manufacture by which they are converted into road materials. They would then not only be able to differentiate between coal tars, their distillates and residues, mixtures of tar with asphalt, petroleum residuums of paraffin, asphaltic or semi-asphaltic base, solid native bitumens, natural asphalts and asphaltic cements produced by refining and fluxing them, also rock asphalts or bituminous limestones, but also appreciate their great complexity in composition, which is accountable for their widely varying behaviour in practical use.

As the most useful test of any road material is the physical test, road engineers to-day naturally place most reliance in their observation of the behaviour of materials under practical trials, with the result that asphaltic cements produced by properly refining and fluxing natural asphalts, are to-day recognised as being absolutely the best known resilient, waterproof binders for macadam roads, because such materials are capable of withstanding all climatic conditions and of making each piece of stone adhere to its neighbour, thereby holding it up to its work, and at the same time able to resist any tendency towards ravelling or disintegration. When natural asphalt is used in the construction of roads on this principle, such roads are known as asphalt-macadam.

There are two methods of constructing asphalt-macadam road crusts: the first by placing broken stone or other similar aggregate from about 2½ to 4 in. deep (according to the nature of the traffic pertaining to the road in question) upon the sub-grade, and then applying the hot asphaltic cement by the so-called penetration method; and the second by which the warm, dry aggregate and hot binder are mixed in a suitable mixing machine before being placed on the road, this latter method being known as the mixing method.

Enough binder must be used in either method of construction to cover completely each particle of mineral aggregate and just to fill the voids, which naturally should be reduced to a minimum by the use of proper sizes of stone.

In both methods a moderately heavy, self-propelled tandem roller is used for thoroughly compacting the asphalt-macadam road crust into as homogeneous a mass as possible, after which a seal coating is usually applied. This seal coating is made by squegeeing a small quantity of asphaltic cement over the rough surface and sprinkling with about ¼-in. gauge stone chippings and re-rolling, the finished surface then having a mosaic appearance.

The penetration method is the simplest and cheapest, but there is no question that the results obtained by adopting the mixing method are far and away the most successful, as, unfortunately, in the penetration method the hot asphaltic cement, immediately it is poured upon the cold stone, becomes chilled and fails to penetrate as it is intended to do, with the result that, instead of the voids being entirely filled with asphalt, and as a consequence the stone being thoroughly coated on all sides, the asphaltic cement merely runs through the voids in small strings, which is of not the slightest use for holding the stone in place below that at the very top, hence attrition takes place below the top surface, and the roadway is therefore liable to quickly disintegrate under fast and heavy motor traffic.

As the solution of the modern road problem is not cheapness, but economical initial expenditure, the mixing method of constructing asphalt-macadam road crusts will in the future unquestionably be adopted by all road engineers after carefully considering both methods.

Machines are now available for mechanically mixing asphalt-macadam in their proper proportions. These machines vary from adapted batch concrete mixers to specially designed portable apparatus comprising, in some instances, driers and heaters for the aggregate, heating devices for the binder, combined with batch mixers, thus enabling the asphalt-macadam to be mixed and laid hot *in situ*. The development of new and improved machinery has undoubtedly been largely responsible for much of the progress recently made in bituminous road building, and while the importance of increased knowledge of materials should not be underestimated, it must be borne in mind that the efficient utilisation of new materials and their economical application have only been made commercially possible in many cases through the employment of suitable apparatus, thus not only cheapening operations, but also making possible work on a considerably larger scale than would be feasible without such equipment, hence it is that the road engineer, the contractor who builds the road, as well as the manufacturer of the road building equipment, all have a certain part to play in the development of the art, as the building of roads that will meet the demands of modern traffic conditions cannot be accomplished entirely by the efforts of any one individual or any one class, but needs co-operation among those who are engaged in the work.

River Pollution: Damages against Town Council. Mr. Justice Phillimore, at Oxfordshire Assizes, on Friday, granted an injunction restraining the Banbury Corporation from allowing sewage to overflow into the river Cherwell, and the plaintiffs, Mr. Stephen Spokes and Mr. John Frederick Spokes, of Twyford Mill, were awarded £2,250 damages.

Civic Government by Commission.—The commission form of local government is being given its first trial in Canada in St. John, N.B. Under the new arrangement the mayor, Mr. James H. Frank, will be head of the Finance Department, and each of the four commissioners will rule over another civic department. Two of the commissioners will serve for four years, the other two and the mayor for two years.

Methods for Differentiating Soils for Sewage Purification.*

By GILBERT J. FOWLER, D.SC., F.I.C., and WILLIAM CLIFFORD, ASSOC.M.INST.C.E.

The suitability of a soil for the purification of sewage is well known to be conditioned by numerous factors, physical, chemical and biological. Whether any one or more of the physical properties will serve as a measure of the suitability for sewage purification is a matter for observation and experiment. Messrs. McGowan and Finlow† have examined by mechanical analysis the soils and subsoils from eight sewage farms, and found that the rate of filtration seemed to be roughly proportional to the number of particles per gramme of the soil.

It is admitted, however, that complete mechanical analysis is a long and tedious process. An instrument devised by Dr. E. H. Hankin, and modified by one of us, for the purpose of rapidly differentiating the light sandy soils of the United Provinces and other parts of India for the treatment of sullage and waste matter, promised to be of service on English soil; this led to further observations and experiments, the main object of which was to see whether a simple mechanical test, not necessarily mechanical analysis, would afford sufficient data to allow of an approximate calculation being made of the amount of sewage which a given soil and subsoil would filter under the usual methods of broad irrigation.

The subject will be considered under the following heads:—

(1) Porosity, as determined by variable pressure porosimeter.
(2) Porosity, as determined by constant pressure porosimeter.
(3) Percolation experiments.
(4) Mechanical analysis.
(5) Volume contraction of soils.
(6) Water content of soils.
(7) Test for sewage-sick land.

VARIABLE PRESSURE POROSIMETER.

The instrument with which the following observations were made was, as above stated, devised by Dr. E. H. Hankin, and somewhat modified by one of us. An apparatus very similar in principle was used by Prof. King during his earlier investigations‡ on the flow of air through porous media.

The apparatus consists of (1) a strong galvanised iron cylinder (air reservoir) of approximately 5 gallons capacity, provided with a Bourdon pressure gauge reading from 0 to 15 lb.; (2) an air compression pump (really a stand bicycle pump), by means of which the air reservoir is charged; (3) a galvanised iron cylinder (medium container), 17 in. long and 11 in. diameter, open at the one end, but closed at the other by a conical-shaped cap to the apex of which the heavy blows necessary to drive the cylinder into the medium (sand or soil) are applied. A water tank and a specially constructed loose cylinder end having a rubber-lined groove are provided for investigations dealing with the effect of various liquids on the enclosed medium and for problems relating to the gaseous contents of sands and soils.

Method of Use. The experimental cylinder is driven by means of a mallet into the sand or soil the flow through which is to be measured. The air reservoir filled with compressed air (15 lb. pressure) is then connected to the earth-driven cylinder by means of a short piece of pressure tubing provided with brass unions. The cock to the air reservoir is now opened; the air expands freely into the conical end of the earth-driven vessel, and the pressure falls at once to about 10 lb. The pressure continues to fall, rapidly at first and then more slowly. The more porous the medium, the more rapid the fall of pressure.

The time taken for the pressure to fall to 1 lb. is noted. This is called the total time.

By noting the pressure each second of the time for the fall of each 1 lb. pressure, a pressure-time curve can be plotted, from which the centroid vertical§ can be calculated. This gives the mean time.

* Paper read at the Annual Summer Meeting of the Association of Managers of Sewage Disposal Works at Wolverhampton, reported in THE SURVEYOR of July 12th.
† Fourth Report Royal Commission. Vol. iv., Part II., p. 275.
‡ Geological Survey NIX, Annual Report U.S.A.
§ The centroid vertical may be considered as the Y ordinate through the centre of gravity of the area of the curve considered as a uniform lamina.

Experiments.—Several observations were made on a stiff soil in the garden of the Public Health Laboratory, York-place, Manchester, and on a loose garden soil at Urmston; the results indicated a relationship between the amount of the finest particles of a soil and the time of passage of the given volume of air. It was evident that to test the instrument satisfactorily it was necessary to try it on a number of soils *in situ* whose history was at least approximately known. The Wolverhampton sewage farm afforded such an opportunity, and a number of trials were made there, of which the following is a description:—

(1) Field No. 43. (*a*) The instrument was first tried in a sand pit. The loose sand was cleared away and the cylinder driven into the compact sand which lay in its natural bedding. Four observations were made. The total time in each case for the pressure to fall to 1 lb. was 23 seconds. (*b*) The sandy loam (recently ploughed) a few yards from the sandpit required only 5 seconds for the pressure to fall to 1 lb.—three observations gave the same result. (*c*) A further trial was made on a portion of the field which was being dosed

FIG. 1.—POROSIMETER.

with sewage at the time. The first attempt was negative, as the compressed air lifted the cylinder out of the soil. During the second attempt the cylinder was held down. The fall of pressure below 10 lb. was slow and could be easily followed. The air appeared to be displacing water from the soil, which was obviously saturated. The total time was 100 seconds.

(2) Field No. 44. (*a*) Sandy clay soil. Two observations gave total time 42 seconds each. (*b*) Peaty soil. Total time 12 seconds.

(3) Field No. 36. (*a*) Clayey loam soil. Total time 28 seconds. (*b*) 30 ft. from previous position. Total time 18 seconds.

(4) Field No. 32. Peaty soil. Total time 10 seconds.

(5) Field No. 12. Gravelly sand. Total time 6 seconds. The most porous and free filtering soils on the farm. Total time 8 seconds.

The following table [illegible] the foregoing [illegible]

EXPERIMENTS WITH VARIABLE PRESSURE POROSIMETER.

Date of experiment.	No. of field.	Nature of soil.	Total time for pressure to fall to 1 lb. (seconds).	Mean average time corresponding to centroid vertical of curve of fall of pressure (seconds).
Dec. 21, 1910	43	Sand.	23	9·61
" " "	43	Sandy loam.	5	1·75
" " "	43	"	100	2·10 water logged.
Jan. 17, 1911	44	Sandy clay.	42	10·71
" " "	44	Peaty soil.	12	1·56
Jan. 28, 1911	36	Clayey loam.	28	7·75
" " "	36	"	18	1·93
" " "	32	Peaty loam.	10	2·52
Feb. 5, 1911	12	Sandy gravel.	8	2·08

Remarks.—Omitting the results from the waterlogged soil (field No. 43) as obviously exceptional and not

comparable with the others, the total times vary from 5 seconds (sandy loam) to 41 seconds (clayey loam). The corresponding mean times vary from 1·75 second to 10·71 seconds. The increase in the time generally follows or rather accompanies an increase in the silt and clay content of the soil (see mechanical analysis), but there are evidently other factors to be taken into account. For example, the sandy clay in field No. 44 was apparently a less porous soil than the clayey loam in field No. 36, yet the latter had quite 10 per cent more silt and clay than the former. The explanation no doubt lay in the history of the two soils. Field No. 36 had been recently ploughed and worked up (five months previously), while field No. 45 had not been ploughed for eight or ten years.

CONSTANT PRESSURE POROSIMETER.

It was thought that the violent blows necessary to drive the cylinder of the variable pressure porosimeter into the soil would disturb its natural lie and so vitiate the results; further that the pressure was sufficient to produce eddies in the air passing through the capillary passages of the soil.

A modification of an apparatus used by Prof. King for measuring the effective size of soil particles was therefore devised. The apparatus consists essentially of an aspirator provided with a water-pressure gauge and a detachable soil-containing cylinder. The cylinder, which is turned out of 2½-in. tubing, is screwed at the one end, and has a sharp cutting edge

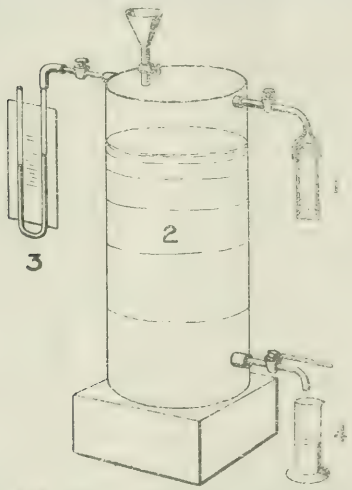


FIG. 2.—CONSTANT PRESSURE POROSIMETER.
1—Soil cylinder, 2—Aspirator; 3—Pressure gauge; 4—Measuring vessel

at the other. The screwed end is protected by a perforated cap when obtaining a sample of soil.

Method of Use.—The detachable cylinder with its perforated cap is used for obtaining a sample of soil much in the same way as a cork-borer is used for making a hole in a cork, except that in hard or stony soil a hammer may be used to assist in driving in the cylinder. On withdrawing the cylinder a core of soil remains within.

The cylinder, after removal of the cap, is screwed to the aspirator, care being taken to secure an air-tight joint. The flow of water from the aspirator reduces the pressure within the vessel, and air flows in through the soil contained in the cylinder. The difference of pressure, which is easily controlled by the water tap, is measured by a water gauge in the form of a U tube open to atmospheric pressure. On opening the water tap, which allows water to flow from the aspirator, the pressure (difference pressure between atmospheric and aspirator) increases until the flow of air through the soil balances the flow of water from the aspirator. When the pressure is constant the flow of water from the aspirator measures the flow of air through the soil. Generally the time for the flow of 3·000 c.c. of air through the soil at various pressures was noted. The pressures ranged from 1·0 c.m. to as much as 25·0 c.m.

The following test was made with two grades of clean, dry sand. One grade passed a 30-mesh sieve and was caught on a 60-mesh; the other passed 60-mesh and was caught on a 90-mesh sieve. The bottom of the cylinder was covered with fine copper gauze, the sand filled in a small quantity at a time and tamped lightly. First the 30-60 sand was used, then diluted successively with 9·1 per cent, 22·9 per cent, 32·5 per cent, and 41·1 per cent of the 60-90 sand. The time for the passage of 3 000 c.c. of air at a pressure of 3·17 c.m. was noted with the following result:—

	Sand.	Pressure.	Time (seconds) for 3,000 c.c. of air to pass.
		c.m.	
I.	100 per cent 30-60	3·17	61·5
II.	90·9 per cent 30-60 9·1 per cent 60-90	3·17	105·0
III.	77·1 per cent 30-60 22·0 per cent 60-90	3·17	146·0
IV.	67·5 per cent 30-60 32·5 per cent 60-90	3·17	174·0
V.	58·9 per cent 30-60 41·1 per cent 60-90	3·17	216·0

It will be seen that the increase of time is fairly proportional to the increase of the finer graded sand.

Three graded sands were tested separately, with the result given below:—

Grade of sand.	Pressure.	Time for 3,000 c.c. of air to pass through.
	c.m.	
20-30	3·0	27 seconds.
30-60	3·0	80 ,,
60-90	3·0	288 ,,

The results indicate that for clean, packed sand the time for the passage of a known volume of air gave a measure of the size of the particles. These results are in general agreement with those obtained by Prof. King.

The following results were obtained from samples of soil obtained in several fields, the numbers of which are given in the second column. The time of flow in seconds for 3,000 c.c. of air to pass through the cylinder of soil is given for three different pressures, although in many cases the flow at eight and ten different pressures was recorded, the range of pressure varying from 1·0 c.m. to 20·0 or 25·0 c.m. of water.

TABLE SHOWING TIME OF FLOW IN SECONDS FOR 3,000 C.C. OF AIR TO PASS THROUGH CYLINDER OF SOIL AT THREE DIFFERENT PRESSURES.

Date.	No. of field.	Nature of soil.	Time in seconds. Pressure. 20·0 c.m.	10·0 c.m.	7·0 c.m.
1911.					
May 10	12	Gravelly	780	510	336
May 15	36	Sandy clay	1,170	870	630
May 19	36	,,	1,170	870	630
May 25	32	Peaty	810	510	306
June 1	44	Sandy clayey	360	174	132
Oct. 26	44	Peaty	312	177	114
Oct. 27	44	,,	213	132	102
Oct. 31	44	,,	372	282	216
Nov. 1	32	,,	325	204	152
Nov. 7	12	Gravelly	126	79	58
Nov. 15	12	,,	169	109	53
Nov. 24	12	,,	228	148	74
Nov. 24	12	,,	288	198	135
Nov. 29	44	Peaty	600	390	294
Nov. 29	44	,,	342	222	168
Dec. 1	34	Sandy clay	575	360	275
Dec. 1	34	,,	116	74	57
Dec. 17	16	Sandy loam	186	119	91
Dec. 17	16	,,	120	75	57
Dec. 19	36	Sandy clay	300	186	154
Dec. 19	36	,,	142	84	64
May 10	12	Gravelly	780	510	336
Nov. 7	12	,,	126	79	58
Nov. 15	12	,,	169	69	53
Nov. 24	12	,,	228	148	74
Nov. 24	12	,,	288	198	135
Dec. 6	3	Sandy loam	240	116	113
Dec. 6	3	,,	126	82	62
Dec. 17	16	,,	186	119	91
Dec. 17	16	,,	120	75	57
Mar. 8	44	Peaty	2,250	1,600	1,100
May 23	32	,,	810	510	396
Oct. 26	44	,,	312	177	144
Oct. 27	44	,,	213	132	102
Oct. 31	44	,,	372	282	216
Nov. 11	32	,,	325	204	152
Nov. 29	44	,,	600	390	294
Nov. 29	44	,,	342	222	168
Mar. 7	44	Clayey	810	561	440
June 1	44	,,	360	174	132
May 15	36	Sandy clay	1,170	870	630
May 19	36	,,	1,170	870	630
Dec. 1	34	,,	575	360	275
Dec. 1	34	,,	116	74	57
Dec. 19	36	,,	300	186	154
Dec. 19	36	,,	142	84	64

Remark.—The samples were taken generally midway between the grip (distributing gutter) and the

drain. Where two samples were taken from the same field on the same day, they were taken about 3 ft. from one another. It was noticed that the sampling cylinder was more difficult to drive into the soil during the dry weather of May than during the moister period of November and December. While the cylinder was always driven into the soil 12 in., the sample in the cylinder was often much less, owing to compression. Peaty soil adhered very tenaciously to the cylinder, and suffered most compression. Moist, sandy clay (No. 34) adhered very little to the metal and showed only slight compression. The apparent porousness of one of the sandy clays may possibly be due to air leaking by, between the soil and the cylinder, owing to the want of adhesion. The results obtained during the dry weather in May are higher than those obtained later in the year, and seem to point to the soil being less porous when comparatively dry than when moist. Further observations are required before a definite statement on this point could be made. The filling of the cylinder with sand by hand, and the taking of a sample of soil in the field, are two widely different operations. The contact made between the metal and the soil varies with different soils, and with the same soil with different water contents. *e.g.*, peaty soil was loose and porous in dry weather (summer), while in the wetter seasons it was almost as impervious as clayey soil. Clayey soils, on the other hand, were hard and impervious (to air) when dry, as in summer, but appeared more porous when wet; this, however, may be due to air passing between the cylinder and the soil, as clayey soil adheres but little to the metal.

PERCOLATION EXPERIMENTS.

Where the soil is fairly uniform and the ground water level is not too near the surface, it would seem that the relative porosity of the soils might be directly determined by noting the rate of flow of water from vertical holes or miniature wells into the surrounding soil.

One of the two methods used by Mr. L. F. Richardson* for determining the porosity of peat is an application of the same idea to known boundary conditions.

The measurements summarised below were obtained from two sizes of cylindrical holes, both 12 in. deep, one 2¾ in. diameter, the other ⅜ in. diameter.

Method of Observation.—A wood ring on which the neck of an inverted bottle would rest was placed over the larger hole, into which water was poured to near surface level and allowed to percolate some time before beginning the measurement. The level of the water in the hole was then brought to within 2 in. of the surface, and a bottle of known capacity filled with water was inverted over the hole. The mouth of the bottle touched the water and formed a water seal for a moment. A slight lowering of the water level in the hole admitted air to the bottle, and so maintained a fairly constant level of water in the hole. The time taken to empty the bottle was noted. A small glass funnel was fitted into the smaller holes, and the bottle inverted on the funnel. In this case the water level was maintained slightly (from 1 in. to 1½ in.) above the surface of the soil.

Rate of Percolation from Holes in the Soil 12 Inches Deep and 2¾ inch and ⅜ inch Diameter Respectively.

Date.	Field.	2¾ inch.	⅜ inch.
Nov. 15, 1911	12 Gravelly sand	153 c.c. per min.	85·4 c.c. per min.
" "	12 "	99·1 "	21·2 "
" "	12 "	——	13·4 "
Nov. 29 "	44 Peaty	26·5 c.c. per min.	·34 "
" "	44 "	37·8 "	·04 "
Dec. 1 "	34 Clayey	143·0 "	2·7 "
" "	34 "	74·0 "	7·0 "
" "	*34 "	18·2 "	——
Dec. 6 "	3 Sandy loam	72·0 "	11·4 c.c. per min.
" "	3 "	36·0 "	20·1 "
" "	3 "	——	86·3 "
" "	3 "	——	18·9 "
Dec. 17 "	16 Sandy loam	112·0 c.c. per min.	20·0 "
" "	16 "	133·5 "	22·5 "
Dec. 19 "	26 Sandy clay	20·1 "	1·7 "
" "	26 "	19·8 "	1·2 "
" "	26 "	102·0 "	——

*Hole 6 in. deep only.

Remarks.—Considerable variation occurs in the same field, in the rate of flow from both holes—*e.g.*, the two large holes in No. 12 gave 153·0 c.c. and 99·1 c.c. per minute, while the three small holes gave 85·4 c.c., 21·2 c.c. and 13·4 c.c. per minute respectively. Again, in No. 3, four small holes gave 41·4 c.c., 20·1 c.c. 86·3 c.c. and 18·9 c.c. per minute respectively, yet when averages are taken the freer filtering soils stand out from the stiffer and slower filtering soils. The high result (145·6 c.c. per minute) obtained from one of the larger holes in No. 34 is probably explained by the fact that the cylinder had passed through the overlying clayey loam into a sandy subsoil at that point. The rate of flow from the smaller hole was, as was to be expected, less than from the large hole.

* "Proceedings," Royal Dublin Society, Vol. XI., N.S., No. 27.

MECHANICAL ANALYSIS.

When it was proposed to examine the soils by mechanical analysis, the main idea was to see whether there was any relation between the quantity of the finer constituents of the soil and the results obtained by the various methods of examining the porousness of the soils, meaning, by the "finer constituents," all that would pass a 90-mesh wire sieve. The choice of 90-mesh was quite arbitrary. It would have been much more satisfactory if a definite-sized mesh—say 1 mm., had been chosen. Six sieves were used at first, having 10, 20, 30, 40, 60 and 90 mesh per inch respectively, but three (10, 20 and 40) were soon discarded as introducing unnecessary grading.

The following table shows the diameter of the wire and the length of the side of the mesh in terms of inches and of millimetres.

Mesh per linear inch.	Diameter of wire.	Length of side of mesh inch.	Length of side of mesh mm.
10	·0148	·0852	2·172
20	·0140	·0460	1·016
30	·0076	·0257	·655
40	·0064	·0186	·474
60	·0056	·0111	·282
90	·0044	·0067	·170

Sample.—The sample was taken from the cylinder of soil used for the constant pressure porosimeter, and included the upper 12 in. of soil; generally the lower 3 in. or 4 in. would be classed as subsoil. The larger stones were picked out and weighed separately, a proportionate part being allocated to the sample, which varied from 40 to 100 grammes.

Method of Analysis.—The fresh soil, which was weighed in a porcelain dish, was covered with water and triturated with a glass rod, having the end protected by a piece of rubber tubing. The muddy liquid was then poured on to the nest of sieves (30, 60 and 90 mesh) which had been previously wetted and which rested on a shallow dish. A piece of rubber tubing attached to the service tap provided means for a fine jet of water; this was directed into the porcelain basin and eventually washed the soil on to the coarsest sieve. The washing was then continued on the sieve, the protected glass rod being used to separate and break down the aggregates. When the particles remaining on the larger sieve were clean, that sieve was removed and the process continued on the next sieve, and so on to the 90-mesh sieve. The whole of the waste water (3 or 4 litres) and the fine sand which passed the 90-sieve was collected into a tall beaker and allowed to stand twenty-four hours. The opalescent liquid was then syphoned off and the sediment (fine sand, silt and clay) dried and weighed. Several determinations were made of the amount of

Table Showing Mechanical Analysis of Various Soils. Upper 12 Inches.

No. of Field.	Nature of soil.	Over ·05 mm.	Maximum size of particles. Average ·17 mm.	Maximum size of particles. Average ·22 mm.	All particles less than ·17 mm.
12	Gravelly sand	29·1 per cent	26·1 per cent	21·3 per cent	70·1 per cent
12	" "	38·1 "	18·3 "	27·0 "	70·1 "
12	" "	24·7 "	27·8 "	22·1 "	25·3 "
12	" "	12·5 "	24·5 "	50·0 "	33·0 "
12	" "	17·9 "	22·1 "	28·3 "	32·6 "
16	Sandy loam	11·8 "	31·1 "	22·7 "	34·4 "
16	" "	9·9 "	36·9 "	31·3 "	31·9 "
3	" "	6·7 "	14·5 "	20·8 "	49·1 "
3	" "	8·5 "	13·7 "	25·2 "	42·6 "
26	Clayey loam	13·5 "	12·5 "	20·6 "	53·4 "
26	" "	6·0 "	19·6 "	22·4 "	52·0 "
26	" "	13·1 "	13·2 "	20·9 "	50·8 "
34	" "	7·9 "	14·0 "	24·6 "	53·5 "
34	" "	5·0 "	11·7 "	14·7 "	57·8 "
34	" "	9·8 "	11·8 "	23·3 "	55·0 "
32	Peaty loam	10·0 "	16·9 "	20·8 "	51·4 "
10	" "	22·6 "	10·3 "	10·3 "	56·8 "
14	" "	18·5 "	12·1 "	11·6 "	57·8 "
13	" "	1·2 "	9·7 "	15·0 "	71·1 "
14	" "	2·3 "	9·6 "	10·7 "	71·4 "

matter that would settle from the opalescent liquid after six days. The amount varied from 1 to 3 grammes. No correction, however, was made to the figures for silt and clay. The washed gravel and sand on the sieves were dried, and before weighing the sieve was shaken over a clean dish. That which passed through was transferred to the next sieve. The amount passing the 90-sieve dry was added to the "silt and clay."

Remarks.—In the foregoing table the fields are placed in the order of the silt and clay content.* This order agrees well with the observed filtering capacity; the lower the silt and clay content the greater the filtering capacity. The peaty soils, however, are somewhat exceptional; they have a higher percentage of matter that passes a 90-mesh sieve than the clayey soils, but are on the whole more free filtering. During dry weather peaty soil is more freely fissured, thus affording easy lines of drainage.

VOLUME CONTRACTION.

The cracks observed in soils have often been commented on, but their significance in relation to the purification of sewage does not appear to have received that attention which they deserve. The amount of contraction on drying, and the conditions which favour or retard drying are matters which have a practical bearing on the land filtration of sewage.

Messrs. Cameron and Gallaghert give a useful summary of the previous work on the physical condition of soils, and describe two new methods for determining the expansion and contraction of soils. In both methods the measurements are made at intervals as the column of soil under observation dries. It occurred to one of us to magnify the contraction of the soil by a long lever and to record the motion of the lever continuously.

Method of Observation. A sample of soil was obtained by means of a thin walled brass tube 1·2 in. diameter, having a sharp cutting edge, used in the same way as a cork-borer, the upper 2 in. of soil having been previously removed. The core or cylinder of soil, which was 2½ in. to 3 in. long, was trimmed down to 2 in., and weighed in a small aluminium dish. Weighings were also made every twenty-four hours and the loss of moisture noted. A light flat-headed brass pin, with the point upward, rested on the column of soil. A carefully balanced wood lever rested on the pin point. The end of the lever, which was provided with a parchment point, recorded the contraction continuously on the smoked paper of a clock-driven drum. From the linear decrease of the column the percentage volume contraction was calculated by the formula

$$D = l - (l - x)^3$$

where x represents the unit linear change.

The subjoined table gives a summary of the results obtained with four soils:—

Volume Contraction Experiments. Summary of Results.

Time.	Percentage Volume contraction. Field No. 12. Gravelly sand.	Field No. 3. Sandy loam.	Field No. 44. Clayey loam.	Field No. 44. Peaty loam	Percentage decrease of moisture content. No. 12.	No. 3.	No. 44.	No. 44.
24 hrs.	1·67	2·99	·56	9·06	3·67	5·32	3·25	10·43
48 ,,	1·96	4·12	·80	18·88	7·09	7·69	9·11	19·56
72 ,,	2·29	5·31	0·75	24·96	8·93	11·97	11·91	29·34
96 ,,	2·66	6·14	2·16	29·69	9·87	14·36	13·66	35·87
120 ,,	2·99	6·75	3·01	33·64	10·52	17·17	15·24	38·11
144 ,,		7·16	3·72	37·70	—	18·50	16·81	39·99
168 ,,		7·5	4·25	39·15		20·19	18·91	41·19
192 ,,			4·6	40·15			20·31	42·04
Total moisture content, determined by drying at 100°c. ...					12·53	23·86	20·12	49·99

Remarks. Apart from any question as to the correctness of the estimate of contraction the figures afford practical value in the light they throw on contraction during the first forty-eight hours—i.e., in the variations of volume which lie within the range of the moisture content of the soil. Taking the average quantities of the moisture content of soils from fields numbered 12, 3, 44 (gravel and sand) and 44 (peaty) as 7 per cent, 10 per cent, 6 per cent, and 10 per cent respectively, the corresponding decrease of volume is about 1·9 per cent, 5·0 per cent, 3·0 per cent, and 9·5 per cent respectively. In other words, the peaty soil decreased in volume nearly twice as much as the clayey soil and the sand loam, and five times as much as the sandy gravel. The large volume contraction of peaty soils in dry weather resulting in innumerable fissures explains to a certain extent the ease with which liquid passes from the surface into the drains, the high silt and clay content notwithstanding.

MOISTURE CONTENT OF SOILS.

Two sets of determinations of the moisture content were made—one on mixtures of the upper 12 in. of soil, the other on the upper 3 to 5 in. of soil. The determinations on the upper 3 to 5 in. were continued

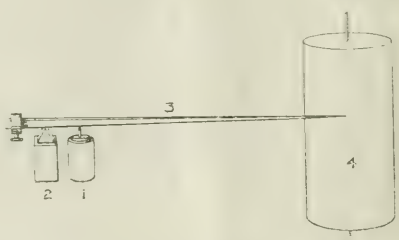


Fig. 3.—Arrangement for Recording Contraction.
1—Core of soil; 2—Fulcrum. 3—Lever; 4—Recording drum.

over several months, each determination being made on a mixture of from five to ten samples taken at different parts of the field, and as near as possible midway between the grips (distributing gutters) and the drains.

The first table gives the results for the 12-in. samples. The second summarises the results of 75 determinations, during January, February, March, April, June, October (the latter two months were unusually dry.).

Moisture Contents of Soils:
Average samples from the upper 12 inches.

Date.	No. of field.	Nature of soil.	Percentage of weight.
			Per cent.
October 25, 1911	40	Peaty	54·1
,, 26 ,,	14	,,	48·2
,, 27 ,,	14	,,	44·8
,, 31 ,,	14	,,	55·5
November 1 ,, ...	42	,,	—
,, 29 ,,	14	,,	50·7
,, 29 ,,	14	,,	47·5
December 6 ,, .	3	Sandy loam	21·4
,, 6 ,, ...	3	,,	21·2
,, 19 ,,	36	Clayey loam	18·6
,, 19 ,, ...	36	,,	23·7
,, 1 ,, ...	34	,,	18·3
,, 1 ,,	34	,,	17·7
,, 17 ,, .	16	Sandy loam	19·5
,, 17 ,, .	16	,,	15·6
,, 24 ,,	12	Gravelly sandy	11·1
,, 24 ,,	12	,,	13·5

Seasonal Variation of Moisture Content.

	31 per cent to 41 per cent	21 per cent to 31 per cent	11 per cent to 21 per cent	1 per cent to 11 per cent
Peaty soils	1	10	14	1
Clayey soils	0	1	6	0
Sandy loam	0	2	10	3
Gravelly sand	0	0	7	5

A METHOD FOR ESTIMATING THE CHARACTER OF ORGANIC MATTER PRESENT IN SOILS.

In the first place a determination of the moisture content (loss on drying) is made. A quantity of the air-dried soil equal to 5 grammes of dried substance is mixed with sufficient water to form a 90 per cent sludge (10 per cent solid, 90 per cent liquid). This is then diluted to 500 c.c. in a large cylinder, and well stirred. After two hours' settlement, a clarification test* is made on the settled liquid. As a further check it is of interest to determine the loss on ignition of the sediment formed after two hours' standing of the diluted liquor. The quantities to be used for the oxygen absorption test are dependent to some extent on the character of the soil.

A sufficient number of observations have not yet been made to say with certainty how far this method is of value, but the following results will indicate

* The silt and clay content includes very fine sand and nearly corresponds to the three particle-sizes, fine sand, silt and clay—given by Messrs. Hall & Russell and Messrs. Cameron & Gallagher.

† Bureau of Soils, U.S. Department of Agriculture. Bulletin No. 60

* Journal Society Chemical Industry, 1908, Vol. xxvii., p. 205.

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
A Dangerous Turning and an Important Improvement	94
Appointments Vacant	123
Asphalt Macadam	95, 108
Assistants' and Students' Section	116
A Thin Carpet Layer of Bitumen and Sand	94
Dangerous Tramway Poles	95
Design of Masonry Dams	93, 100
Dust Prevention in France	122
Geology of Cheltenham, with Special Reference to the Water Supply	121
Institution of Municipal and County Engineers:	
Annual Meeting	94, 96
Annual Dinner	104
Notices	123
Institution of Municipal Engineers:	
Meeting at Keswick	106
Notices	123
Institution of Water Engineers:	
Summer General Meeting at Cheltenham	121
Keswick and its Municipal Undertakings	106
Local Government Board Inquiries	117
Meetings	127
Methods of Differentiating Soils for Sewage Purification	93, 109
Municipal Competitions Open	124
Municipal Contracts Open	124
Municipal Engineering Work at Newcastle-on-Tyne	95, 113
Municipal Work in Progress and Projected	118
Notes on Birmingham	114
Personal	119
Recent Publications	122
Royal Sanitary Institute	123
Tenders for Municipal Works or Supplies	126
Waste of Water	95, 121

what may be expected. The figures represent the oxygen absorbed from permanganate $\left(\frac{N}{80}\right)$ in four hours (parts per 100,000 of the soil extract).

—	By colloidal matter.	By soluble matter.
Wet sludge	12·08	2·24
Sandy loam not treated with sewage	1·28	0·04
Sandy loam not treated with sewage	1·30	0·10
Soil heavily treated with sewage, after 7 days' rest	8·69	0·34
Soil heavily treated with sewage, after 1 month's rest	2·06	0·32
Clayey soil, normally irrigated. Field No. 34	1·50	0·06
Peaty soil, normally irrigated. Field No. 40	8·68	1·06
Peaty soil, normally irrigated. Field No. 44	6·31	0·56
Peaty soil, not irrigated. Field No. 15A	6·72	0·06
Sandy clay, normally irrigated. Field No. 41	6·38	0·16
Clayey. Field No. 36	1·30	0·22

CONCLUSION.

The foregoing results, although limited in number and dealing only with a few kinds of soils, indicate that soils can be differentiated as to filtering capacity by various mechanical tests. Further investigation is required, and physical data accumulated about soils of known capacity for filtering and purifying sewage. Generally speaking, the relative porosity of sandy soils can be measured by some form of instrument for passing a known volume of air through an isolated portion of soil. Direct percolation with water may be useful where other means are not available. The simple form of mechanical analysis above described would appear to be sufficient for all practical purposes. The finest mesh sieve (90) was chosen quite arbitrarily, and was more a matter of convenience. It might be available to take a 100-mesh sieve as a standard for future work. The anomalous results obtained from peaty soils show that caution will need to be exercised in interpreting results. The peaty soils, judged by the porosimeters, by direct percolation and by mechanical analysis, are less porous than the clayey soils, yet practical experience indicates that they are not less capable of dealing with sewage, especially during dry weather. The explanation probably lies in the larger volume contraction, which takes place on drying. Innumerable fissures are formed, thus providing easy passages for the liquid.

Hence, although the porosity of a soil depends largely on the proportion of the finer particles present, the influence of moisture and colloidal matters as affecting the texture of the soil require to be taken into account. The method of working the soil and of irrigating the same have an enormous influence on the filtering capacity; indeed, by indiscriminate flooding, a fairly open soil may be so compacted as to render it almost impervious. With the loose porous soils of Central India the native method of intermittent irrigation of small plots has much to recommend it. In this country, with less evaporation, moving spray jets may usefully be employed with very porous soils.

MUNICIPAL ENGINEERING WORK AT NEWCASTLE-UPON-TYNE.

CITY ENGINEER'S REPORT.

In reporting upon the works executed by his department during the year ended March 31st last, Mr. W. J. Steele, city engineer and town surveyor of Newcastle-on-Tyne, quotes the following statistics: Area of city, 8,452 acres; population (estimated), 269,193; rateable value, £1,649,497; inhabited houses (each flat being counted as one house), 50,294; highways, 250 miles; bridges maintained by corporation, 27; sewers, 275 miles; parks and open spaces (inclusive of Town Moor), 1,400 acres; tramways (in single track), 54½ miles; quays, 6,380 lin. ft.; quayside railways and sidings (in single track), 2½ miles; transit sheds (area of floor space), 175,275 sq. ft.

The estimated increase in the population is 2,522, and the density over the whole area of the city is 31·84 per acre. If the public open spaces are deducted, the density is 38·17 per acre, and varies from 2·47 in the parish of Fenham to 123·24 in the parish of Westgate. Under the provisions of the Housing and Town Planning Act, 1909 (says Mr. Steele), the density will probably not exceed 80 persons to the acre in any area where the Act is applied. All other things being equal, it has been established that the density of the population has considerable influence on the health of a community; consequently it is of importance that full advantage should be taken of any means by which the density can be kept at a reasonable figure.

BACK STREETS.

In considering this subject it is questionable whether the provision of back streets is always necessary in developing land for building purposes. The land required for back streets would be put to much better use if it formed part of the open space at the rear of the buildings. Where semi-detached houses are erected, ample space can be provided at the flanks of the houses for the drains, water and lighting services, the delivery of coal, and the removal of refuse. These requirements can be provided for in terrace houses, if the number of houses in any terrace is limited to about eight, by means of a passage about 6 ft. in width being made between the terraces and continued at the back of the houses. In their present form the cost of constructing back streets is a considerable charge upon the property owner, and their future maintenance, cleansing, lighting and watching a heavy charge upon the rates.

The number of dwellings erected during the year (each flat being counted as a separate dwelling) has been 251, or 59 less than in the previous year, and the lowest number recorded since 1882. It is about 220 short of the number required to meet the estimated increase in the population. The estimated number of empty dwellings in the city is 500, and at the present rate of building this number should be rapidly reduced. The estimated cost of new buildings for which plans have been approved by the committee during the year is £341,351, compared with £391,271 for the year 1911, and £476,200 for the year 1910.

TOWN PLANNING SCHEME.

The Local Government Board have sanctioned the preparation of a scheme under the Housing and Town Planning Act, 1909, for the Crag Hall Dene area. The area extends beyond the boundaries of the city into the district of the Urban District Council of Gosforth and negotiations are in progress with that council with regard to the next procedure under the Act. A scheme for the eastern portion of the city, embracing an area of 1,540 acres, is being considered by the committee.

PRIVATE STREETS.

The number of streets in which work was executed under the Private Improvement Acts was 51, but in several cases only a very small amount of work was done. The policy, so far as conditions permit, of only carrying out such work in any street as building de-

velopment demands, delays the declaration of such street as "a highway repairable by the inhabitants at large," and gives it an unfinished appearance, but the principle, in the opinion of the city engineer, is undoubtedly just to the frontagers.

A large number of the old streets were resurfaced with tar-macadam, the total area laid being 20,702 sq. yds., representing in length about 1¾ miles.

THE CITY'S HIGHWAYS.

The approximate total length of the highways now maintained by the corporation is 250 miles, of which about 75 miles are back streets. The cost of maintenance only for the year, after reducing the mileage of back streets so as to be equal in width to front streets, is £108 per mile. From a recently compiled statement of the cost of maintaining highways in several towns in the country, the average cost per mile is about £138; therefore, Mr. Steele points out, the total cost of maintenance in the city is £6,000 lower than what it would be if the average of other towns was reached. Persistent requests are made for the resurfacing of chip-paved streets with tar-macadam, and the committee set aside a sum each year for this purpose, but, owing to the limited funds at the disposal of the committee, many years must elapse before the numerous requests can be complied with; for the current year (1912-13) a list of streets entailing an expenditure of £23,811 was considered, but only £4,635 could be allocated for the work.

REFUSE DISPOSAL.

During the year 136,964 tons of refuse were disposed of; 44,499 tons were deposited on tips within the city, 40,284 tons sent to sea, 34,512 tons burnt at the destructors, and 17,669 sent by rail to various farms. Exclusive of trade refuse, the house refuse amounted to 88,272 tons, and is equivalent to 6·56 cwt. per head of the population, or 35·10 cwt. per house, the cost of removal and disposal being 21·14d. per head of the population, or 9s. 5·12d. per house. The street refuse amounted to 45,254 tons, and is equivalent to an average of 181 tons per mile of highway cleansed.

SNOW REMOVAL.

During the winter the cost of removing snow from the highway was £1,395, against £364 during the previous winter. In regard to this Mr. Steele remarks: "If any further evidence were required, these figures show the impossibility of making an accurate provision in the annual estimates for this service, but fortunately the saving in other services rendered it unnecessary to submit a supplementary estimate to the council."

THE OUSEBURN VALLEY CULVERT.

The Local Government Board having sanctioned a loan for the extension of the culvert in the Ouseburn Valley, a contract has been entered into with Mr. W. T. Weir, of Howdon-on-Tyne, and the work is in progress. When this extension is completed it will permit of the continuation of the embankment forming road No. 2 under the Corporation Act, 1904. During the year 81,809 loads of material were deposited in the embankment (18,038 from the corporation and 63,771 from other sources), giving an average of 1,573 per week, as compared with an average of 1,176 loads during the previous year.

TRAMWAYS.

With the exception of a few places on the heavy traffic routes, which are having attention, the permanent way of the tramways is in a reasonably good condition. The cost of maintenance during the year was £5,215, or £96 11s. 5d. per mile, measured in single track; the cost of renewals of junctions, crossovers and straight track was £2,326, or £43 1s. 5d. per mile. Including maintenance and renewals, the cost per mile was £139 12s. 10d. During the ensuing years the cost of maintenance will inevitably increase, owing to the fact that during the ten years the system has been in operation an exceptionally small amount of renewals has been required, an eloquent testimony, the city engineer observes, to the sound work in the original laying of the track.

London County Hall. In reply to questions at the last meeting of the London County Council, it was stated that tenders for the superstructure would be invited for January next, with a view to the work being commenced in April. It was anticipated that the whole building would be completed by midsummer, 1916.

SOME NOTES ON BIRMINGHAM

INSPIRED BY THE SUMMER MEETING OF THE INSTITUTE OF SANITARY ENGINEERS.

By A. J. M., M.INST.C.E., F.G.S.

[On Friday and Saturday of last week the Institute of Sanitary Engineers met at Birmingham, were entertained at a reception dinner by the Lord Mayor, Alderman Bowater, and visited, among other places, the sewage farm, filter beds, and University. The following general notes are given in connection with the meeting.]

The Institute of Sanitary Engineers is to be congratulated on its choice of a place for its summer meeting. The capital of the Midlands is a city in which any body of men might be glad to assemble, but it is peculiarly appropriate in the case of a gathering of sanitary engineers, and there are many lessons which we can learn from it.

Ancient as Birmingham is—and its origin is lost in the mists of antiquity—the main part of its history is bound up with the past two centuries. Little more than 200 years ago, when good Queen Anne came to the throne, Birmingham was a quiet country town of some 15,000 inhabitants. To-day it occupies the proud position of second city in England. It has close on 900,000 people—more than London itself could boast at the opening of the nineteenth century—and the million is not far off. Birmingham stands to-day impressive in size, in stateliness, and in the magnitude of its world-wide trade.

The point of chief interest to engineers is that the Birmingham of to-day is largely the creation of the engineer. Deprived by Nature of most of the advantages on which the prosperity of other towns has been built up, Birmingham has had to fashion them for itself. Other manufacturing centres owe their origin to the possession of water power. Birmingham's motive power has been won for it largely through the genius of two of its own citizens—James Watt and Matthew Boulton. Other towns derive their importance from the great waterways on which they stand. Birmingham, remote from the sea, and without a navigable river, has had to cut its own canals, and later to lay the iron roads which link it with the rest of England and with the sea. It draws its supply of raw materials from every quarter of the globe. Its wares are sought and prized all over the world, and most of all throughout that mighty empire which Birmingham's grand old citizen—Joseph Chamberlain—has done so much to develop and consolidate.

The engineer has not only provided means for the cheap and speedy conveyance of goods from one corner of the earth to the other. He has also annihilated distance by the introduction of modes of communication which enable us to make our wants known on the instant to those who are able to supply them. Only the other day a great Atlantic liner, one of the two largest ever built, was wrecked on her maiden voyage. But in that brief and crowded interval before she sank she sent out into the darkness a cry for help. And far away in the night the "Carpathia" heard it, and hurried to her aid. An incident like this fires the imagination; but the daily triumphs of applied science pass unheeded. We do not realise, though lately we have had some startling reminders, how precarious our own lives would be without the means of communication which the engineer provides for us. Time was when famine was rife in one county of England while the adjoining county enjoyed a good harvest. We have changed all that. If the harvest in one district fails, the news is flashed at once all over the world, and the surplus food from more favoured regions pours in to supply the need. A great city like Birmingham, dependent as it is for its very existence on food grown outside its own borders, levies tribute upon every quarter of the globe. Wheat from India and Canada, mutton from New Zealand, beef from the Argentine, tea, coffee and spices from the Far East, flow in in an endless, unfailing stream.

But a great modern community has other needs than mere food, and in satisfying some of these Birmingham, by reason of its geographical position, is faced by greater difficulties probably than any other city in the kingdom. It occupies the very summit of the south Midlands, the ridge of the roof, so to speak. It lies on the head waters of streams which flow northward to the distant Humber, and of others which make their way south-west to the Bristol Channel. The local gathering grounds are small, and not above suspicion. Badly, indeed, would Birming-

ham have fared for water had it not been for that great underground reservoir, the new red sandstone, upon which the city is built. Some twenty years ago the demand for water began to press upon the limits of the local resources. The corporation, under the advice of the late Mr. James Mansergh, brought in a new supply from the mountains of Radnorshire, a distance of about 80 miles. Ample provision has been made for future requirements, the works being capable of development to supply 75,000,000 gallons per day, or more than three times the present consumption. £6,500,000 has been spent on the scheme, which ranks as the greatest undertaking of the kind in the world.

Having at such great cost brought in a wholesome and abundant water supply, Birmingham is confronted with the problem, scarcely less formidable in its way, of getting rid of it after it has been used. In the first place the sewage is heavily charged with manufacturing refuse, including acids, which microbes, as we all know, abhor. In the second, Birmingham, through its position, to which we have already referred, high up in the watershed, has no large and friendly river to receive its purified sewage. The latter, therefore, has to run the gauntlet of a string of critical neighbouring authorities in a tiny stream whose normal flow above the outfall is actually less than that of the sewage. Birmingham is fortunate in having in charge of its sewage works an engineer who can convert such an unpromising liquid as he has to deal with into an effluent which actually improves the stream into which it is discharged.

So much for the sanitary work which is carried on in Birmingham. And now let us glance at the result. The city is stated by the medical officer—and he seems to have good grounds for the claim—to be the healthiest large manufacturing city in Europe. Birmingham has not always occupied this proud position. The death-rate in 1874 was 26·8 per 1,000. By 1910 it had been reduced to 13·67, practically one-half. But death-rates convey little meaning to some of us. Let us take it another way: 7,777 people died in 1910. If the 1874 rate had been maintained, the death-roll would have been nearly twice as great. The saving is equivalent to one life in every hour of the twenty-four, on six days in the week, in every week in the year. It is a grand achievement, and one of which the corporation and their officers have every right to be proud.

Nearly 2,000 years ago there was a great writer who said: "We are members one of another." It is true now, was the case then, very much more so as to-day. The march of invention, the triumphs of engineering, the progress of specialisation have given the old text a new meaning and a breadth of application which was undreamt of at the time it was written. The independent family, the independent community, has long been a thing of the past. The life of every one of us is dependent on the work of hundreds, if not thousands, of others of whose very existence we are hardly aware.

Unfortunately we do not always remember our membership and its obligations. There are one or two present-day tendencies which are very sinister. One is the ignorance and indifference of a great many people in the comfortable classes with regard to the conditions under which their less fortunate fellow-countrymen live. Another tendency, and it has been developing at an alarming rate of late years, is to take advantage of the dependence of different sections of the community upon each other to blackmail the country at large. If it were only the employers or the well-to-do classes who were attacked, it would be another matter, for these classes can, as a rule, take care of themselves. But this is not the case. The victims of the new economic warfare are chiefly found among the weak and the poor, to whom the enforced idleness, and the enhanced prices of the necessities of life brought about by a conflict in which they have no part, are wellnigh crushing misfortunes. And the sanitary engineer cannot afford to view with indifference an industrial warfare which throws even the sanitary service out of gear and sacrifices human life on the altar of hate. Birmingham has an enviable record in the matter of trade disputes. Its working men have a high reputation for independence and intelligence. They are not the sort of men to be wheedled or driven against their will into an ill-advised or suicidal conflict. It is, moreover, the birthplace of those land and building societies which have done so much to give the working man a stake in his own country, with the result that wealth is more evenly distributed here than in many other less favoured towns.

In other matters more closely affecting health Birmingham shows a worthy lead. A generation ago it was the rule, and not the exception, as in so many other places, for every family to inhabit a separate house. More recently, during a congress of the Royal Sanitary Institute, the then Lady Mayoress called attention to the absence of underground and cellar dwellings. Birmingham, like other towns in the North and Midlands, is not without its back-to-back houses or its slums, but the housing question has been vigorously attacked during the past ten years, and the medical officer is able to report a great change in the ideals of the poorest inhabitants with regard to house accommodation.

The corporation maintains, too, a large staff of lady health visitors, whose happy combination of tact with expert knowledge secures them a welcome wherever their friendly help and advice are needed. Infant consultations also are held in various parts of the city. It is not surprising that the infant mortality in Birmingham, though still much higher than it ought to be, is steadily decreasing year by year.

In yet another direction Birmingham sets an example which other towns would do well to follow. It employs no fewer than four whole-time smoke inspectors, and by means of cautionary letters, followed if necessary by police court proceedings, it is making an earnest effort to deal with the smoke nuisance. The gas and electricity departments might do a great deal to forward this good work, which at present, if report does not belie them, they oppose by taxing their own customers to relieve the rates of those who pollute the air with coal smoke. Is the day far distant when Birmingham will import gas and electricity instead of coal, and when the coal-cart will be relegated to that limbo to which the water-carrier and the tinder-box have preceded it?

The Lord Mayor of Birmingham (Alderman W. H. Bowater) extended a most hearty welcome to the members of the Institute of Sanitary Engineers on Saturday. He pointed out that the death-rate in that city had been reduced by about one half as compared with what it was thirty years ago. That improvement had been brought about by many causes, but by no means the least cause was the work which had been accomplished by sanitary engineers, who had assisted in a great measure in improving the conditions under which the people lived.

The President (Mr. A. J. Martin, M.Inst.C.E.) declared that Birmingham had a claim on the respect and admiration of the whole country. Its excellent water supply would undoubtedly be responsible for the better physique of the citizens and for immunity from disease.

At a dinner held in the evening at the Midland Hotel, Mr. A. Brown (chairman of the council of the institute) proposed the toast of "The City and Trade of Birmingham." "The Institute of Sanitary Engineers" was proposed by Dr. Bostock Hill, who expressed the view that there were indications in every circle, from Parliament downwards, that sanitation was now receiving that consideration which in the past it had failed to obtain.

The President, in response, said their most important task was to teach the man in the street and the woman in the house to appreciate the importance of sanitation and call attention to the laws of health. He attached greater importance to the task they had undertaken of instituting and carrying through a national health week to make the people themselves demand conditions favourable to health and to co-operate in securing these conditions than he did to all technical work.

Association of Consulting Engineers.—A general meeting of duly elected members of the Association of Consulting Engineers will take place on Monday next, the 22nd inst., at 4.45 p.m., at the Institution of Electrical Engineers, Victoria Embankment, W.C.

New Court House for London.—The London County Council have approved a report of the Local Government Committee recommending that the existing Court House at Newington should be demolished, that a new Court House should be built on the site and on adjoining land belonging to the council, and that pending its completion Quarter Sessions should be held at the old Clerkenwell Sessions House, which should be disposed of as soon as the new Court House had been provided. The gross cost was estimated at £100,000.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

The following books have been awarded to the two winners of the premium for June, viz.:

Mr. G. B. R. Pimm, of Wexford, has selected

"A Manual of Reinforced Concrete," by Marsh and Dunn (Constable), and

"Lectures on Cement," by Blount (Institute of Chemistry).

Mr. H. F. Wilkinson, of Tottenham, has chosen

"Reinforced Concrete Design," by Faber and Bowie (Arnold).

The above have been duly forwarded to the successful competitors.

QUESTIONS.

This week answers are invited to the following questions:—

252. Girder Bridge.—Design a girder bridge to carry a 24-ft. road over a river and railway (at an angle of 60°) of two spans, 70 ft. and 42 ft. respectively. The mean height of road surface above bed of river is 21 ft. 6 in., and 17 ft. above rails, and the foundation is clay. Please show calculations and give an estimate of the cost. ("Nomad.")

256. Leak in Drain Pipes.—What is a reasonable amount of leakage to be expected in newly laid stoneware drain pipes of 6 in. and also 12 in. diameter? State the type of joint, average depth of trench, and class of soil. Is one gallon per mile of pipe per hour a permissible amount? ("Welsh.")

258. Roof Design.—Is it necessary or advisable to allow for expansion and contraction in a roof of 50-ft. span? What is a simple and efficient arrangement for such a roof, assuming that this is required? ("Student.")

§ 260. Refuse Disposal.—Where there is no system of sewers in a district, what are the best methods of collecting, removing and disposing of the fluid and solid refuse from the community?

261. Deflection of Beams.—If two precisely similar beams of rectangular section, one of cast iron and the other of wrought iron, were laid across the same span and loaded with the same load (within the elastic limit), what would be the relative deflections of the two beams?

REPLIES TO QUESTIONS.

259. Mechanics.—What is meant by "Instantaneous centre of rotation"? Give an example. What points on the rim of a carriage wheel are moving at the same rate as the middle of the axle? ("A.M.I.C.E.")

By a theorem known as Chasles's Theorem, any displacement of a lamina in its own plane is equivalent to a rotation about some finite or infinitely distant point. Consider, for example, the circular lamina A B C (Fig. 1). Suppose that in consequence of the displacement of the lamina the point A moves to B while the point B moves to C. Now since A B, B C represent two positions of the same line in the lamina, they must be equal, and it is obvious that this displacement could have been effected by means of rotation about O, the centre of the lamina, through the angle A O B. If the three points A B C were in a straight line, then O, the centre of rotation, would be at infinity, and the motion would be a pure translation because every point of the lamina would be displaced parallel to A B through a distance equal to A B. Now if we consider any continuous motion of the lamina, it will be seen that it can be brought from any position to a neighbouring one by rotation about the proper centre. When the two positions are infinitely close this centre is called the instantaneous centre of rotation of the lamina. The instantaneous centre of rotation has the following properties:

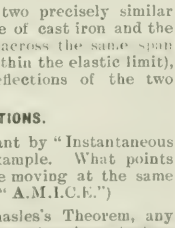


Fig. 1.

(1) The direction of the motion of any point on the lamina for the instant in question is at right angles to the line joining it to the instantaneous centre of rotation.

(2) The velocities of the various points on the lamina for the instant in question are proportional to the lengths of the lines joining them respectively to the instantaneous centre of rotation.

In the case of a carriage wheel, the instantaneous centre of rotation is the point which is in contact with the ground.

Let the circle D E F (Fig. 2) represent the carriage wheel, and let E be the point of contact with the ground, and X the middle of the axle. With the centre E and the radius E X describe the arc D X F cutting the rim at D and F. It is evident that

ED = EX = EF

But these lines respectively join the points D, X and F to E, the instantaneous centre of rotation of the wheel ∴ (by property (2) above) the velocities of D, X and F must be equal. ∴ D and F are the required points. (T. R.)

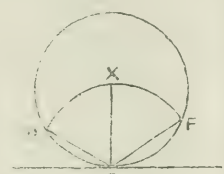


Fig. 2.

Notes.

A correspondent submits the following question and solution:

A straight bar of steel 40 inches in length, 1 inch broad, and $\frac{1}{10}$ inch in thickness, is bent into the form of a bow, having an elastic deflection of 2 inches in the middle, and the ends are united by the bowstring. Taking the modulus E at 29,000,000 lb., what will be the tension on the string? (A.M.I.C.E., Feb., 1901.)

Let y be the deflection at any point P, and I the least moment of inertia of the section.

Then since $\frac{M}{EI} = \frac{1}{R} = -\frac{d^2y}{dx^2}$

for flat arcs, and since $M = Fy$,

we have $\frac{Fy}{EI} = -\frac{d^2y}{dx^2}$

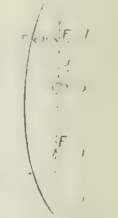
If we write this equation in the form

$$\frac{d^2y}{dx^2} + n^2y = 0, \quad \text{where } n^2 = \frac{F}{EI},$$

the general solution is

$$y = a\cos nx + b\sin nx,$$

where a and b are arbitrary constants. In the present case, $y = 0$ when $x = l$ and also when $x = -l$.



∴ $0 = a\cos nl + b\sin nl$ and $0 = a\cos nl - b\sin nl$,

whence $b = 0$, so that $y = a\cos nx$ is the solution required. Now when $x = 0$, $y = a$, so that a is the central deflection;

and $n = \sqrt{\frac{F}{EI}} = \sqrt{\frac{12F}{29000}}$ and $a = 2$ inches.

But $0 = a\cos nl$.

$$\therefore \quad 2\cos\sqrt{\frac{F \times 12}{29000}} \times 20 = 0$$

$$\therefore \left(\frac{\pi}{2}\right)^2 = 400 \cdot \frac{12F}{29000},$$

whence F = 112 lb.

Port of London Authority's New Offices. The plans of Mr. Edwin Cooper, 12 Gray's Inn-square, London, have been selected by the Port of London Authority on the advice of Sir Aston Webb, R.A., for the new offices about to be erected in Trinity-square, London, at a cost of £300,000.

Widening Putney Bridge. Fulham Borough Council have urged upon the London County Council the necessity in the interests of public safety for the existing footpaths of Putney Bridge to be incorporated with and form part of the carriageway, and the bridge widened for the purpose of constructing new footpaths.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Huddersfield T.C. (July 5th. Mr. A. A. G. Malet).—£15,500 for the extension of the sludge disposal works of the corporation at Cooper Bridge.—Mr. J. H. Field, town clerk, explained that the corporation had spent on the works and land at Cooper Bridge £164,137, and the sum now asked for would complete the works.

Plymouth T.C. (July 11th. Mr. Courtenay Clifton).—£800 and £2,000 for the provision of a bathing pool at the Reform Beach, and for the improvement of bathing facilities at Tinside Beach, as well as £980 for laying out the Mutley Park Estate as a pleasure ground, and constructing a roadway through the estate connecting Oxford-avenue with Mutley Park-road. Mr. C. H. Trounson (on behalf of the borough engineer, Mr. J. Paton) submitted and described the plans. They showed that the proposed pool at Reform Beach would be about 60 ft. in length, would average 33 ft. in width, and vary in depth from 7 ft. 6 in. to 11 ft. 6 in. They proposed to prolong the existing diving platform and to use the rocks as far as possible for the boundary terraces.

Wednesbury T.C. (June 25th. Mr. Courtenay Clifton).—£5,000 for the extension of the public offices and public baths, and £1,800 for the purchase of two pieces of land situated near the council schools, Holyhead-road, for purposes of open spaces or recreation grounds.—The town clerk, Mr. T. Jones, stated that for the large loan they asked for a period of thirty years, and for the £1,800 a period of sixty years. The works were all within the borough and complied with the by-laws. The plans had been before the committee and passed. The increase in the sum originally asked for was due to increase in cost of materials, and the fact that a new boiler was necessary at the baths. The accommodation at the town hall had been inadequate for a number of years past.

APPLICATIONS FOR LOANS.

Barnsley T.C. £1,000 for the purposes of the markets.

Briton Ferry U.D.C.—£16,000 for a housing scheme.

Chelmsford R.D.C.—£1,400 for the purchase of a site for a reservoir.

Dorchester T.C.—£3,263 for the construction of sewage disposal works.

Down C.C. £5,000 for the repair of Kirkcubbin and pier.

Edmonton U.D.C.—£6,800 for private street works.

Kensington B.C.—£1,760, further loan for the Church-street improvement.

Linton (Cambs) R.D.C.—£550 for building cottages.

Macroom R.D.C. £5,000 for a housing scheme.

New Forest R.D.C.—£800 for the proposed Lyndhurst improvement.

Northwich U.D.C.—£7,126 for public baths and £4,000 for workmen's dwellings.

Sudbury T.C.—£5,680 for industrial dwellings.

Sutton-in-Ashfield U.D.C.—£200 for public conveniences.

Swindon T.C.—£24,000 for the extension of the Rodbourne sewage works.

Woking U.D.C.—£4,500 for sewage works.

Yeovil T.C.—£1,225 for a new street.

LOANS SANCTIONED.

Chester-le-Street R.D.C.—£1,264 for street improvement works.

East Grinstead R.D.C.—£3,122 for the construction of sewage disposal works.

Esher and the Dittons U.D.C.—£6,094 for new tanks and filters at the sewage disposal works. The surveyor, M. H. C. Fread, is preparing the necessary contract plans, specifications and bills of quantities prior to advertising for tenders.

Hackney B.C.—£1,385 for an underground convenience.

Harwich T.C.—£655 for a fire station and fire appliances.

Jarrow T.C. £1,551 for public works.

Kettering U.D.C.—£3,000 for a school for delicate and phthisical children.

Leatherhead U.D.C.—£230 for street improvement purposes.

Merthyr T.C.—£1,197 for a site for a recreation ground and £456 for laying out, £111 for street improvements, and £6,384 for road work.

Midhurst R.D.C.—£1,650 for water supply works.

FORTHCOMING INQUIRIES.

JULY.

		£
22.	**Dover.** For baths, recreation ground and road purposes (Mr. F. H. Tulloch) ...	1,490
22.	**Watford.** For street improvement works (Mr. R. H. Bicknell)	750
23.	**Annfield Plain.** For the erection of dwellings (Mr. Courtenay Clifton)	14,400
23.—	**Caerphilly.** For new road works (Mr. W. O. E. Meade-King)	1,290
23.—	**Epsom.** For road and electricity purposes (Mr. H. R. Hooper)	5,661
23.—	**Glossop.** For street works (Mr. M. K. North)	200
23.—	**Margate.** For the purchase of a fire station site (Mr. F. H. Tulloch)	1,500
23.—	**Petersfield.** For water supply purposes (Mr. P. M. Crosthwaite)	1,878
23.—	**Ryton.** For private street works (Mr. Courtenay Clifton)	1,166
24.—	**East Ham.** For the erection of a fire station and dwellings (Mr. R. H. Bicknell)	8,628
24.—	**Featherstone.** For the erection of workmen's dwellings (Mr. Courtenay Clifton)	35,745
24.—	**Heckmondwike.** For the provision of a burial ground (Mr. M. K. North)	2,017
24.—	**Merthyr.** For cemetery extension purposes (Mr. W. O. E. Meade-King) ...	1,000
24.—	**Sunderland.** For the extension of an infectious diseases hospital (Mr. R. A. Farrar)	6,000
24.—	**Ulverston.** For works of water supply (Mr. R. G. Hetherington) ...	440
25.—	**Ambleside.** For sewage disposal purposes (Mr. R. G. Hetherington)	4,834
25.—	**Cambridge.** For the purchase of land for hospital purposes (Mr. S. M. Copeman)...	
25.—	**Carlton.** For street and cemetery purposes (Mr. M. K. North)	4,200
25.—	**Hereford.** For market, sewerage, and electricity purposes (Mr. W. O. E. Meade-King)	2,600
25.—	**Ilford.** For road widening purposes (Mr. R. H. Bicknell)	1,220
25.—	**Rhymney.** For the provision of working-class dwellings (Mr. W. H. Collin) ...	6,800
25.—	**Saddleworth.** For the provision of working-class dwellings (Mr. Courtenay Clifton)	16,000
26.—	**Bromley.** For road making purposes (Mr. M. K. North)	4,880
26.—	**Ludlow.** For cemetery extension purposes (Mr. W. O. E. Meade-King)	4,300
26.—	**Ulverston.** For works of water supply (Mr. R. G. Hetherington)	1,000

International Fire Conference and Exhibition.—The first international conference and exhibition, embracing every phase of fire prevention, fire protection and fire fighting, will be held at Madison-square-gardens, New York, from October 2nd to October 12th. Fireproof building construction and all accessories, fire-alarm systems, automatic sprinklers and fire extinguishers, motor fire engines, fire escapes, and, in fact, every device and manufacture in the fields of fire prevention and extinguishment will be exhibited and demonstrated, and, in addition, an important conference will hold sessions daily for the general consideration of the fire question by architects, builders, engineers, insurance men and fire chiefs and fire fighters on the same platform. Mr. A. D. V Storey, 1269 Broadway, New York City, is the secretary and manager.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Lostwithiel, Maldens and Coombe, Monmouthshire, Wallasey £94,000, Yarmouth; housing and town planning—Newquay; refuse collection and disposal—Maldens and Coombe; roads and materials—Croydon, Southgate £5,000, Twickenham; sewerage and sewage disposal—Cattbridge £38,656, Nantwich £12,500, water, gas and electricity Blackburn. Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

ADMINISTRATION.

Hackney B.C.—It has been agreed to appoint a Leaders Committee, to consist of the chairman of each Standing Committee and eight other members, to open tenders in public prior to the council meetings in order to prevent the delay which now takes place.

Maldens and Coombe U.D.C.—Application is to be made to the Local Government Board for modern by-laws for the better regulation of combined drainage and other matters connected therewith, and the surveyor, Mr. R. H. Jeffes, has been asked to prepare draft by-laws embodying the following general principles: (*a*) All combined drains to be laid in iron, with lead joints; (*b*) not more than four houses to be connected to any one combined drain; (*c*) a fall of 1 in 50 to be insisted on; (*d*) manholes to be placed at every change of direction and where required; sound, hard bricks to be used in the construction thereof.

Watford U.D.C.—A scheme for the rearrangement of the surveyor's department has been adopted. A highway surveyor is to be appointed, and the services of Mr. Fayers retained as building surveyor, with the duty of preparing all quantities as required by any department of the council.

BUILDINGS.

Antrim C.C.—A proposal to rebuild the jetty at Red Bay pier with greenheart piles and bracing, and pitch-pine flooring, at a cost of £1,800, has been referred to the Piers and Harbours Committee.

Erixham (Devon) U.D.C.—The surveyor, Mr. J. Silley, has been instructed to prepare specifications and invite tenders for an additional wood-piled landing stage near the passenger landing stage, at a cost of £232, as well as the renewal of piles in various positions at the pier.

Leek U.D.C.—The tender of Mr. Sampson Salt, at £900, has been accepted for the building of new offices at the gas works.

Llandyssul R.D.C.—A bridge is to be constructed over the river Ceri at Cwmdu, near Newcastle Emlyn, at a cost of £130, one-third of which will be contributed by the Cardigan County Council.

Lostwithiel T.C.—It has been agreed to support the proposal to provide a joint isolation hospital for the district, comprising the Bodmin Rural and Urban, Wadebridge Urban and Lostwithiel Urban areas.

Maldens and Coombe U.D.C.—The surveyor, Mr. R. H. Jeffes, is to report upon the possibility of adapting for municipal and public hall purposes certain land and buildings adjoining the present offices of the council.

Monmouthshire C.C.—The tender of Mr. W. A. Linton, of Newport, at £5,397, has been accepted for [illegible] and extensions of the county [illegible] at Newport.

Montrose T.C.—The plans of the burgh surveyor, Mr. S. L. Cruickshank, for the new Trail shelter to be erected on the beach at an estimated cost of £600 has been approved.

Newcastle-upon-Tyne T.C.—It has been decided to accept the offer to build a new city hall on the site of the Northumberland baths, the approximate cost being estimated at £100,000. The proposal also includes the baths to be there re-erected and built to a smaller size, £4,000 and £800, as well as other rooms.

Wallasey T.C.—The Works Committee recommend the acceptance of the plans of Messrs. Briggs & Thornely, assistants to the late Mr. Owen Owen, for the proposed new town hall. The building is estimated to cost £94,000.

Winchester T.C.—The tender of Mr. J. Hunt, at £1,079, has been accepted for the construction of a bandstand, shelter, lodge and public conveniences at the North Walls Recreation Ground.

Yarmouth T.C.—A scheme is in course of preparation for the provision of a new Haven Bridge.

HOUSING AND TOWN PLANNING.

Bridlington R.D.C.—It has been decided to co-operate with the Bridlington Corporation in the preparation of a town planning scheme.

Newquay U.D.C.—The question of providing workmen's dwellings is to be considered by a committee of the council.

Stratford-on-Avon T.C.—The tender of Messrs. T. Barker & Sons, of Loughborough, at £3,495, has been accepted for the erection of twenty-four cottages.

Twickenham U.D.C.—It has been agreed to make application to the Local Government Board to prepare a town planning scheme, in accordance with the plan prepared by Mr. F. W. Pearce, the surveyor to the council.

PARKS AND OPEN SPACES.

Newcastle-upon-Tyne T.C.—A scheme is being considered for the provision of a recreation ground, at an estimated cost of £7,500.

REFUSE COLLECTION AND DISPOSAL.

Lowestoft T.C.—The council have agreed to undertake the work of refuse removal themselves at the expiry of the present contract.

Maldens and Coombe U.D.C.—At a future meeting consideration will be given to a suggestion of Mr. H. Hunter, the sanitary inspector, that a small trade refuse destructor be obtained in view of the difficulty of disposing of fish offal, garbage and the like.

Tiverton T.C.—Mr. A. J. Milden, of Ash Thomas, has agreed to take the refuse of the town for five years to fill up a quarry on his farm, and Mr. Elworthy, also of Ash Thomas, will provide wagons to take the refuse away by traction power for £100 a year.

ROADS AND MATERIALS.

Broadstairs U.D.C.—Tenders are to be obtained for works of granite kerbing and channelling.

Bushey U.D.C.—The tender of Messrs. Bailey & Son, at £415, has been accepted for making up Windmill-street.

Croydon T.C.—A scheme is under consideration for the widening of North-end and an improvement of the junction with George-street, at an estimated cost of £120,000.

Derbyshire C.C.—It has been agreed that 20s. per week be the minimum rate of wages for the council's adult roadmen and labourers when full time is made, and that no workman shall be dismissed in consequence of the passing of the resolution.

Dudley T.C.—It is intended to spend £825 in erecting premises for the preparation of tar-macadam.

Exeter T.C.—Property to the value of £3,051 has been purchased in Bartholomew-street West for street improvement purposes.

Kingstown (Co. Dublin) U.D.C.—The tender of Messrs. Stansbury & Banks at £2,215, has been accepted for tar-macadam work along the sea front.

Maldens and Coombe U.D.C.—Plans and estimates are to be prepared for making up part of Duke's-avenue under the Private Street Works Act. A small deputation is to be appointed to meet the chairman of the Highways and Bridges Committee of the Surrey County Council to discuss the plans for the Road Board's scheme for a suggested loop road from Kingston vale to Esher.

Marylebone B.C.—The Baker-street improvement scheme is to be carried out without delay.

Porthcawl U.D.C.—The road constructed by the Council at Porthcawl over the Lock's Common leading to the pier for the convenience of motorists has been completed.

Southwark B.C. A sum of £5,000 is to be allocated to the Works Committee for the purpose of improving the roads of the borough.

Swansea T.C.—A plan has been drawn up by the surveyor, Mr. G. Bell, for planting 2,900 trees in the streets, at a cost of £1,812.

Twickenham U.D.C.—Mr. F. W. Pearce, the surveyor, has been asked to prepare a report and estimates as to the substitution of wood block or other suitable paving for the present granite macadam in portions of St. Margaret's-road, in view of the motor-omnibus traffic.

Ware U.D.C. It is proposed to widen Star-street at an estimated cost of £3,011.

SEWERAGE AND SEWAGE DISPOSAL.

Barnsley T.C.—New surface-water drains are to be constructed at a cost of £200.

Blean R.D.C.—The tender of Mr. A. S. Ingleton, at £10,997, has been accepted for contract No. 1 of the Herne and Reculver drainage works.

Coatbridge T.C.—A new sewerage scheme, estimated to cost £38,656, has been approved.

Grimsby T.C.—The stream at the rear of Roperystreet is to be culverted at a cost of £5,900.

Nantwich R.D.C. The construction of new sewage works is to be proceeded with at an estimated cost of £12,500.

Norwich T.C.—The Sewerage and Irrigation Committee report that they have further considered the scheme as to the sewerage of Earlham-road (part of) and Gipsy-lane, at an estimated cost of £5,800, but now make no recommendation thereon, the committee being of opinion that that part of the city has not yet sufficiently developed to justify the expenditure. The estimated cost of the sewerage of Thorpe-road from Carrow-road to the boundary of the city at Harvey-lane and the district south thereof was £5 915, and the actual expenditure has been £4.377, the saving of £1,538 being due to the utilisation of considerable lengths of the old combined sewer in Thorpe-road, and the purchase of a large number of concrete tubes at a low figure.

WATER, GAS, AND ELECTRICITY.

Abersychan (Mon.) U.D.C.—The surveyor, Mr. E. Whitwell, has prepared a lighting scheme, which the council are considering.

Blackburn T.C.—The tender of Messrs. R. McAlpine & Sons, of Glasgow, has been accepted for the construction of the new reservoir at Wilpshire.

Cottingham U.D.C.—The tender of Mr. W. Whiting, at £795, has been accepted for water mains extensions.

Coventry T.C.—The tender of Messrs. E. C. & J. Keay, Limited, of West Bromwich, at £1,707, has been accepted for the erection of a roof over the new gas-purifiers at Foleshill.

Dunmow R.D.C.—The Dunmow waterworks undertaking is to be acquired by the council for £2,500.

Perth C.C.—The Perth District Committee have decided to raise the embankment of the Errol water dam at an estimated cost of £1,000.

Rothesay T.C.—The gas manager has received instructions to prepare specifications for a new gasometer with a capacity of 300 000 cub. ft.

Stepney B.C.—A proposal has been made for the extension of the electricity supply undertaking at a cost of £137,750. The accounts of the undertaking for the year ended March 31st show a surplus carried to net revenue account of £38,196, as compared with £24,105 in the previous year. This surplus represents a gross profit of 9¾ per cent on the capital employed.

Teignmouth U.D.C. There has been a net profit on the working of the gas undertaking last year of £353.

Truro R.D.C.—The tender of Mr. W. E. Bennett, of Bodmin, at £2,637, has been accepted for the construction of the Perranporth waterworks.

Wolverhampton T.C. A profit of £6,000 was carried to the electricity undertaking last year.

MISCELLANEOUS.

Esher and the Dittons U.D.C.—The tender of Messrs. Rose has been accepted for six new lengths of the horse path competing for the Claygate Brigade, the estimated cost being about £15.

PERSONAL.

Mr. R. J. Stevenson, assistant surveyor to the Filey Urban District Council, has resigned, and Mr. R. M. Robson, the surveyor, will now undertake all the duties of the office.

Mr. E. Southall Moule, assistant surveyor to the Redditch Urban District Council, has been appointed assistant in the engineer and surveyor's department of the borough of Luton.

Messrs. J. Parry, M.INST.C.E., water engineer to the Corporation of Liverpool, and G. Swarbrick, deputy borough surveyor of Swansea, have been elected members of the Royal Sanitary Institute.

Mr. S. C. Lloyd, who has for some years held the appointment of district surveyor under the West Sussex County Council, has been successful in obtaining an appointment under the East Suffolk County Council.

Mr. George Smith, of the borough surveyor's office, Luton, has been appointed as assistant to Mr. H. C. Fread, the surveyor to the Esher and the Dittons Urban District Council. There were eighty-eight applicants for the post.

Mr. Frederick Robert Ryman, borough engineer and surveyor of Stamford, was married last week, at the parish church of Tinwell, near Stamford, to Miss M. Bradshaw, only daughter of Mr. and Mrs. J. T. Bradshaw, of Tinwell. Mr. W. B. Purser, surveyor to the Kesteven (Lincs) County Council, acted as best man.

Mr. W. Rees Jeffreys, Secretary to H.M. Road Board, was entertained at Toronto at dinner on June 26th by the Ontario Motor League, Mr. W. A. McLean, Provincial Engineer of Highways, proposing the toast of "Our Guest." In the course of an interesting address, Mr. Rees Jeffreys dealt at length with the highways of England.

Mr. Willis Glossop, surveyor to the Newbold Urban District Council, sent in his resignation at the June meeting of the council, and last week the following motion was carried:—"That Mr. Glossop be asked to reconsider his resignation, and that should he do so the council will increase his salary to such an amount as will make it worth his while to retain his appointment."

Mr. L. M. Jones, the city engineer of Port Arthur, Ontario, was born at Dowlais, Wales, and was educated at Cardiff. His professional career commenced in 1899, when he became identified with the Canadian Pacific Railway construction at Winnipeg. After gathering further engineering experience, he was in 1906 appointed assistant city engineer of Port Arthur, a position he retained until 1909, when he accepted a post with Messrs. Smith, Kerry, & Chace, of Toronto. He returned to his former office at Port Arthur in 1910, and in June of last year was elected to the chief appointment there.

Mr. R. O. Wynne-Roberts, M.INST.C.E., has been invited by the Provincial Government of Saskatchewan to investigate the question of utilising the lignite coalfields of that province for power, gas, and other purposes. In accepting this offer, Mr. Wynne-Roberts will not entirely sever his connection with the city of Regina—by whom, as our readers are aware, he has been retained in connection with water supply matters—but will continue to act as consulting engineer for the work of extension at Boggy Creek. His decision to take up the work referred to was received with considerable regret by the Water Committee, but the greatest satisfaction was expressed with the manner in which he has served the city since his arrival from England. To quote the Regina *Morning Leader*, "Mr. Wynne-Roberts may be said to have solved Regina's water problem for many years to come, and little doubt is entertained of his being able successfully to tackle the big proposition now set before him by the Government, the solution of which it is by everyone admitted will be of incalculable value to Regina, Moose Jaw, and the towns of Southern Saskatchewan." His new task is by no means a light one, for his investigation will entail the inspection of a territory measuring, roughly speaking, about 600 square miles.

In last week's issue there appeared a brief outline of the career of Mr. R. J. Thomas, county surveyor,

Buckinghamshire, the new president of the Institution of Municipal and County Engineers. In the interval we have been able to obtain a more detailed account of his life and work, which, we are sure, will be read with interest by the members of the important body for the direction of whose affairs he will be responsible during the ensuing twelve months. Mr. Thomas was educated at the Grammar-school, Carnarvon, at Towyn, and at the University College of Wales, Aberystwyth. He was articled to his father, the late Mr. J. Thomas, county surveyor of Carnarvonshire. After holding minor appointments at Croydon, Salisbury, and Carlisle, he was appointed engineer-in-charge of the restoration of the Shrewsbury and Holyhead road when that highway was transferred to the county of Carnarvon from the Turnpike Trust in 1886. He obtained the testamur of the institution in the autumn of 1886, this materially assisting him in his successful application for the appointment of county surveyor, then vacant and advertised in consequence of the death of his father. He prepared and organised the direct system of maintenance of all rural main roads in the county for the newly established county council (1889), and received the council's thanks and a handsome honorarium for the success of this system upon securing the appointment of county surveyor of Buckinghamshire in 1890. Mr. Thomas developed the system of direct maintenance in Bucks, where the main roads now exceed 500 miles in extent, and organised the county council's extensive scheme for contributions to district highways. He has built numerous county bridges in various materials, erected court-houses, police-buildings, and carried out extensions to the lunatic asylum costing £70,000. During the past eight or nine years he has used extensively various bituminously bound materials upon important trunk roads traversing the county, and has tar-painted a large number of slightly less important roads. Mr. Thomas has travelled and studied the road question in the United States, Canada, and Europe, and has attended road congresses as a delegate, and contributed papers to them in these countries as well as in the United Kingdom. He obtained the Bessemer premium of the Society of Engineers for a paper on "Road Construction and Maintenance." He is chairman of a committee charged with the preparation of a paper for the International Road Congress, 1913, embodying the latest English practice in bituminous road construction. Mr. Thomas is a member of a committee appointed by the Board of Trade for dealing with British engineering at the Brussels and Turin Exhibitions, is a member of the Institution of Civil Engineers, and a past-president of the County Surveyors' Society. He was elected hon. secretary for the home district of the Institution of Municipal and County Engineers with a seat on the council in 1899, was appointed member of the Examining Board in 1901, and became a vice-president in 1910.

FOR OTHER ADVERTISEMENTS

See End of Paper.

TEDDINGTON URBAN DISTRICT COUNCIL.

ROAD CONTRACTORS AND TAR-PAVIORS.

The above-named Council are desirous of receiving Tenders for the following Works in connection with the Making-up of Blackmore's-grove and Claremont-road, Teddington, under the Private Street Works Act, 1892:

935 Lineal Yards of 12-in. by 6-in. Norwegian Granite Kerb and Laying.

961 Lineal Yards of Tees Scoriæ Setts Channel and Laying.

3,690 Square Yards of Road Formation.

2,191 Square Yards of Tar-paving.

Plans and Specifications may be seen, particulars and Forms of Tender obtained, on application to Mr. Marshall Hainsworth, Surveyor, Council Offices, Teddington.

Sealed Tenders, endorsed "Street Works" must be delivered to the undersigned not later than Saturday, the 3rd day of August next.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
G. H. SALMONS,
Clerk.

Council Offices, Teddington.
11th July 1912.

CANNOCK URBAN DISTRICT COUNCIL.

WASHING BACTERIA BED MEDIUM.

The Cannock Urban District Council invite Tenders for the Excavating, Removal, Washing and Replacing of Filtering Material in Bacteria Bed, &c., at their Sewage Farm, Longford-lane, Cannock.

Specification, Schedule, and Form of Tender may be obtained on application to Mr. Robt. Blanchard, Engineer and Surveyor, at the Council Offices, Cannock.

Sealed Tenders, endorsed "Tender for Washing Filtering Material," and addressed to the Chairman of the Sewage Farm Committee at the Council Offices, Cannock, are to be delivered not later than 10 a.m. on Friday, the 2nd day of August, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

C. A. LOXTON,
Clerk to the Council.

Council Offices, Cannock.
June 19, 1912.

BOROUGH OF LOUGHBOROUGH.

WATERWORKS DEPARTMENT.

APPOINTMENT OF TWO WATERWORKS INSPECTORS.

The Corporation require the services of an experienced Chief Waterworks Inspector. Candidates must be qualified plumbers, thoroughly practical, and accustomed to the use of waste water meters. Salary 38s. per week and uniform.

The Corporation also require the services of an Assistant Waterworks Inspector, who must be a qualified, practical plumber, experienced in service work and meter reading. Salary 32s. per week and uniform.

Applications in candidate's own handwriting, accompanied by copies of not more than three recent testimonials as to character and abilities, to be forwarded to me not later than noon on Thursday, the 1st August next.

ALBERT H. WALKER, Assoc.M.Inst.C.E.,
Borough Surveyor and Waterworks Engineer.

Town Hall, Loughborough.
July 17th, 1912.

RURAL DISTRICT COUNCIL OF SEDGEFIELD.

ASSISTANT SANITARY SURVEYOR.

The above Council invite applications for the position of Assistant Sanitary Surveyor. Salary £2 per week.

Candidates must be good draughtsmen, accurate surveyors and levellers, be able to prepare estimates and take off quantities and to have had experience in the carrying out of sewage disposal works and private street works.

Applications, in candidate's handwriting, stating age and experience, together with copies of two recent testimonials, to reach me, the undersigned, not later than Wednesday, the 24th inst., at 5 p.m.

(By order)
J. W. LODGE,
Clerk to the Council.

Union Offices,
Sedgefield, Ferryhill,
17th July, 1912.

CITY OF BRADFORD.

ESHOLT SEWAGE DISPOSAL WORKS.

SLUDGE FILTER PRESSES, CONTRACT NO. 22.

The Corporation are prepared to receive Tenders for the supply, delivery, and erection of 28 Sludge Filter Presses at their Esholt Sewage Disposal Works.

Further Particulars and Copy of Specification may be obtained at the Office of Mr. Joseph Garfield, Assoc.M.Inst.C.E., Sewage Works Engineer, Bradford.

The Contract will be let subject to the fair contracts clauses of the Corporation, which may be seen at the Engineer's Office, and which the accepted contractor will be required to sign.

Sealed Tenders, endorsed "Esholt Sewage Disposal Works, Contract No. 22," must be delivered at the Office of the undersigned not later than 10 a.m., 3rd September, 1912.

The Corporation do not bind themselves to accept the lowest or any Tender.

FREDERICK STEVENS,
Town Clerk.

Town Hall, Bradford.
July 16, 1912.

Institution of Water Engineers.

SUMMER GENERAL MEETING AT CHELTENHAM.

(*Conclusion.*)

Among the contributions at the recent summer general meeting of the Institution of Water Engineers at Cheltenham was a paper by Mr. L. Richardson, F.R.S.E., F.L.S., F.G.S., entitled

THE GEOLOGY OF CHELTENHAM, WITH SPECIAL REFERENCE TO THE WATER SUPPLY.

In his paper Mr. RICHARDSON endeavoured to make it clear that towns situated on the lower lias at the foot of hills composed of rocks which dip away from those towns, and which also constitute divides between great river systems, must go some distance afield in order to secure a continuous adequate supply of water. Cheltenham, he pointed out, had had to draw upon the Severn at Tewkesbury, and Gloucester had resorted to the abundant supply contained in the triassic sandstones of the Newent district. A boring that had recently come under his notice was the means of furnishing some very instructive information. Firstly, it emphasised the extreme toughness of the lower lias limestones; secondly, it proved the great thickness in this district of the limestones and clays which make up the lower portion of the lower lias; and, thirdly, it revealed the salinity of the waters. He was now inclined to think that the Cheltenham mineral waters after all had not so deep-seated an origin as it had been customary to suppose; that, instead of being derived from the Keuper, they came solely from the lower lias. One of the principal water horizons in that part of Gloucestershire was that where the relatively impervious lower lias clays met with the succeeding sandy clays of the middle lias. The sandy beds were easy to locate. In ascending the lower portion of the hill slope, damp ground would be noticed followed by dry soil with a wealth of gorse bushes. Above the slope marked by gorse bushes would usually be found flat ground, originated by the hard marlstone. Water falling upon the porous ground sank in, and, as the prevalent dip was in a south-easterly direction, soon disappeared, travelling in that direction. Consequently, if a comparatively small supply of water were desired from that source, the further up the hill slope the well sinker went the better; but, of course, the well had to be deeper. A number of springs also issued from the neighbourhood of the marlstone. As that contains a considerable amount of iron (not, however, in sufficient quantity in Gloucestershire to work commercially), the water was usually very ferruginous. Such highly coloured water might be observed at a spring above Woodmancote and at another near Prinknash, while the name "Red Well" for a spring at Matson, near Gloucester, explained itself. The principal horizon from which water issues in the district was from the top of the upper lias clays, that was from the base of the porous overlying Cotswold sands or inferior oolite limestones. The prevalent dip of the inferior oolite beds was again to the south-east, but the beds were much faulted. Also the hill masses, over the whole of which these inferior oolite beds were originally continuous, had been much dissected by the backward growth of tributaries of the river Severn. Some head waters which once were contributed to the Thames had been diverted to the Severn. But, in spite of this, it had been a considerable drawback to towns and villages at or near the foot of the Cotswold Hills that the dip of the beds had been away from them. If it had not been for the little valleys produced by the headward growth of the Severn tributaries and faults, such towns and villages would have been at one period very badly off. The river Chelt, which contributed most of the water that was stored in the Dowdeswell reservoir, derived its main supply from this horizon.

Mr. H. PRESTON (Grantham) said he would like to know the reason for the highly coloured water which had been observed at certain springs by Mr. Richardson. They had heard of this having occurred in the Gloucester reservoirs, and he asked whether it was considered there was any connection between the two, or whether it was simply precipitation of the iron oxide in the water. The author of the paper was inclined to think the Cheltenham mineral waters came solely from the lower lias; in Lincolnshire they usually found saline water in that formation. He had read the paper with extreme interest, particularly as it referred to rocks with which he was most acquainted in his own county, and it was gratifying to have had such a contribution before the meeting.

Mr. R. READ (Gloucester) stated that there were similar mineral waters to those of Cheltenham at Gloucester, and they undoubtedly came out of partings in the lower lias clay. There were beds of nodules of stone 4 in. or 5 in. in thickness, and these produced the water.

Mr. GEORGE EMBREY (Gloucester) said he could bear out what Mr. Preston had said. The clay in that part of the country yielded water in all directions, but the water from every well was different in character.

Mr. RICHARDSON, in reply, stated that the red colour of the water was, of course, due to oxide of iron. One point to which he wished to refer was the practice which he had made of keeping a careful record of all borings that were put down in the district, his opinion being that it was very desirable that these should be available for reference. He thought it would be very convenient if the record of every deep boring made were included in the "Proceedings" of the Institution of Water Engineers; it would then be an easy matter to obtain information when it was required.

WATER REGULATIONS COMMITTEE'S REPORT.

In the course of the recent meeting of the Institution of Water Engineers a report on the work of the Incorporated Joint Committee on Water Regulations, prepared by Mr. F. J. Bancroft (Barnet), one of the representatives of the institution on the committee, was submitted by the president, Mr. J. S. Pickering. The report was as follows:—

"In the year 1908 the Joint Committee issued a model code of water regulations, attached to which were appendices containing standard specifications of various water fittings in common use, and extracts from General Water Acts relative to the waste and misuse of public water supplies. On this occasion the committee were unable to guarantee that the Local Government Board would sanction the adoption of the model code by those water authorities who were dependent upon the sanction of the board for the regulations. Several corporations and companies, who were empowered by their private Acts to issue regulations and by-laws independently of the Local Government Board, adopted the model code *in extenso*; while many other water authorities submitted the code to the board for their approval—for the moment, however, without success.

"The incorporation of the Joint Committee, the registration of a 'standardisation mark' (under regulations approved by the Board of Trade) for use on fittings constructed in accordance with the standard specifications, and conferences between representatives of the committee and the Local Government Board officials, contributed to the strengthening of the position of the committee, and the removal of the board's objections to the model code. Thus in the course of last year the board issued a revised edition of their own 'Model By-laws,' which in many vital points showed that the recommendations of the committee had been adopted. In connection with this the board issued a preface, in which the work of the committee and the assistance rendered by the Institution of Water Engineers and other bodies were fully recognised; moreover, the board clearly indicated the possibility of water authorities publishing officially, in the form of 'Conditions of Supply,' annexed to water regulations, such parts of the model code as could not for the moment be accepted by them as by-laws subject to legal penalties for breach.

"The committee have now prepared in pamphlet form—(1) the Model By-laws issued by the Local Government Board, (2) those issued by the committee revised to date, and (3) supplemental conditions of supply which it is proposed should be adopted, as far as they may apply, by water authorities, and issued as an appendix to the statutory by-laws approved by the Local Government Board. This pamphlet will shortly be supplied gratuitously to all members of the institution in charge of water undertakings; and

it is hoped that, as a result, a large number of water authorities will now adopt a uniform code of water regulations.

"The institution is represented on the Joint Committee, not only by the two delegates specifically appointed by the council (Mr. F. J. Bancroft and Mr. Frederick Griffith), but by fifteen other members appointed by their respective water authorities; so that of the forty-eight members of the committee, seventeen, or more than 35 per cent, are members of the institution. The council feel every confidence, therefore, in commending the work of the committee to all the members, and in urging them to assist as much as possible in securing uniformity of practice in so important a matter as that of water regulation for preventing the waste, undue consumption, misuse, or contamination of public water supplies."

DUST PREVENTION IN FRANCE.

According to a statement by Consul William H. Hunt, of St. Etienne, France, a report has been made to the French Academy of Science drawing attention to the detrimental effect on the eyes of the dust arising from tarred roads.

In an experiment made to determine the nature of this effect, mixtures were made up consisting of fine road dust and tar in varying proportions and the eyes of rabbits were dusted with the mixtures. Results showed that while the pure road dust had little or no effect on the rabbits, their eyes were greatly affected by the presence of tar, and serious diseases broke out after the application, showing its noxious effect.

The report to the academy states that tar produces good results only if the roads are well built and kept in good repair, and are composed of sufficiently hard material, if the tar fully penetrates the crevices and does not form a merely external crust, which the first winter rains raise up and form into mud, and if the drying conditions during the dry season are satisfactory. Under these conditions, the report states, it may be said that tar effectively protects the surfaces of highways against motor-car traffic and against ordinary traffic if it is not extraordinarily heavy.

The use of superficial tarring is becoming more and more extended in the neighbourhood of Paris. In the St. Etienne district, and other parts of provincial France, progress has been slower except near a few large industrial centres. The appropriations allowed for experiments in tar roads in 1909 amounted to £3,815, covering 106 kilometers of roads.

In the department of Loire the tar is spread hot by hand or by spraying. Another method of application consists of rendering cold tar fluid by the addition of 10 per cent crude oil and spreading it by the same means and the same manner as hot tar. In the department of Seine et Oise recent experiments have been made with various tar and oil emulsions. Deliquescent salts were found to be of shorter duration, so that they can be applied only for special occasions, such as fêtes, races, &c. This department each year uses solutions of calcium chloride for watering certain sections of the roads which are not in sufficiently good condition to receive a coat of tar. The cost of this process is about 1d. per square metre.

But few experiments have been made in France with crude petroleum on account of the high cost and the inconvenience of the mud which appears with the autumn rains.—From the *Contract Record* (Toronto).

An Opportunity for Assistants and Town-planning Experience.—In our last issue (p. 75) we referred under this heading to opportunities for "good third-year municipal engineer's pupils," and for anyone seeking practical experience in town planning. We have received a number of applications, and have forwarded them to the Assoc.M.Inst.C.E., who will make the appointments, but, as the matter is not yet closed, we shall be pleased to forward any further applications that arrive in response to this second announcement. All communications should be addressed to the Editor of The Surveyor, and their envelopes should be marked "Appointment." We may add that the work offered will be carried out in a district distinctly attractive for its healthy and beautiful surroundings, and under a chief whose training should be invaluable, and whose name will carry great weight as a recommendation for future appointments. The schemes in hand cover 11½ square miles, and provide for an increase in population of at least 35,000 in three and a-half years.

SOME RECENT PUBLICATIONS.*

The Sewerage Engineer's Pocket-book (in German). By Dr.-Ing. K. Imhoff. Price 2·80 marks. Munich: R. Oldenburg.

This little book contains in a small compass a large amount of valuable information and suggestions for engineers engaged in preparing schemes of sewerage and sewage disposal. In addition to the suggestions upon the points to be observed, a large number of valuable diagram curves, showing the flow of water in sewers of various sections, including some not in general use, are given. Examples are given of the methods of calculating the sewers in accordance with German practice, and the book is well worthy of study by English engineers.

Problems in Engineering, with Solutions. Edited by Sydney G. Turner, Assoc.M.Inst.C.E. Price 5s. nett. London: St. Bride's Press, Limited.

In this volume are collected about 130 of the most useful problems which have appeared in the "Assistants' and Students' Section" of The Surveyor, together with solutions. They are classified under ten headings, according to the subject-matter, and the volume forms a handy note-book in such subjects as mechanics, strength of materials, water supply, sewerage and sewage disposal, and many others. The fact that each question contained in the volume deals with a point which has caused difficulty to the original inquirer is proof that the book will be of great use in the elucidation of knotty points in daily practice. Published in response to repeated requests from readers of the "Assistants' and Students' Section," the book will be found useful not only to those for whom that feature of The Surveyor is specially meant, but also to many older members of the profession.

The Main Drainage of Towns. By Noel F. Taylor, C.E., M.I.Mun.E. Price 12s. 6d. nett. London: Chas. Griffin & Co., Limited.

The term "main drainage" is usually applied to the main sewers only of a town, and if this definition is accepted, the title of Mr. Noel Taylor's book is, in a degree, misleading, seeing that it deals with sewers of all sizes, their construction and ventilation, the principles of hydraulics and hydrostatics, house drainage, the pumping of sewage, the theoretical consideration of sewage disposal, and the design and construction of sewage disposal works. A large number of books dealing with main drainage and sewerage alone have been produced in the past. Others deal with sewage disposal by itself, and in both cases volumes of considerable size have been necessary in order to deal with the subjects fully, and even then much more space might have been given with advantage to the further treatment of the subject.

In the present case the author has attempted to deal in detail, in 161 pages, with main drainage proper, including the principles of hydraulics and hydrostatics, thirty pages being devoted to the pumping of sewage, twenty-three to house drainage, nineteen to the theory of sewage disposal, and forty-eight to sewage disposal works. It is clear that, under these restrictions, the author has set himself a most difficult, if not impossible, task—*viz.*, to deal in full detail with his various subjects, and at the same time to avoid confusion. He has made a worthy attempt to compress within small limits an enormous amount of information, including elaborate illustrations, diagrams, mathematical calculations, tables, and chemical and bacteriological work. A book of this kind, which contains in so small a space so large an amount of matter, must obviously require the most careful correction and checking, and the work of editing it properly would be a severe task. This attention does not appear to have been given.

It is possible that one may obtain an incorrect impression on first examining the book, but an unfavourable impression is created by the preliminary study, when one finds ungrammatical, vague, or incorrect statements, such as the following: "Concrete" is the term applied to all mixtures of a semi-liquid state used in building construction which have the property of hardening . . . the aggregate is best made from porous material . . . the proportions of concrete vary, but the usual one is 6–1 sand, plus gravel and the best Portland cement." Such sentences as these show careless correction of the proofs. Again, such a statement as "Opinions regarding the manurial value of sewage are very complicated and probably much over-estimated" reminds one of Mark Twain's remark

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

to the effect that the report of his death had been very much exaggerated. Again, we are told that "General Scott sought to make cement from sludge precipitated by lime and clay, which it failed to do in sufficient quantity or of a quality to prove of any monetary value." We are also told "the awful forms" of certain appliances in common use "is incredible."

These are, after all, chiefly errors in composition but at the same time they show carelessness, and the reader at once becomes suspicious as to the accuracy of the rest of the work. On the other hand, the author has certainly presented a number of sketches and designs which may be of considerable service; the book represents an enormous amount of labour, and it would be ungrateful not to acknowledge the trouble taken. The book will certainly be useful to engineers who have sufficient experience to enable them to discriminate between right and wrong, but it is impossible to speak with unqualified approval of a scientific book the English of which is so faulty as to render the sense of the text obscure, neither is it possible to place absolute reliance upon the accuracy of the work, to the editing of which insufficient attention has been given. "The Main Drainage of Towns" contains material for a good and useful book, but it has been presented by the publishers without the usual corrections and revision being made. The grammatical errors should at least have been set right by the publishers' reader.

Junior Institution of Engineers.—About 100 members of the Junior Institution of Engineers recently paid a visit to the works of the Marconi Wireless Telegraph Company at Chelmsford.—On the 27th inst. a visit will be paid to the Chingford reservoir and pumping station.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. THOMAS, M.INST.C.E., County Surveyor, Buckinghamshire.

EXAMINATION.

The October, 1912, examination will be held in Birmingham on the 10th 11th and 12th of that month.

COUNCIL MEETING.

At a council meeting held at Caxton Hall, Westminster, S.W., on Thursday, July 11, 1912, there were present: Messrs. A. D. Greatorex (outgoing president in the chair), R. J. Thomas (incoming president), Sir James Lemon (hon. treasurer), T. W. A. Hayward, G. F. Carter, E. B. Martin, J. W. Cockrill, E. J. Elford J. S. Pickering, T. W. Stainthorpe, H. T. Wakelam, W. H. Prescott, O. E. Winter, W. T. Lancashire, W. Stubbs, J. S. Brodie, W. N. Blair, W. Harpur, W. Jones, E. P. Hooley, G. A. Phillips, J. L. Redfern, E. R. Matthews, N. Scorgie, A. H. Campbell, Thomas Cole (secretary), and H. A. Giles (assistant secretary).

The following gentlemen were:

Elected as Members: Messrs. R. G. Gurney, surveyor, Ledbury Urban District Council; J. G. Matthew, deputy surveyor, Exmouth Urban District Council; A. D. Barron, deputy borough engineer, Douglas; W. Bennett, executive engineer, Public Works Department Rangoon; S. R. Drake surveyor, Leatherhead Urban District Council; J. H. Walters, borough surveyor, Congleton; S. Palmer, borough surveyor, St. Ives; J. B. Nuttall, borough surveyor, Heywood; P. Sinclair, burgh surveyor, Carnoustie; J. Gorman, State engineer to the Government of Kedah, Malay States; H. Holmes, borough surveyor, Ossett; and R. Robertson, county road surveyor, Inverness.

Elected as Associate Members: Messrs. A. D. Scott, engineering assistant, Barrow-in-Furness; W. H. Duckworth, engineering assistant, Watford Urban District Council; S. J. Kirby, engineering assistant, Batley; and S. F. Hopley, assistant surveyor, Bedwellty Urban District Council.

Transfer Associate Member to Member: Mr. H. E. Goldsmith, chief assistant, Public Works Department, Hong Kong.

Elected as Students: Messrs. R. A. Adamson, Chiswick; W. A. Walker, Stourbridge; and C. F. Hodson, Lincoln.

(By order of the Council)

THOMAS COLE, *Secretary.*

11 Victoria-street, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. E. A. STICKLAND, ASSOC.M.INST.C.E., Borough Surveyor, Windsor.

NORTH-WESTERN DISTRICT MEETING AT CLITHEROE.

A meeting of the Institution of Municipal Engineers will be held on Saturday, July 27th, at Clitheroe.

PROGRAMME.

10.15 a.m.—Meet at Clitheroe Station and proceed on a round of visits to the following works:—
(1) Isis Cement Company's cement works.
(2) Horrocksford Lime Company's tar-macadam works.
(3) Messrs. R. Briggs & Son's stone quarries.
(4) Messrs. J. Carter & Company's stone quarries and tar-macadam works.

1 p.m.—Meet at the town hall, where members will be received by his Worship the Mayor, Alderman C. Mitchell, and Alderman Hardacre, chairman of the Highways and Waterworks Committee.

1.30 p.m.—Lunch.

2.30 p.m.—Wagonettes leave town hall for waterworks.

5.30 p.m.—Tea in the town hall, followed by—

6.30 p.m.—Meeting, when a paper, "Municipal Progress in Clitheroe," by Mr. A. R. Bleazard, borough surveyor, will be read.
Election of district officers.

Members are requested to fill in the usual form and return it to me not later than Wednesday, July 24th.

GEORGE HAYES, *Hon. District Secretary.*

147 Church-street,
Westhoughton, Lancs.

ROYAL SANITARY INSTITUTE.

ANNUAL CONGRESS AND EXHIBITION AT YORK.

The annual congress of the Royal Sanitary Institute, which is to take place this year at York, will open on July 29th. The proceedings will commence with a reception of the members and delegates in the Mansion House by the Lord Mayor, a public luncheon following, and in the evening the inaugural address to the congress will be delivered by the Archbishop of York.

On Tuesday, July 30th, a conference of municipal representatives and of engineers and surveyors will be held in the Exhibition Buildings, and on Friday, August 2nd, and the following day, the Engineering and Architecture Section will meet in the Museum. Mr. A. D. Greatorex, M.INST.C.E., borough engineer and surveyor of West Bromwich, will preside at the conference of engineers and surveyors, and the section devoted to engineering and architecture will have as its chairman Mr. J. Walker Smith, M.INST.C.E., chief engineering inspector to the Local Government Board for Scotland.

At the conference of engineers and surveyors discussions will take place on, among others, the subjects of Housing and Town Planning Progress, to be opened by Mr. H. Gilbert Whyatt, ASSOC.M.INST.C.E., borough engineer and surveyor, Grimsby, and Sewage Disposal in Rural Districts, to be opened by Mr. Ascough Rodwell, surveyor to the Skipton Rural District Council. The question of the modification of the Model Building By-laws from the rural point of view will be considered in the Engineering and Architecture Section.

The opening of the Health Exhibition arranged in connection with the congress has been fixed for Saturday, July 27th.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1360 Holborn), subject to later confirmation by letter.*

BUILDING INSPECTOR.—July 20th.—Corporation of Bradford. £120 per annum.—Mr. Frederick Stevens, town clerk.

INSPECTOR OF NUISANCES.—July 22nd.—Mynyddislwyn Urban District Council. £80—£100.—Mr. T. C. Griffiths, clerk, Blackwood, Mon.

CLERK OF WORKS.—July 22nd.—Evesham Rural District Council. £2 10s. per week.—Mr. E. H. Wadhams, clerk.

ROAD FOREMAN.—July 22nd.—Corporation of Birmingham. 40s.—Mr. H. E. Stilgoe, city engineer.

JUNIOR DRAUGHTSMAN. —July 22nd. — Derbyshire Education Committee. £100 per annum.—Mr. G. H. Widdows, County Education Office, St. Mary's-gate, Derby.

ENGINEER AND SURVEYOR'S TEMPORARY ASSISTANT.—July 22nd.—Wembley Urban District Council. £3 3s. per week.—Mr. C. R. W. Chapman, engineer and surveyor.

CLERK OF WORKS.—July 22nd.—Neath Rural District Council. £2 10s. per week.—Cuthbertson & Powell, clerks.

CLERK OF WORKS.—July 23rd.—Truro Rural District Council.—Mr. C. Hancock, solicitor, Truro.

CEMETERY SUPERINTENDENT. — July 23rd.—Corporation of Grimsby. £85—£100 per annum.—Mr. Gilbert Whyatt, borough engineer and surveyor.

CLERK OF WORKS.—July 25th.—Alnwick Urban District Council. £3 3s. per week.—Mr. John Balmbra, clerk.

HIGHWAY SURVEYOR. — July 26th.— Newbury (Berks) Rural District Council.—£100 per annum.—Mr. S. V. Pinniger, clerk, Market-place, Newbury.

CLERK OF WORKS.—July 26th.—Seisdon Rural District Council. £3 3s. per week.—Mr. Herbert Taylor, clerk.

ASSISTANTS TO COUNTY SURVEYOR.—July 27th.—West Sussex County Council. £130—£150.—Mr. H. W. Bowen, county surveyor, 23 North-street, Horsham.

CLERK OF WORKS.—About middle of July.—Essex County Council. £3 3s. per week.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

HIGHWAY SURVEYOR AND INSPECTOR.—July 27th.—Wantage Urban District Council. £140 per annum.—Mr. E. B. Ormond, clerk.

CLERKS OF WORKS.—July 29th.—For the construction of covered service reservoir of concrete.—Mr. W. Fiddian, civil engineer, Stourbridge.

FOREMAN.—July 29th.—East Grinstead Urban District Council. 30s.—35s.—Mr. W. E. Woollam, engineer and surveyor.

CHIEF ASSISTANT.—July 29th.—Corporation of Clydebank. £120 per annum.—The Town Clerk, Municipal Buildings, Clydebank.

CLERK OF WORKS.—July 29th.—Newburn Urban District Council. £2 10s. per week.—Mr. G. Wilkinson, clerk.

INSPECTOR OF NUISANCES.—July 29th.—Elham Rural District Council. £120 per annum.—Mr. B. C. Drake, clerk, Hythe, Kent.

PERMANENT WAY FOREMAN.—July 30th.—Pontypridd Urban District Council. £130—£150 per annum.—Mr. J. Colenso Jones, clerk.

FIRST ASSISTANT SURVEYOR.—July 30th.—Pontypridd Urban District Council. £100—£140 per annum.—Mr. J. Colenso Jones, clerk.

CLERK OF WORKS.—August 3rd.—Corporation of Hyde. £3 per week.—Mr. T. Brownson, town clerk.

ASSISTANT ENGINEER.—August 31st.—Darjeeling Municipality, India. 150 rupees monthly.—The Chairman.

MUNICIPAL COMPETITIONS OPEN.

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CARDIFF.—August 6th.—Designs and estimates for fire station.—The Town Clerk.

GOOLE.—September 1st.—Competitive designs and estimates for municipal offices, for the urban district council. Two premiums £30 and £15.—Mr. R. Tyson, clerk.

CHORLEY.—September 9th.—Designs for a school, for the corporation.—Mr. J. Mills, town clerk.

GLASGOW.—October 29th.—Preliminary sketch designs are invited by the corporation for the extension of the municipal buildings. Honorariums of 100 guineas to five selected designs.—Mr. John J. Burnet, A.R.S.A., 239 St. Vincent-street, Glasgow, is assessor.—Applications to the clerk, Mr. J. Lindsay, town clerk.

HUDDERSFIELD.—October 31st.—Designs for laying out certain areas as a town planning scheme, for the corporation. Premiums of 100, 50, and 25 guineas.—Mr. J. Henry Field, town clerk.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those requiring for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

Buildings.

WEST RIDING.—July 19th.—For alterations to playground entrance, and rebuilding walls of school for the Education Committee.—Mr. Francis Alvey Darwin, clerk.

RUNCORN.—July 19th.—For the construction of an underground reservoir, for the rural district council.—Mr. G. F. Ashton, clerk.

GLASGOW.—July 20th.—For relining chimney stalk with firebrick, for the corporation.—Mr. J. Lindsay, town clerk.

KENT.—July 20th.—For works of painting and repairs at a council school, for the Education Committee.—Mr. H. Fielding, 15 Burgate-street, Canterbury.

WILLITON.—July 20th.—For the construction of a sea-wall about 50 yds. long, timber groyne, and other incidental works, for the rural district council.—Mr. Frank Risdon, clerk, Williton, Somerset.

EVESHAM.—July 22nd.—For alterations and additions to a cottage, for the corporation.—Borough Surveyor.

GLAMORGAN.—July 22nd.—For alterations and additions and painting at council schools, for the county council.—Mr. T. Mansel Franklen, clerk, Council Offices, Cardiff.

NORTHAMPTON.—July 22nd.—For the masonry and other works required in the widening of the South Bridge over the river Nene in three arched spans, for the corporation.—Mr. Herbert Hankinson, town clerk.

BRADFIELD.—July 22nd—29th.—For the construction of waterworks, for the rural district council.—Mr. R. E. Rawstorne, clerk, 4 Bridge-street, Caversham, Reading.

BECKENHAM.—July 22nd.—For the erection of caretaker's lodge and public conveniences, for the urban district council.—Mr. J. A. Angell, surveyor.

LEICESTER.—July 23rd.—For the erection of a carshed and other works, for the corporation.—Mr. E. G. Mawbey, borough engineer.

ANGLESEY.—July 23rd.—For the erection of a school, for the Education Committee.—Mr. J. Owen, F.R.I.B.A., county architect, Menai Bridge.

MANCHESTER.—July 23rd.—For the erection of conveniences and shelters, for the corporation.—The Clerk.

BERWICK-UPON-TWEED.—July 23rd.—For the construction of a service reservoir to hold about 700,000 gallons, for the sanitary authority.—Mr. W. Weatherhead, clerk.

DEVON.—July 24th.—For alterations and repairs to public schools, for the Education Committee.—The Architect, 1 Richmond-road, Exeter.

DERBYSHIRE.—July 24th.—For the erection of a lock-up, courthouse and residence, for the Standing Joint Committee.—Mr. N. J. Hughes-Hallett, clerk, County Offices, Derby.

STOURBRIDGE.—July 25th.—For the construction of a covered service reservoir of a capacity of 500,000 gallons, and other works, for the District Water Board.—Mr. J. Donaldson Harward, clerk, High-street, Stourbridge.

BEDFORD.—July 25th.—For repairs to council schools, for the County Education Committee.—County Surveyor, Shire Hall, Bedford.

MUCH WOOLTON.—July 25th.—For the erection of a shelter and public convenience, for the urban district council.—Mr. Thos. D. Syers, clerk.

SHEFFIELD.—July 26th.—For extensions to electric power station, for the corporation.—The Clerk.

PORTSMOUTH.—July 26th.—For erecting store and mess-room at refuse destructor, for the corporation.—Mr. G. Hammond Etherton, town clerk.

BURNLEY.—July 27th.—For the concrete work in the repair of the sewage tanks, for the rural district council.—Mr. H. Pritchard, engineer.

LLANDOVERY.—July 29th.—For the construction of new intake and filtering gallery, and laying steel main at the water supply works, for the corporation.—Mr. H. Alfred Thomas, town clerk.

BIRMINGHAM.—July 30th.—For the erection of a tramway depot, for the corporation.—Chairman of the Tramways Committee.

MONTGOMERYSHIRE.—July 31st.—For improvements and alterations to a school, for the Education Authority.—Mr. L. Phillips, clerk, Newtown.

ST. HELENS.—July 31st.—For the erection of a public library, for the corporation.—Mr. A. W. Bradley, borough engineer.

WEST RIDING.—August 9th.—For the erection of a school at Silsden, for the Education Committee.—Education Architect, County Hall, Wakefield.

BRADFORD. — For the erection of single-room dwellings, for the corporation.—Mr. F. Stevens, town clerk.

Iron and Steel.

ISLINGTON. — July 24th. — For the supply of 3,000-kw. steam turbine alternator, exciter, condensing plant, switch gear, and circulating and steam piping, for the borough council.—Mr. W. F. Dewey, town clerk.

STOURBRIDGE.—July 25th.—For the supply and delivery of about 857 tons of cast-iron pipes, for the District Water Board.—Mr. J. Donaldson Harward, clerk.

WOOD GREEN.—July 31st.—For the supply of unclimbable wrought-iron fencing and six pairs of gates, for the urban district council.—Engineer and Surveyor.

VALETTA.—August 1st.—For the supply of pipes and castings, for the Director of Contracts.—Crown Agents for the Colonies, Whitehall-gardens.

Roads.

WANDSWORTH.—July 20th.—For the purchase of a Leyland patent steam motor wagon, fitted with interchangeable tipping body and 1,000-gallon tank for street watering, for the borough council.—Mr. P. Dodd, borough engineer.

LUTON.—July 20th.—For the supply of broken granite and broken slag, for the corporation.—Borough Surveyor.

CHELTENHAM.—July 20th.—For providing and laying 5,000 sq. yds. of creosoted deal block pavements, for the corporation.—Mr. J. S. Pickering, borough engineer.

HALIFAX.—July 20th.—For carrying out private improvement works, for the corporation.—Mr. J. Lord, borough engineer.

ST. ANNES-ON-THE-SEA.—July 22nd.—For making up certain streets, for the urban district council.—The Surveyor.

SOUTHAMPTON. July 22nd. For works of slab paving, for the corporation.—Borough Engineer.

WANDSWORTH.—July 22nd.—For flagging the footways of Grove-road, Balham, for the borough council.—Mr. D. A. Nicholl, town clerk.

WEST SUFFOLK.—July 22nd.—For the supply of road tools, for the county council. Mr. A. Townshend Cobbold, clerk, Bury St. Edmunds.

BROADSTAIRS.—July 22nd.—For the supply of kerbing and channelling, for the urban district council.—Mr. L. A. Skinner, clerk.

WANDSWORTH.—July 22nd.—For the construction of a sewer at Southfield, for the borough council.—Mr. D. A. Nicholl, town clerk.

BECKENHAM.—July 22nd.—For the supply of binding materials for Wickham-road, Hayes-road and Thesiger-road, for the urban district council.—Mr. F. Stevens, clerk.

CHESTER-LE-STREET. — July 22nd–31st. — For making up certain private streets, for the rural district council.—Mr. G. W. Ayton, highway surveyor.

SOUTHALL-NORWOOD.—July 23rd.—For works of paving, channelling and kerbing, for the urban district council.—Mr. R. Brown, engineer and surveyor.

EALING. — July 23rd. — For making up private gardens, Warwick-place, and back alleys of the West Elers estate, for the corporation.—Mr. Geo. E. Brydges, town clerk.

HORNSEY.—July 23rd.—For making up a thoroughfare, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor.

NEATH.—July 23rd.—For supplies of granite or syenite and limestone metalling, for the corporation. Mr. D. M. Jenkins, borough engineer.

EALING.—July 23rd.—For laying about 8,850 super. yds. of tarred slag macadam and other works, for the corporation.—Mr. Geo. E. Brydges, town clerk.

KEARSLEY.—July 24th.—For repaving 8,700 super. yds. of main road with granite setts, for the urban district council.—Mr. H. Martin, clerk.

ISLE OF WIGHT.—July 24th.—For the supply of Cherbourg quartzite, for the rural district council.—Mr. H. Eldridge Stratton, clerk.

BATTLE.—July 24th.—For steam rolling the district roads, for the rural district council.—Mr. F. Gorham Ticehurst, clerk.

BUCKLOW.—July 24th.—For levelling, metalling, and channelling, for the rural district council.—Mr. J. McD. McKenzie, surveyor, Station-buildings, Altrincham.

STAINLAND (Yorks).—July 24th.—For taking up, redressing and repaving, for the urban district council.—Mr. J. H. Walker, surveyor.

RHONDDA.—July 25th.—For making up work and the construction of retaining wall, for the urban district council.—Mr. W. J. Jones, engineer.

BURY.—July 25th.—For flagging and kerbing works, for the corporation.—The Clerk.

STOCKPORT.—July 25th.—For making up certain streets, for the corporation.—Mr. J. Atkinson, borough surveyor.

BURNLEY.—July 27th.—For the execution of a road improvement, for the rural district council.—Mr. H. Pritchard, surveyor.

WEST RIDING.—July 27th.—For kerbing, channelling, pitching, surface-water drainage, and walling, for the Highways Committee.—The County Surveyor, County Hall, Wakefield.

WITHAM. — July 29th. — For the use per day of steam roller and scarifier, for the urban district council.—Mr. W. P. Perkins, surveyor.

WITHAM.—July 29th.—For the supply of granite, for the urban district council.—Mr. W. P. Perkins, surveyor.

NEW SARUM.—July 29th.—For works of making up, for the corporation.—Mr. Francis Hodding, clerk.

EAST PRESTON.—July 29th.—For steam rolling the district roads, for the rural district council.—Mr. A. Shelley, clerk, Littlehampton.

CHESTER-LE-STREET.—July 29th.—For the construction of a new road, for the rural and urban councils.—Mr. W. Ayton, highway surveyor.

SWANSEA.—July 29th.—For the construction of a new road, for the rural district council.—Mr. E. Harris, clerk.

NEWBURN.—July 29th.—For making up certain streets, for the urban district council.—Mr. T. Gregory, surveyor.

SALISBURY.—July 29th.—For making-up work, for the corporation.—Mr. W. J. Goodwin, city engineer and surveyor.

STRATFORD-ON-AVON.—July 29th.—For the supply of broken and unbroken road macadam, for the corporation.—Mr. Roden Dixon, borough surveyor.

WATFORD.—July 30th.—For making up certain footpaths, for the urban district council.—Mr. W. Hudson, clerk.

WOODFORD. — July 30th. — For the supply of granite and steam rolling, for the urban district council.—Mr. W. Farrington, surveyor.

HAMMERSMITH.—July 31st.—For making up a thoroughfare, for the borough council.—Mr. H. Mair, borough surveyor.

LANARK.—August 1st.—For repairs to Craig-street, for the District Committee of the Middle Ward.—Mr. W. E. Whyte, district clerk, Hamilton.

BARNET.—August 1st.—For works of repaving, rekerbing and channelling in High-street, for the urban district council.—Mr. Henry W. Poole, clerk.

BARNET.—August 1st.—For making up of private street, for the urban district council.—Mr. Hy. W. Poole, clerk.

TEDDINGTON.—August 3rd.—For making up certain roads, for the urban district council.—Mr. M. Hainsworth, surveyor.

SUNBURY-ON-THAMES. — August 6th. — For the supply of granite, for the urban district council.—Mr. H. F. Coales, surveyor.

BUNGAY.—August 8th.—For the supply of Mountsorrel or Quenast granite, for the urban district council.—Mr. P. J. Sprake, clerk.

CHICHESTER.—August 29th.—For making up with granite macadam about 10,000 super. yds. of London-Portsmouth road, for the corporation.—Mr. J. W. Loader Cooper, town clerk.

CASABLANCA.—August 29th.—For the improvement of several roads, for the Special Committee of Public Works.—The President, Comité Special des Travaux Publics, Dar En Niaba.

CASABLANCA.—August 31st.—For the construction of public roads, for the Moroccan Adjudications Commission.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

Sanitary.

UPTON-ON-SEVERN.—July 20th.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. G. H. T. Foster, clerk.

DONCASTER.—July 20th.—For scavenging and the removal of house refuse, for the rural district council. —Mr. H. Thirwall, inspector of nuisances.

MERTHYR.—July 20th.—For scavenging work, for the corporation.—Mr. T. Aneuryn Rees, clerk.

WIGTON.—July 22nd.—For the construction of glazed socketed earthenware-pipe sewer, for the rural district council.—Mr. T. B. Simmons, surveyor.

ST. LEONARDS.—July 22nd.—For laying stoneware pipe sewer, for the corporation.—Mr. P. H. Palmer, borough engineer.

HOOLE.—July 22nd.—For works of sewerage, for the urban district council.—Mr. F. Davies, building surveyor, 14 Newgate-street, Chester.

EARSDON.—July 22nd.—For laying earthenware sewer, for the urban district council.—Mr. J. R. MacMillen, surveyor, Shiremoor, Newcastle-upon-Tyne.

POOLE.—July 22nd.—For the supply of three iron-bodied sanitary tumbler carts of 200-gallons capacity, for the corporation.—Mr. S. J. Newman, borough surveyor.

NORWICH.—July 22nd.—For the removal and disposal of nightsoil, ashes and other refuse, for the corporation.—Mr. A. H. Miller, town clerk.

SEDGEFIELD.—July 23rd.—For work of scavenging, for the rural district council.—Mr. J. W. Lodge, clerk.

SWINTON. — July 24th. — For supplying six sprinklers for percolating filters, and media, for the urban district council.—Mr. H. Entwisle, surveyor.

REPTON.—July 24th.—For laying socket-pipe sewer, for the rural district council.—Mr. F. W. Bullock, surveyor, Egginton, Derby.

RUNCORN.—July 24th.—For the removal of nightsoil, for the rural district council. — Mr. Geo. F. Ashton, clerk.

LARNE.—July 24th.—For the construction of the Greenisland sewerage works, for the rural district council.—The Clerk.

HEXHAM.—July 25th.—For the construction of sewage disposal works, for the rural district council. —Mr. J. H. Nicholson, clerk.

GOOLE.—July 29th.—For the construction of 4 miles of sewers formed with stoneware and cast-iron pipes, concrete tubes and brickwork, pumping station, screen and suction tanks, engine-house, pumping machinery, cast-iron main, and other works, for the urban district council.—Mr. Robert Tyson, clerk.

NORTON.—July 29th.—For scavenging work, for the rural district council.—Mr. J. E. Moulding, clerk, The Edge, Sheffield.

NOTTINGHAM. — July 29th.—For the supply of sanitary fittings at schools, for the corporation.—Mr. F. B. Lewis, city architect, Guildhall.

BATH.—July 29th.—For the construction of iron and stoneware intercepting sewers, for the corporation.—City Surveyor.

LEISTON-CUM-SIZEWELL.—July 30th.—For the construction of grit chamber and settling tank, with manhole, for the urban district council.—Mr. Harold A. Mullens, clerk.

MIDSOMER NORTON.—July 31st.—For the construction of stoneware pipe sewers, for the urban district council.—Mr. C. H. Sunderland, surveyor.

CANNOCK.—August 2nd.—For washing of bacteria-bed medium, for the urban district council.—The Clerk.

COCKERMOUTH.—August 3rd.—For laying a surface drain, for the rural district council.—Mr. J. H. Musgrave, clerk.

TINTWISTLE.—August 7th.—For the construction of sewage disposal works, for the rural district council.—Mr. D. Pennington, clerk.

EAST ASHFORD.—August 12th.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. Julius Kingsford, clerk.

CHAPEL-EN-LE-FRITH.—August 13th.—For the construction of sewage disposal works, for the Whaley Bridge Joint Sewerage Board.—Mr. J. B. Boycott, clerk.

ETON.—August 14th.—For scavenging at Iver, for the rural district council.—Mr. H. L. C. Barrett, clerk, Slough.

DISLEY.—August 17th.—For the construction of sewers, for the rural district council.—Mr. E. N. Davenport, clerk, Park Chambers, Vernon-street, Stockport.

YEARDSLEY-CUM-WHALEY.—August 17th.—For the construction of sewers, for the urban district council.—Mr. S. Taylor, clerk, 9 Terrace-road, Buxton.

MACCLESFIELD.—August 17th.—For the construction of sewers, for the rural district council.—Mr. F. May, clerk.

HALIFAX.—August 17th.—For the construction of cast-iron pipe sewer and appurtenances, for the Highways Committee.—Mr. J. Lord, borough engineer.

CHAPEL-EN-LE-FRITH.—August 20th.—For the construction of new sewers, for the rural district council.—The Clerk.

Stores.

LUTON.—July 20th.—For the supply of broken granite and broken slag, for the corporation.—Mr. B. Penny, town clerk.

WHITEHAVEN.—July 22nd.—For the supply of iron castings, wrought iron, ironmongery, cement, brushes, brooms and timber, for the Harbour Commissioners.—Mr. John Tyson, clerk.

SALFORD.—For the supply of stores, for the gas department.—Mr. W. W. Woodward, engineer, Gas Offices, Bloom-street.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

CARMARTHEN.—For building a school at Garnant, for the county council.—Mr. W. V. Morgan, county architect:—

D. J. Thomas, Garnant	£7,780
Evans & Edwards, Brynamman	7,730
D. Rees & Sons, Ystalyfera	7,690
R. Davies, Carmarthen	7,540
W. Evans, Ammanford	7,452
Jones Brothers, Ammanford	7,400
D. Evans & Sons, Gwaunmman	6,896
C. Thomas & Co., Llandilo	6,848
D Howells & Son, Llandebie *	6,480

FAREHAM.—For the supply of granite, basalt, or other road stone, for the rural council.—Mr. J. F. Whitear, surveyor:—

P. Falla, Guernsey.*
Johnston Brothers, London.*
Rowe & Mitchell, London.
Penlee and St. Ives Stone Quarries, Limited, Bristol.
Mendip Granite and Asphalt Company, Limited, Shepton Mallet.
British Macadams, Gravesend.
H. L. Cooper & Co., London.
J. Mowlem & Co., Limited, London.
Summerfield & Land, Limited, Liverpool.
Dean Coverack Quarry Company, Limited, Cornwall.
Brookes, Limited, London.
Clee Hill Granite Company, Limited, Ludlow.
A. & F. Manuelle, London.
Roadstone Supply Company, Shepton Mallet.
United Stone Firms Limited, Bristol.

LEEK.—For the erection of new offices and extension of coal store, for the urban district council.—Mr. W. E. Beecham, surveyor:—

J. Heath & Sons, Leek	£997
T. Grace, Leek	978
S. Salt, Leek †	900

LEWISHAM.—For paving with granite setts, for the borough council.
Mr. E. van Putten, borough surveyor:—
J. Mowlem & Co., Limited, Westminster.—18s. 6d. per yd. super. (£46).
Stanstead-road, Catford (between Catford-hill and St. Dunstan's College).—Norwegian granite or Swedish, 21s. 6d. per yd. super (£365).

MACCLESFIELD.—For the erection of public conveniences, for the corporation.—Mr. C. W. Stubbs, borough surveyor:—

H. Berry & Sons, Macclesfield	£139
J. Clayton, Macclesfield	123
G. Simpson & Son, Macclesfield	98
Gorton & Wilson, Macclesfield *	95

RAWTENSTALL.—Accepted for alterations at the market hall, for the town council.—Mr. J. Johnson, borough surveyor:—
W. Ashworth, Waterfoot.

ROMFORD.—For road improvements and laying sewers, for the urban district council.—Mr. J. Turvey, surveyor:—

W. J. Lingwood, Romford	£808
Parlby & Bescoby, Romford	744
E. Free & Sons, Maidenhead	739
W. Jackson, Forest-gate *	701

Surveyor's estimate, £716.

SOUTH MIMMS.—For the construction of a sewage tank, percolating filters, sand filters, and detritus chambers, for the rural district council:—

—Jackson, Barking	£2,570
G. G. Rayner, Croydon	1,995
H. Brown, Watford	1,950
Johnson, Son & Marsh, London	1,900
S. Worboys, Potters Bar	1,865
Cunliffe & Sons, Limited, Birmingham *	1,747

SOUTH MOLTON.—For laying 3,560 yds. of service mains, connection of house services, provision of valves and hydrants, and laying gas mains, for the corporation.—Mr. H. E. C. Rayner, borough surveyor:—
Best Brothers, Teignmouth*—Gas mains, £410; water mains, £1,399.
W. C. Shaddock, Plymouth—Gas mains, £462; water mains, £1,591.
G. Pollard & Co., Taunton—Gas mains, £472; water mains, £1,565.
Fothergill Brothers, Exeter—Gas mains, £537; water mains, £1,733.
Ellis & Sons, North Tawton—Gas mains, £602; water mains, £1,737.

WOODFORD.—For sewage works extension, for the urban district council.—Mr. W. Farrington, engineer and surveyor:—

W. Cunliffe & Sons, Birmingham	£1,776
W. Manders & Co., Leyton	1,704
W. & C. French, Buckhurst Hill *	1,624

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JULY.

22.—Association of Consulting Engineers: General Meeting, Institution of Electrical Engineers, Victoria Embankment. 4.45 p.m.
24.—Institution of Municipal Engineers: Council Meeting. 6 p.m.
25-28.—Royal Institution of Public Health: Congress in Berlin.
27.—Institution of Municipal Engineers: North-Western District Meeting at Clitheroe.
27.—Junior Institution of Engineers: Visit to Chingford reservoir and pumping station. 3 p.m.
29.—Royal Sanitary Institute: Congress at York opens.

COMPETITIONS OPEN.

COUNTY BOROUGH OF HUDDERSFIELD.
TOWN PLANNING.

The Housing and Town Planning Committee of the Huddersfield Corporation invite Competitive Designs from Architects and Surveyors for the Laying Out of certain areas within the County Borough and part of an adjacent suburb.

The following prizes will be offered—*viz.*:—
1st prize, 100 guineas.
2nd prize, 50 ,,
3rd prize, 25 ,,

Copies of the Conditions of Competition, and other particulars, may be obtained on application to the Borough Engineer (Mr. K. F. Campbell, M.INST.C.E.) upon depositing Two Guineas. The deposit will be returned on the receipt of *bonâ-fide* designs, together with all documents issued by the Borough Engineer to the Competitor.

The designs, endorsed "Town Planning," must be delivered at the Borough Engineer's Office, 1 Peel-street, Huddersfield, not later than 31st day of October, 1912.

J. HENRY FIELD,
Town Clerk.

Huddersfield.
June 26, 1912.

APPOINTMENTS OPEN.

CLERK OF WORKS required for the Construction of a Covered Service Reservoir of Concrete with reinforced top. Experience on this class of work essential. Applications, with copies of recent testimonials, stating salary required, to be sent to Mr. W. Fiddian, Civil Engineer, Stourbridge, not later than Monday, the 29th instant.

NEATH RURAL DISTRICT COUNCIL.
RESOLVEN SEWERAGE WORKS.
APPOINTMENT OF CLERK OF THE WORKS.

The above Council require the services of a thoroughly competent Clerk of the Works to supervise the Construction of Sewerage and Sewage Disposal Works under the direction of the Engineer.

Salary £2 10s. per week, payable monthly, subject to one month's notice at any time on either side.

Every candidate must have had previous experience in the supervision of the Construction of similar works, and he will be required to check all levels and be competent to measure up and keep systematic account of the work done from day to day.

The works comprise the construction of detritus tanks, settling tanks, storm-water tanks, effluent tanks, bacteriological filter-beds, with automatic distributors, the laying of 12-in., 9-in. and 7-in. sewers, with the necessary manholes, flushing chambers, vent shafts, and other appurtenances.

Applications, stating age, with full details of previous experience and particulars of similar work the construction of which the applicant has supervised, accompanied by copies only of not more than three testimonials, are to be sent in to the undersigned on or before Monday, July 22nd, 1912, endorsed "Resolven Clerk of Works."

CUTHBERTSON & POWELL,
Clerks to the Council.

DARJEELING MUNICIPALITY, INDIA.
APPOINTMENT OF ASSISTANT ENGINEER.

The Commissioners of Darjeeling Municipality require the services of an Assistant Engineer.

Candidate must have some practical knowledge of sewage works, modern sanitary arrangements, waterworks, the construction and repairs of buildings and roads, and should be able to prepare estimates and reports.

The person appointed will be required to devote the whole of his time to these duties. He will be provided with free quarters and a pony, and will be allowed one Chuprassee.

The salary will commence at Rs.150/- or Rs.200/- monthly, according to qualification, and an increment of Rs.25/- a month will begin in each of the next two succeeding years.

Applications, which should be accompanied by copies of recent testimonials, will be received up to 31st August, 1912.

The Candidate selected will be required to pay his own passage money or train fare, but no security will be required.

Apply to Vice-Chairman

COUNTY BOROUGH OF GRIMSBY.
CEMETERY SUPERINTENDENT.

The Cemeteries Committee is prepared to consider applications for the position of Superintendent at the Cemetery on Scartho-road, at a commencing salary of £85 per annum, rising by £5 per annum to £100, with uniform, house, coal, &c., in addition.

Particulars of duties and form of application may be obtained from the undersigned on receipt of a stamped addressed foolscap envelope.

Applications, endorsed "Cemetery Superintendent," to be delivered not later than the first post on Tuesday, the 23rd instant.

H. GILBERT WHYATT, A.M.INST.C.E.,
Borough Engineer and Surveyor.

Municipal Buildings,
170 Victoria-street,
Grimsby.
July, 1913.

SEISDON RURAL DISTRICT.
KINVER SEWERAGE AND SEWAGE DISPOSAL WORKS.

The Seisdon Rural District Council require the services of a competent Clerk of Works to supervise the carrying out of the above Works under the general superintendence of the Engineer.

Salary £3 3s. per week.

Applications, in candidate's own handwriting, stating qualifications, and with copies of not more than three recent testimonials, to reach me on or before Friday, the 26th inst.

HERBERT TAYLOR,
Clerk to the Council.

Lichfield-street,
Wolverhampton.
July 16, 1912.

PONTYPRIDD URBAN DISTRICT COUNCIL.

APPOINTMENT OF FIRST ASSISTANT SURVEYOR.

The above Council invite applications for the appointment of First Assistant Surveyor.

Candidates must have a thorough practical and theoretical knowledge of the duties required, including Bridge Construction, Road Making, Private Street Works, Sewerage and Sanitary Engineering, Good Draughtsmanship and the general routine of a Municipal Engineer's Office.

Salary £100, increasing by annual increments of £5 to £140 per annum.

Forms of application may be had on application to the undersigned upon receipt of a stamped addressed envelope.

Applications, accompanied by copies of not more than three testimonials, must be received by the undersigned on or before Tuesday, July 30th, 1912 endorsed "Assistant Surveyor."

Canvassing, directly or indirectly, will disqualify.

J. COLENSO JONES
Clerk to the Council.

Municipal Buildings,
Pontypridd.
July 16, 1912.

PONTYPRIDD URBAN DISTRICT COUNCIL.

TRAMWAYS PERMANENT WAY.

APPOINTMENT OF FOREMAN.

The above Council require the services of a thoroughly experienced and practical man to supervise Repairs to the Tramway Track.

Applicants must have had experience in the construction and repair of Tramway Track for electric traction, including platelaying, paving in granite and wood blocks, bonding, jointing, &c.

Salary £130, rising by annual increments of £10 to £150 per annum.

Forms of application may be obtained from the undersigned on receipt of a stamped addressed envelope.

Applications, accompanied by copies of not more than three testimonials, must be received by the undersigned on or before Tuesday, July 30th, 1912, endorsed "Tramway Foreman."

Canvassing, directly or indirectly, will disqualify.

J. COLENSO JONES
Clerk to the Council.

Municipal Buildings,
Pontypridd.
July 16, 1912.

ALNWICK URBAN DISTRICT COUNCIL.

CLERK OF WORKS.

Applications are invited for the appointment of a Clerk of Works in connection with the augmentation of the Waterworks for the above district, at a salary of £3 3s. per week. The person appointed will be required to devote the whole of his time to the duties of the office and work under the instructions of the Council's Engineers, Messrs. Taylor, Wallin & Douglas, of Newcastle-on-Tyne.

It is necessary that applicants should have had considerable experience in levelling, setting out of works, and of ferro-concrete constructions.

Applications, in the candidate's own handwriting, stating age, qualifications, present and past experience, together with copies of not more than three recent testimonials, and endorsed "Clerk of Works," must be addressed and delivered to me at the Council Offices, on or before 25th July, 1912.

Probable duration of engagement six months. One month's notice on either side to terminate engagement.

Canvassing members of the Council or Engineers, either directly or indirectly, will be considered a disqualification.

JOHN BALMBRA,
Clerk to Urban District Council.

Council Offices,
Alnwick.
July 16, 1912.

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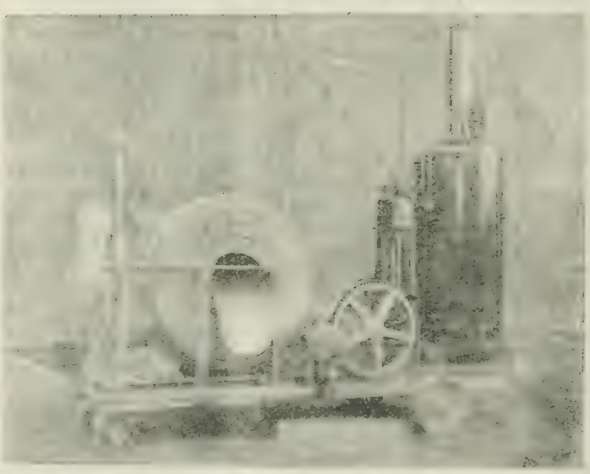

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The Surveyor

And Municipal and County Engineer.

Vol. XLII. JULY 26, 1912. No. 1,071.

Minutes of Proceedings.

Bacteria.

The science of bacteriology is one which necessitates close and prolonged study on the part of those who desire to penetrate thoroughly into its mysteries and become acquainted with the denizens of that, in numbers, enormous world which is only made visible by the aid of the microscope. In spite of this we are not inclined to agree entirely with those speakers who, in the discussion upon Mr. William Ransom's paper at the annual meeting of the Institution of Municipal and County Engineers, declared that "the less they (engineers) knew of the intricacies of the question the better." Municipal engineers are, of course, mainly concerned with those micro-organisms which are connected with the supply of drinking water and the disposal of sewage and do not need to trouble with any others. In the management of works for the purification of water and sewage, municipal engineers gain their experience by practical observation of the many different processes in use, of the comparative results of these processes, and the varying conditions which occur from time to time at various stages in the processes, and if some knowledge of bacteriology does nothing more than increase their interest in the works under their control it is well worth acquiring, and no apologies are needed for bringing forward for consideration at their annual meeting such an excellent paper as that read by Mr. Ransom. The discussion itself, in the present case, indicates the value of introducing such a subject, as it was of an eminently practical character. We do not for a moment suggest that engineers should omit to call in bacteriologists to assist them in solving the many difficult problems which confront them from time to time, but we believe that those who have some knowledge of the subject will be more likely to recognise its importance and the necessity of employing a fully qualified bacteriologist than those who know nothing at all about it, and, for that very reason, are incapable of appreciating the part which bacteria play in the success or failure of the works in their charge.

The paper itself needs no comment beyond a word of praise for its straightforward, simple style. We cannot, however, refrain from criticising the opinion expressed by Mr. E. Willis that they "should not try to sterilise milk and other forms of food, as by so doing they *only eliminated pathogenic organisms*, which were largely eliminated from the human system by the phagocytes, and so long as they could strengthen the latter they would keep their bodies healthy." The italics are our own, and we would ask what other purpose is sterilisation supposed to serve beyond the destruction of pathogenic organisms? How would Mr. Willis "strengthen the phagocytes" of the large number of children who now benefit by the use of pasteurised milk; or those of the inhabitants of towns like Lincoln and a number of other places, particularly in America, on those occasions when the water supply was suddenly found to be infected with typhoid or other disease germs; or those of all the vast numbers of poorer people who, unfortunately, are compelled to live under such devitalising and weakening conditions as those which exist in our slum areas? We are fully aware of the fact that sterilisation, on a practical scale, is not perfect, in that it does not affect the spores of spore-forming bacteria, but fortunately most disease germs are, we believe, not of the spore-forming species, and are thus unable to escape destruction by methods of sterilisation properly carried out. We have personal experience of the difficulty of impressing people with the importance of "strengthening their phagocytes," or even of getting them to accept the statement that they possess such valuable defenders against disease germs in their bodies, especially those people who are naturally inclined to drink or eat more than is good for them. It seems to us that it is much more feasible for local authorities to do their best by sterilisation and other means to prevent pathogenic germs from gaining access to the bodies of the ratepayers than to attempt to make them "strengthen their phagocytes," except, of course, by improving in a general way the conditions under which the people live, and thus raising the standard of public health.

The space at our disposal is limited, but we cannot refrain from observing that at least one of those municipal engineers who took part in this discussion has evidently acquired some considerable knowledge of bacteriology and has made good use of it. Mr. E. G. Mawbey made some pertinent remarks with reference to the necessity for frequent collection of house-refuse, and drew attention to the effect of dirty and dusty roads and streets upon health. Accumulations of refuse breed flies and we believe that these

insects disseminate disease to a much greater extent than is generally understood. Again, experiments made to ascertain the number of bacteria in sewer air showed that there were an enormously greater number in the air which came down a side entrance to a manhole from the street than in the air of the sewer itself. It is practically certain that in reducing the dust nuisance, as so many have done very successfully by modern methods of treating the road surface, municipal engineers have indirectly done much to improve the general conditions of public health, and if Mr. Ransom by his paper, and in particular Mr. Mawbey by his contribution to the discussion, should have caused some of those who were present to devote a little attention to the bacteria in road dust and refuse heaps, they will have rendered a valuable service to their profession.

* * *

The Road Crust as an Arch.

While the arched form which is usually given to a road crust assists in the maintenance of the material by favouring a tendency towards compression rather than a separating effect, it is not often that such a crust is regarded as actually playing the part of an arch capable, as an arch, of supporting the loads which come upon it. Some extracts which appear in another part of the present issue, however, relating to concrete road-crusts, show that the small amount of strength or efficiency which a road crust displays, when regarded as an arch, is sometimes greatly exaggerated; so that one does from time to time, as in the present case, come across the statement that the strength of a road crust regarded as an arch is really an important matter on ordinary roads. The statement which Mr. Logan Waller Page has, as we think by inadvertence, recently made applies to roads the surfaces of which would have a camber of only $\frac{1}{4}$ in. per foot, and on this basis we have made some calculations which show what the stresses would really be in the case of such a road provided with the concrete crust.

First, taking the case of a road 20 ft. wide, with a 6-in. concrete crust, having a rise of $2\frac{1}{2}$ in. at the middle, which is that given by a slope of $\frac{1}{4}$ in. per foot, we find that, taking only the dead weight of the road crust itself, we should get a pressure of about 200 lb. per square inch, while with a moderate crowd load of 60 lb. per square inch, the pressure on the concrete at the crown would be 400 lb. per square inch, and the thrust per foot run on the margin would be nearly 13 tons. A road margin designed to take a thrust of 13 tons per foot run is a fairly solid abutment; but if we are to regard the road crust as an arch, it follows, of course, that we shall have to regard the margins of the roads as abutments. The arch having, however, a very small rise, the horizontal components of the thrusts are enormously greater than they would be in the case of a bridge, the rise of which is calculated partly with a view to keeping down the thrusts upon the abutments below some reasonable figure. If we suppose now that a traction engine with an axle weight of 10 tons proceeds along the 20-ft. road just within one half of it, we find that this imposes upon the concrete a stress of over 3,000 lb. per square inch; and this is on the assumption that the load is carried by a strip 3ft. wide. Since we might have another vehicle behind or in front, we cannot regard the thrust upon the road margins as distributed over more than 10 ft. lengthwise, giving 30·4 tons per foot run, the thrust at the crown being 304 tons. If we add together the thrusts upon the margin due to dead load and live load we get very nearly 37 tons per foot run.

Taking next a 30-ft. road with 8 in. of concrete, the rise of $\frac{1}{4}$ in. per foot gives $3\frac{3}{4}$ in. at the crown, which for convenience we may call 4 in. Taking the dead load, we get a thrust of nearly 12 tons and a pressure at the crown of 280 lb. per square inch. A moderate crowd load would give, in addition, a pressure of 211 lb. per square inch, or a thrust per foot run of about 9 tons. Thus we have for dead weight and crowd load taken together a pressure at the crown of over 490 lb. per square inch, and at the margins over 20 tons per foot run. Suppose now that a traction engine is proceeding along one side of the road 7 ft. from the centre, and is passed by a motor lorry, one wheel of which comes a foot past the centre on the same side as the traction engine, we get for this loading a thrust of 408 tons. If we assume that this is distributed over 4 ft. lengthwise—a liberal allowance—the pressure is more than a ton per square inch, or about 2,380 lb. per square inch. The thrust per foot run at the margins, even if we assume it to be distributed over a length of 20 ft., amounts to nearly 20 tons. Taking the dead load and the live load together we get a pressure at the crown of nearly 2,660 lb. per square inch, and a thrust at the margins of over 32 tons per foot run. In actual practice small local depressions would enormously increase the pressures as calculated above, even if abutments capable of taking the thrusts were really built, while the thrusts taken here as distributed over a 3 ft. or 4 ft. width would, owing to local cracks, be often concentrated on areas of a half or a quarter the size. Generally, what usually makes the arch idea so impossible of realisation is the fact that there is hardly ever an abutment capable of taking the thrusts except when the road is in a cutting in solid rock. The arch *form* for a foundation is suitable in many cases, as already noted, but when it is desired to develop the strength of a crust as an arch in rock cutting, the rise given to the foundation course should be much greater than any which can be given to the surface. One course or the other must then be thicker towards the haunches, the essential condition being that if the sub-crust is to develop strength as an arch without excessive pressures, its under surface must have a sufficient rise.

* * *

The Alkaline Waters of the London Basin.

The review on Dr. Thresh's paper dealing with this subject, which appears in our present issue, discusses the matters brought forward from the point of view of those engineers whom Dr. Thresh condemns in his paper. It is certainly remarkable that Dr. Thresh, posing as one "not competent to compare the mineralogical constituents of granite with those of the Thanet sands," and inviting the advice of the geologist, should nevertheless unhesitatingly condemn the practice of geologists and engineers in general who "persist" in sinking wells into the chalk instead of stopping short at the Thanet sands. Dr. Thresh is beyond doubt a great chemist and medical officer; he is also a great authority upon matters of water supply, and his opinion on all matters pertaining to its quality will always carry the greatest weight. It is as strange, however, for him to condemn the practice of engineers who have made well-sinking their life work, as it would be for the engineers to give a medical opinion. While the profession of the doctor, of the lawyer, or of the chemist is in each case sacred, so that no layman can give an opinion without at once rendering himself ridiculous, every one is an engineer, and the chemist in particular, together with the medical officer, will frequently be found giving an opinion in the most confident voice on purely engineering matters, often to the inconvenience of the engineer. It is very easy for the ordinary layman to bring forward plausible and specious arguments difficult to disprove which are nevertheless in absolute disagreement with practical experience. Sewage disposal engineers are frequently hampered by such comments and advice, which, when given by men of high scientific standing, naturally carry great weight, however erroneous they may be.

It is surprising that a man of Dr. Thresh's great

experience should tell us in so many words that our chalk wells ought to have stopped short in the running sands of the Thanet beds—sands which are notorious for choking bore tubes and for being peculiarly difficult to work in. Dr. Thresh advises this apparently solely because the water in the sand is soft. On the other hand, as was recently demonstrated by Dr. Houston, there is no evidence to show that hard water is less beneficial to health than is soft water. Then there is the question of the rate of supply. The water may exist in the Thanet beds, but obviously it cannot flow out of a close, retentive stratum at the same rate as it will flow from chalk fissures. What engineer dealing with chalk wells has not known the supply at the first level close under the Thanet sands to fail, and where it has been found that by descending to a deeper level in the chalk, or by driving a heading well below the Thanet sands, an ample supply has been obtained? Would it have been practicable in such a case to have drawn the supply entirely from the Thanet sands? Yet Dr. Thresh tells us that "chalk absorbs rather than yields water" in these very places. It cannot be doubted that Dr. Thresh's remarks will in some degree cause temporary annoyance to those engineers who "persist" in sinking wells into the chalk, but it is hardly likely to cause them to change their methods.

* * *

Institution of Municipal and County Engineers: The District Committees.

The establishment of the District Committees is undoubtedly one of the most important features of the new constitution of the Institution of Municipal and County Engineers, and it was a happy idea on the part of Mr. A. H. Campbell, M.INST.C.E., the city engineer of Edinburgh, to submit at the recent annual meeting a paper which was pregnant with suggestion as to the modes in which these committees may promote progress. If the District Committees are adequately to fulfil their real function and to become centres of influence, they will have to operate on lines of considerably greater originality and freedom than the strict letter of the articles and by-laws under which they are constituted suggests. To use the very apt phrase of Mr. Campbell, the printed constitution is but the skeleton of the body, but the dry bones to the living reality. This reality must consist of the putting on of flesh, and the stirring to the depths of that as yet untouched body of opinion and of skill that still holds aloof, and that must be brought into a living unity with the institution. The main suggestions contained in Mr. Campbell's paper may be summed up in the three ideas of decentralisation, local self-government, and co-ordination. In regard to decentralisation, the proposal is that the districts as at present constituted should further subdivide themselves into county units in order that frequency of meeting and community of interest may lead to a more vigorous local organisation and a realisation that the institution has something to offer to every member. Further, the District Committees should not become stereotyped, but each should be allowed the fullest latitude in organising its affairs in accordance with the requirements of the localities concerned—that is to say, the principle of local self-government should be fully conceded. But if this freedom of development is not to result in a dissipation of energy or in disintegration, it must be dominated by an organisation by which the local county subdivisions shall be fully linked up through the district committees with the central council. These are the suggestions, and in the main we agree with them. The future successful working of the institution is a matter of such importance, however, that we shall be pleased to hear from any of our readers who may have suggestions to offer. Two minor points were raised in Mr. Campbell's paper—*viz.*, the possibility of effecting a considerable saving in the printing and postage bill, and the desirability of the venue of the council meetings being altered from time to time. Both these matters are worthy of consideration by the council.

* *

Public Health Congresses.

With the exception of the institutions which are specially constituted for municipal engineers, there is probably no professional society which is more appreciated by them than the Royal Sanitary Institute, the annual congress of which will take place next week at York. The members and delegates will be received by the Lord Mayor, and the fact that the inaugural address will be delivered by the Archbishop of York is an acknowledgment of the public character of the good work which the institute is doing. In connection with the congress there is to be a conference of engineers and surveyors, the subjects for discussion comprising housing and town planning progress, and sewage disposal in rural districts; while the question of the modification of the Model Building By-laws from the rural point of view will be considered in the Engineering and Architecture Section. It will thus be seen that many of the subjects which come within the purview of the congress are of peculiar interest to municipal engineers, many of whom will doubtless desire to be present. The Health Exhibition which has been arranged in connection with the congress will be opened to-morrow (Saturday).

The inaugural meeting of the congress of the Royal Institute of Public Health in Berlin took place yesterday, and the proceedings, which extend over three days, will be conducted in five sections. Many of the subjects for discussion are principally of medical interest, but the section devoted to Municipal Engineering, Architecture, and Town Planning, presided over by Mr. P. C. Cowan, D.SC., M.INST.C.E., the chief engineer to the Irish Local Government Board, will be of special interest to our readers. We have already announced the titles and authors of the papers to be read in this section, the chief topics being connected with water supply, sewage disposal, town planning, and reinforced concrete practice in architecture and engineering. Special papers dealing with the various public health services of Berlin will be read by delegates appointed by that city to attend the congress.

* *

The Tiverton Road Surveyor's "Reprimand."

Jedburgh justice of the original and time-honoured type was deplorable in so far that it was irretrievable, but in these days when it is sometimes applied to civil as apart from capital cases there is at least the satisfaction of knowing that the verdict may be happily recalled and the damage thus in part repaired. Some such thought as this arises in considering the case of Mr. A. J. Mildon, highway surveyor to the Tiverton Rural District Council, who was recently reprimanded by resolution on the alleged ground that he had broken a contract with a road contractor without consulting the council. In approved Jedburgh formula the council, after condemning the road surveyor, appear to have referred the matter to the General Purposes Committee for inquiry, with the result that at the recent meeting of the council it was moved by the Rev. J. Fowler that the motion reprimanding Mr. Mildon be rescinded on the ground that the committee considered that the road surveyor had cleared himself. This was eventually agreed to after a discussion in which it was stated that the surveyor had always been allowed a great deal of latitude in the management of the roads, and "they had not much to complain of." The correction by the council of their harsh judgment is, of course, very welcome, but in future it will be advisable if they pursue the approved method of justice by arranging for the trial to precede, not to succeed, the sentence.

The Alkaline Waters of the London Basin.

REVIEW OF DR. THRESH'S PAPER BY A WATERWORKS ENGINEER.

In a paper read before the Essex Field Club Dr. Thresh recently discussed the character of waters derived from the chalk and Thanet sand in various parts of Essex. Various analyses were quoted and certain experiments were described from which conclusions of a very interesting nature are drawn. The conclusions are to the effect that the Thanet sand lying beneath the London clay possesses the power of softening hard water by substituting soda, and possibly potassium salts, for those of calcium and magnesium. In fact, Dr. Thresh appears to find in the Thanet sands a natural zeolite which can be revivified by treatment with brine. The constituent possessing this property does not appear to be removed by treatment with dilute acid, but it can be removed by treatment with strong hydrochloric acid. The property of softening water belongs both to the clayey and to the sandy matters. The softening effect is increased greatly by treating the sand with brine. Further it appears that within certain limits a sand which has ceased to soften a water of a certain degree of hardness will exert a softening effect upon a water of a greater hardness, and will exert a hardening effect upon a water of a softer character. Dr. Thresh has also obtained similar results when using granite dust in place of the Thanet sand.

It appears that Dr. Thresh's knowledge of the existence of zeolites caused him to make his experiments with the Thanet sand, for he says that, following twenty years of research work as to the sources of sodium salts present in the Essex water: "Last year, when referring to Bischof's 'Chemical and Physical Geology,' I came across a passage stating that a calcareous water passing through certain silicates of alumina containing potash and soda became softened, and directly afterwards I heard of a German process of softening water by filtration through an artificial zeolite, and the revivifying of the zeolite by treating it with brine." This apparently led to the experiments with powdered soda glass, powdered granite, and finally with Thanet sand. Dr. Thresh later directs attention to the fact that granite and Thanet sands have properties in common which are probably due to a common constituent. He points out that a sample of felspar has given disappointing results, and tells us that experiments have been commenced with mica. It is curious to read this statement in the light of the well-known fact that the lime zeolite known as harmatome or phillipsite, contains silica, alumina, lime and water, and has therefore a considerable resemblance to felspar, but certainly is not felspar. Geikie defines zeolites as "a characteristic family of minerals which have resulted from the alteration, and particularly from the hydration, of other minerals, especially felspars." Why, then, does Dr. Thresh look for a zeolite in felspar or mica?

Again, the action of brine on natural zeolites is no new discovery. As long ago as 1850 the fact was established that zeolites placed in contact with salt solutions would be affected, even as Dr. Thresh surmised that the zeolite in the Thanet sand would be affected before he treated it with brine. However, Dr. Thresh has set before us certain definite facts ascertained by experiment which prove that the Thanet sands exert a softening action on water.

WATER IN THE CHALK.

Analyses of waters tend to show varying characters of waters derived from the chalk and Thanet sands in Essex. For these differences Dr. Thresh offers the following explanation: "So long as water in the chalk contains carbonic acid it continues to dissolve the chalk and open out the fissures. When all the acid has been used up in dissolving the calcium carbonate it no longer possesses the power of opening out fissures, and as the chalk becomes more compressed by the superincumbent mass of sand and clay it becomes so dense as to be almost impervious. Beyond this point, therefore, the water cannot travel in the chalk, and it comes up through the fissured chalk into the sands above, and then becomes exposed to their softening action."

Dr. Thresh's contention that water entering the Thanet sands from the chalk becomes softened is proved by his experiments, but the inference that water rises in the Thanet sands because it has no carbonic acid with which to open out fissures at lower levels is surely open to criticism. The fissures are not produced by the carbonic acid originally. If the chalk is impervious, this is due to the fact that it has no fissures, and consequently water could not get into it, and the fact that it does or does not contain carbonic acid can have very little bearing upon the case. It is very well known by geologists that water is generally found in greatest quantities within the first 50 ft. or 100 ft. below the level of the valleys in a chalk district, and again in the beds immediately incumbent on the chalk marl, and that the intermediate portions are constantly found without any important quantity of free water. Dr. Thresh writes as if it were wrong to attempt to obtain water except from the upper layers of the chalk, and preferably from the Thanet sand. He apparently overlooks the facts that the beds at a much deeper level—*viz.*, those immediately incumbent upon the chalk marl—are also good sources of supply. There is a well at Saffron Walden, for instance, which passes through 1,000 ft. of chalk, while in a well at Diss water was obtained after the whole of the chalk had been traversed. In the face of the abundant evidence of wells sunk through the London clay into the chalk yielding good supplies, it is surprising to find that, in Dr. Thresh's opinion, "experience . . . proves that the chalk absorbs rather than yields water in those areas where it is covered with a large thickness of London clay." By "large thickness" one imagines that Dr. Thresh has in mind the thickness of the clay in South Essex, and wells such as those of the Herts and Essex Waterworks Company at Harlow, which derive their supply from the chalk and produce a hard water, as do a large number of other chalk wells which might be quoted.

ENGINEERS' MISTAKES.

Dr. Thresh observes that: "Engineers persist in continuing the borings made in Central Essex into the chalk, but there is no evidence of more water being obtained than would have been the case had the boring ended in the sands, whereas there is evidence that some of the sand water is lost. Thus at Writtle a certain amount of water was obtained from the Thanet sands, and when the boring pierced the chalk most of the water disappeared, and the chalk had to be plugged to restore the supply. At Tollesbury, where a deep bore has just been made, the water level fell some 15 ft. when the chalk was pierced, a sure indication of a loss of water. Experience elsewhere, which I am not at liberty to mention specially, proves that the chalk absorbs rather than yields water in those areas where it is covered with a large thickness of London clay. In any case, the waters have a common origin, and if the chlorides are derived from the sea they should be accompanied by bromides, and the amount should be approximately the same in proportion to the chlorides as in sea water. In sea water, as before stated, I find that there is one part of bromine to from 274 to 378 parts of chlorine, and that in the alkaline waters the proportions vary, there being for one part of bromine from 225 to 442 parts of chlorine. Considering the difficulty of making anything like an accurate estimation of the bromine, these figures are sufficiently close to indicate some relationship. The difficulty of making an exact determination led me to abandon temporarily further determinations until I had worked out a process which could be relied upon. This has proved far more difficult than I had anticipated, and I am not yet so certain of my results as to feel justified in giving others. I suspect that in sea water there are other compounds of bromine besides bromides, and that there are traces of iodides and iodates or both. This, however, is a chemical question upon which I shall have something to say elsewhere.

HOW TO OBTAIN SOFT WATER.

"Possibly it may be asked whether the softening effect of the Thanet sands is sufficient to account for the removal of nearly all the calcium and magnesium salts from the large volume of water taken from the sands. I think there can be no doubt about the answer. Taking Essex alone, the area under which Thanet sands exist must be about 666,000 acres, and assuming the average thickness to be 12 ft. (a very low estimate), and that each cubic yard contains

28 gallons of water, the water held in the whole of the sand will be about 360,000,000,000 gallons. But my experiments indicate that each cubic yard would completely soften 10 cub. yds. of a chalk water 30 deg. of hardness. The amount of water the Thanet sands are capable of softening on this basis is therefore 21,600,000,000,000 gallons.

"Essex (Administrative County) has a population of over 1,000,000, and if liberally supplied with water it would use 30,000,000 gallons per day, or 10,950,000,000 gallons per year. The amount of Thanet sand under the county would completely soften the whole supply on the above basis for 2,000 years, and partially soften for a much longer period."

IMPOSSIBILITY OF DR. THRESH'S PROPOSAL.

Those engineers whose experience extends to the sinking of wells through the water-bearing Thanet sands may well wonder whether Dr. Thresh's advice is meant to be taken seriously. They will probably retain a lively memory of any attempt to sink a brick shaft, or to drive a heading in this formation if they have ever attempted to do so. The water-bearing Thanet sand is frequently, if not generally, running sand. It chokes bore tubes and renders any ordinary water-gathering device impracticable. Further, the water which it contains is apt to be highly charged with iron. The best method of sinking a well into the upper chalk through this very difficult stratum is to use cylinders, and to continue them into the hard chalk. It is true that where such a well has been made one frequently finds that the water in the autumn, when the chalk-water level is lowest, will run in from the upper stratum of sand. Hence it sometimes follows that the same well will yield a comparatively soft and irony water in the autumn or early winter, and a very hard water in February, and later after the hard water in the chalk has had time to rise. Whether the water coming from the Thanet beds came originally from the chalk, and was held up in the more retentive material after the chalk-water level had fallen is open to question in some cases, but when the sands are covered with a large area of London clay this appears to be the only reasonable explanation.

Dr. Thresh's paper contains excellent material for discussion, but it appears that his future work should include a further study of the nature of zeolites, and that he should explain more fully the means whereby those engineers who "persist in continuing the borings made in Central Essex into the chalk" may obtain some of the 360,000,000,000 gallons of water held ready and softened in the Thanet sand.

Summer School of Town Planning.—The Marquis of Crewe, who is president of the Summer School of Town Planning which is to be held at Hampstead Garden Suburb, is announced to give the inaugural address in the Institute Hall on Saturday, August 3rd. The summer school, as already reported in these columns, is being held under the auspices of the London University Extension Board, and covers a fortnight—from August 3rd to the 17th. The lectures and demonstrations are intended to be of special value to municipal engineers, architects and surveyors, but most of the lectures will be of interest to others who are concerned with town planning from the more general aspect of civic and economic progress. Thus officials of municipal and district councils will find in the syllabus, in addition to courses on the engineering and surveying problems involved in town planning, a series of lectures on the legal aspect of the subject by Mr. E. R. Abbott, clerk to the Ruislip-Northwood Council, who has just successfully piloted the first town planning scheme from a local authority to be accepted by the Local Government Board. Prof. Adshead, who occupies the first chair of town planning established in an English University, will give a series of lectures on "Town Planning in Foreign Countries and Past Times." Mr. Raymond Unwin, F.R.I.B.A., who is responsible for the planning of the Hampstead Garden Suburb, will lecture and demonstrate on "Town Planning in Practice." Among other special lecturers are Mr. Henry Vivian, J.P., who will speak on the financial aspects of the subject, and Mrs. S. A. Barnett, to whose genius and energy, as founder and honorary manager, the initiation and success of the Hampstead Garden Suburb are largely due. Applications to attend the course, or single lectures or excursions, should be addressed to the Hon. Secretary, Summer School of Town Planning, Hampstead Garden Suburb, N.W.

CORRESPONDENCE.

"Be calm in arguing; for fierceness makes
Error a fault and truth discourtesy."
— GEO. HERBERT, *"The Temple."*

HINCKLEY WATERWORKS.

To the Editor of THE SURVEYOR.

SIR,—In connection with my paper on the Hinckley waterworks, which was read at the annual summer meeting of the Institution of Water Engineers at Cheltenham,* several speakers, in the discussion of the paper which followed, were desirous of knowing the cost of the brick service reservoir so as to be able to compare it with the cost of the reinforced concrete reservoir mentioned in Mr. Percy Griffith's paper on the Skegness waterworks.

One or two speakers were of opinion that the cost of the Hinckley brick reservoir was fairly high. I am now taking this opportunity of comparing these two reservoirs as regards cost, size and capacity, as I stated I would do, and I have therefore tabulated the following particulars:—

—	Hinckley brick reservoir.	Skegness reinforced concrete reservoir.
Dimensions ...	100' 6" × 78' 9" × 12' deep of water	100' × 70' × 10' deep of water
Capacity ...	500,000 galls.	400,000 galls.
Cost	£3,0 0	£2,3 9

From the above figures it will be noticed that the costs of the two reservoirs compare very fairly and equally, considering that the capacity of the Hinckley reservoir is one quarter in excess of the Skegness reservoir, and that the cost of the former is about one quarter in excess of the latter.—Yours, &c.,

E. H. CRUMP.

Council Offices,
Hinckley.
July 20, 1912.

Derwent Waterworks.—The Derwent Valley Waterworks will be officially opened on Thursday, September 5th, by Sir Edward Fraser, the chairman of the Water Board.

Electric Traction in Scotland.—A report, recently published, shows that in Scotland horse tramways have now almost disappeared, and that electric propulsion is practically universal.

Troon and Prestwick Water Supply. — The Loch Bradan waterworks, which have been constructed for the supply of water to Troon, Prestwick, and the county special district, were formally opened last week by the Duke of Portland, K.G. Mr. John Eaglesham, Ayr, was the engineer, and the work was carried out under the personal supervision of his assistant, Mr. J. D. Riddell, while the contractors were: Constructing dam and laying first section of conduit, Messrs. Neil MacLeod & Sons, Edinburgh; providing and laying cast-iron piping of second, third, and fourth section, Messrs. D. Y. Stewart & Co., Limited, Glasgow; concrete tubes for conduit, Mr. John Ellis & Sons, Limited, Leicester; valves and fittings, Messrs. Glenfield & Kennedy, Kilmarnock. The cost of the undertaking amounted to upwards of £90,000, including Parliamentary expenses and land claims.

London Water Supply: Proposed New Reservoirs.—At the next meeting of the Metropolitan Water Board sanction will be sought to the expenditure of £1,650,200 on the immediate construction of reservoirs. This is part of the scheme for the future supply of water to London, power for which was given by Parliament under the Act of 1911. It is proposed that reservoirs 6 and 7 at Littleton, together with appurtenant conduits, diversion of the river Ash, and construction of intake works at Laleham, shall be undertaken and let in one tender. A Bill is to be promoted to provide for the construction of a steel conduit from reservoirs 6 and 7 to Kempton, filter-beds at Kempton, an aqueduct from Greenford to the new service reservoir, and the revival of the powers for duplicating the New River Company's aqueduct between Kempton and Fortis Green.

* See THE SURVEYOR, June 21st.—Ed.

Institution of Municipal and County Engineers.

ANNUAL GENERAL MEETING IN LONDON.

Following the discussion reported in last week's issue, the subjoined contribution was submitted for consideration at the recent annual meeting of the Institution of Municipal and County Engineers.

BACTERIA.

By WILLIAM RANSOM, ASSOC.M.INST.C.E.,
Assistant City Surveyor, Worcester.

From Photo by A. J. Nash, Worcester.

Mr W. Ransom is a Sussex man, and, after serving his articles, accepted the post of assistant engineer to the Worcester gasworks, where he gained considerable experience in superintending the extensions to the gasworks. He was then appointed assistant surveyor to the corporation of Worcester, and, under Mr. T. Cook, acquired experience in water and sewerage engineering. He is an associate member of the Institution of Civil Engineers, and a professional associate of the Surveyors' Institution. He has read papers before the Royal Sanitary Institute upon the disconnecting trap and building by-law reform. He was awarded a premium this year for his paper upon "The Purification of Public Water Supply," read before the Institution of Municipal and County Engineers. He is a frequent contributor to the technical papers.

The popular conception of the subject of bacteria is not very inspiring, for it is usually sufficient to mention the word microbe, germ, or micro-organism to bring to imagination or mind of most people hideous and awful creatures with creepy, slimy legs, and repulsive and ferocious features lying in wait to injure poor humanity in his food, drink, and air. Water and sewage engineers, however, know how much they owe to the bacterial work, and that bacteria play a very important part in the dispensation of Nature, and are as much the allies as the enemies of mankind.

If we take a microscopic tour as we shall find that the Lilliputian and whilst revealed to us are full of romance and excitement, and that its myriads of inhabitants are gifted with powerful means for good or evil, as great or greater than any other agency in the universe. We must first clearly understand that our travels will be undertaken, not in the animal world, but in the plant world. The organisms called bacteria comprise a class of low plants, and for a long time the importance of their place in Nature was not recognised. They were simply a sub-division of one of the lowest forms of life, but as the study of their life history became specialised, and bacteriology became a science, it was soon evident that this sub-division of the plant world was of greater importance than the rest of the division. The word "schizomycetes" has been adopted to classify all microscopic plants commonly included under the term bacteria and yeasts. The latter, however, have a higher class of which fungi specimens are known by the name of bacterium.

The study of bacteria commenced with the invention of the microscope, and as that instrument improved, so our knowledge of the bacteria world developed into an exact science.

It was a Dutchman named Leeuwenhoek, born in 1632, who first brought to the notice of man the existence of these creatures. He discovered living organisms in water which he called animalcules. The next man to advance the subject was Plenciz of Vienna, who about 1750 first conceived the idea that decomposition was due to the above animalcules. Scientists were gradually coming to this opinion when Liebeg checked advancement by advocating that decomposition and putrefaction were simply chemical actions. For a considerable period the theory of spontaneous generation was held, except by here and there some scientific worker investigating upon the right lines and yet unable to bring his facts in a sufficiently convincing form before the world. It was Pasteur who really rescued bacteria from obscurity and gave them their right place in the scientific world. The story of his experiments and researches is a romance, and gradually he accumulated such an overwhelming array of evidence that he was able to give the deathblow to the theory of spontaneous generation. His experiments demonstrated beyond doubt that fermentation, putrefaction, and infectious diseases were all due to micro-organism. Koch and others followed up the investigations, and a new science was opened to the world, with results as far reaching as any other branch of knowledge.

The microscopic world is densely populated, for upon one square inch it would be possible to find a population 100 times as dense as that of London. There are all sorts and conditions of bacteria, but they can be described as minute specks or cells of protoplasm which usually take one of the following shapes:—

(1) Round cell form, or the coccus.
(2) Rod cell form, or the bacillus.
(3) Thread cell form, or the spirillum.

The cocci consist of groups of round cells less than 1-25000 in. in diameter, and appear in different forms, either in single bodies or in groups of one, two, three, four, and often having the appearance of a string of beads.

The bacilli consist of cells longer than they are broad. Many of these varieties are gifted with powers of motion.

The spirilla consist of wavy threads attached to a round or rod-like cell.

These varieties of microbes are the simplest forms of life that are known to science, and are to be distinguished from the yeasts and moulds, which have a more complex life history.

The bacteria have a short but active existence, but they reproduce themselves in great numbers by budding, division and spore formation. The latter method of reproduction is one adopted to ensure the preservation of species, in case the other methods should fail. The spores, or seeds, are formed inside the rods or spiral forms, consisting of a tiny bit of protoplasm. The bacterium producing the spore usually dies, but it leaves behind the hardiest form of living matter known to science. Spores can survive hunger and thirst, the perils of an Arctic winter, and some even the dangers of boiling water. These spores naturally increase the difficulty of disinfection, for means which would speedily kill off all bacteria may be unable to touch the sport, which, Phœnix-like, springs into life from the ashes of ordinary methods of disinfection.

POWER OF MULTIPLICATION.

Bacteria have a wonderful power of multiplication. If favourable conditions could arise one bacterium would produce in one day over 16,000,000 descendants, and in two days over 281,500,000,000, which it has been calculated would form about one pint, and weigh about 1 lb. Fortunately for this densely populated world favourable conditions for such a growth do not occur for an extended period, for reproduction is speedily checked by want of food, and also by the fact that bacteria are quickly killed off by the products generated by their own existence. The wonderful power of growth in bacteria is due to the food which they can assimilate, for they can feed on a complex diet and take up organic substances all ready for absorption. Most plants have to obtain their food from simple substances such as CO_2 and H_2O. As bacteria can live on the food which they find ready manufactured for use, their growth and multiplication is simply limited by their power of absorption, until the chemical changes produced in the food itself by the life of

the bacteria checks the growth and affects the food substances.

One of the nearest bacterial relatives in the plant world is the green plant called oscillaria. The green colouring matter called chlorophyll is, of course, absent in the bacteria, and it has been surmised that it is the absence of this matter which forces the bacteria to find new and unorthodox methods of food supply.

IDENTIFICATION PROCESS.

The means taken for the examination and identification of bacteria are complex. The broad principle consists of sterilisation and cultivation. Supposing, for instance, a liquid has to be bacterially examined, the first thing to be done is to sterilise all instruments and appliances which will be used during the examination. This is done by various means, such as heat, filtration, &c., so as to kill off all bacterial life to enable the examination to be made without fear of any outside bacteria being introduced into the sample. Every care has to be taken to prevent air obtaining access to the sample, which might thus be contaminated with foreign bacteria. When sterilisation is complete a few drops of the sample liquid are applied to a culture medium in sterilised surroundings. The medium consists of some suitable food material, such as gelatine, upon which the bacteria present in the sample may thrive and develop. After a little time the naked eye will reveal on the gelatine plate little specks, "each centre being in reality a colony or pure cultivation of one particular organism." Each little speck can be transferred to a separate culture medium so that a pure cultivation can be developed and undergo a thorough investigation. The method adopted for counting the number of specimens in any known quantity is comparatively simple. A small measured portion of the liquid is applied to the culture gelatine, and the bacteria allowed to develop. After a certain time the specks or colonies are counted, and as each speck or colony has come from one germ or spore the number of bacteria in the quantity under examination is thus ascertained. The real difficulty is, of course, in discriminating the individual germ from a group of bacteria. One of the many methods adopted for the identification of bacteria is that of staining the microbes under examination. Some are particularly partial to special dyes, while some spores will not be stained by a weak solution. A liquid under examination would be divided into several portions, and dyes of varying strengths and colour applied, and as a result different kinds of bacteria would be stained to various colours. Results, however, are very difficult to standardise, for bacteria are so easily influenced by the food they live upon, and in the same family it is most difficult to establish the relationships between the rich and the poor, the fat and the lean! Bacteria very quickly deteriorate under some circumstances, and weakened specimens appear to possess characteristics altogether different from their more robust brethren. The difficulties of identification are therefore very many, and we have often to be content with judging our secret friends and foes by their actions rather than by their names. Dr. Houston has told us how the typhoid bacilli quickly deteriorated in raw Thames water, and that he had drunk 218,000,000 attenuated typhoid germs without any ill effect.

The purification of river water for public purposes chiefly consists in the removal of the majority of the bacteria. The work done by sand filtration is estimated by the percentage of bacteria removed, so that the bacterial examination of water is of great importance to the water engineer. The gelatinous micro-organic tissue which gradually forms on the top of the sand filters acts as a bacterial screen, or as a sort of cultivation medium which retains the majority of bacteria from passing through the filter. The perpetual flow of the water must carry away with it those products of bacterial life which would otherwise automatically prevent the growth of the gelatinous scum. Whatever these products may be, they do not have a deleterious effect upon the water. Filters occasionally get out of working order, and perhaps it may be due to a partial period of suspended bacterial action, because the products of bacterial life are not being carried away sufficiently fast.

In recent months a great deal of discussion has arisen as to the significance of bacillus coli in drinking water. Mr. J. R. Johnstone, in the publication of the United States of America Department of Agriculture, has been recording some remarkable experiments and investigations. He has experimented with bacillus coli, and has found that healthy cocoanut trees when inoculated with it are attacked with the bud rot disease, while organisms cultivated from diseased trees behave exactly as the bacillus coli. This opens up a large question to water engineers, as the bacillus coli has been looked upon rather as a danger-signal than as an active source of disease.

Bacteria are to be found almost everywhere. They are present in the soil to a depth of 3 ft. to 4 ft., in water, and in the air. They are most plentiful wherever decay is going on, because of the abundance of food supply thereby provided. While bacteria do not occur in the tissues of the living healthy body, they attach themselves very readily to the surface of the body.

EFFECT OF SUNLIGHT.

The effect of sunlight upon bacteria is very marked. A striking but simple experiment consists in making a "micrograph." Some known bacteria—say typhoid germs—are placed on gelatine and exposed to sunlight, but with the word 'typhoid' cut in cardboard letters placed on the top. The cardboard excludes the sun over a certain portion, and it is found that the bacteria which are exposed to direct sunlight cannot develop. The bacteria under the covered portion multiply, and as they develop print their name "Typhoid" on the gelatine plate.

It must be remembered that bacteria are not always active. They are often dormant, as, for instance, in water which contains no food, and, again, when present as dry dust in the atmosphere. The two great things which are needed are food and moisture, and, given these, their powers of multiplication are soon developed. Nature has largely restricted them to scavenging duties, and allows them comparatively free scope only so far as it relates to the bodies, whether of animals or of plants.

The effect of bacterial life is seen all around us. As the bacteria feed, so they produce chemical changes which alter the face of Nature. Whatever work is done, the bacteria give rise to numerous products which affect the original food stuff. Briefly, the products, which are called ptomaines, are:—

(1) Pigments (as a rule produced by innocent microbes).
(2) Gas, such as H, CO_2, CH_4, or
(3) Acids, such as lactic, acetic, butyric, &c.
(4) Liquefying ferment.
(5) Phosphorescence (as evidenced in the glow produced in sea water by myriads of animalculæ).
(6) Organic chemical products.

Bacteria are directly engaged in many industries influencing the flavour of various productions. Some of the dangerous forms of bacteria have to be guarded against to avoid their work of harmful decomposition. Many industries have been inaugurated to circumvent the decomposing bacteria, such as the building of ice-houses, salting fish, smoking hams, canning fruit, &c.

A large army of bacterial workers are told off to do the scavenging work of the world. Bacteria believe in the utilisation of all matter, and do not allow the resources of Nature to be wasted. By this means the ground is prevented from becoming unfertile. They seize upon anything that is dead and doing no work and convert it into suitable material for the life of plants.

Mr. Conn has prepared an interesting diagram illustrating Nature's food cycle and the part played therein by bacteria. Plants in the first case obtain their food (CO_2) from the air and water (H_2O), and another portion from the soil (nitrates). Plans by means of the sun's heat build these into complex matters such as sugar, starches, fats and proteids. These products form food for the animal world and help to build up the animal bodies. When they die the organic matter would not support plant life. The decomposing bacteria readily seize hold of the dead bodies, and break down the complex matter into simpler matters, such as CO_2, water, &c., which are available life, or into ammonia and nitrogenous compounds, such as nitrites, which are not capable of being absorbed by plants. To reduce these nitrites into nitrates, and then complete the food cycle, another form of bacteria are brought into operation. These are called nitrifying bacteria, and have the power of adding oxygen to the nitrites, thus converting them into nitrates which can be absorbed by plants.

During putrefaction a small portion of nitrogen is dissipated into the atmosphere, and for a long time scientists wondered how the soil was able to recover this lost nitrogen. If it were not recovered the soil must gradually get less fertile. It has been found that there are some forms of bacteria which have the

power of abstracting nitrogen from the atmosphere, and thus we see in Nature's scheme of perpetual motion in the food cycle that bacteria play a most important part and enable the soil to retain its fertility.

SEWAGE DISPOSAL.

Everybody now knows how bacteria have been harnessed by municipal engineers to carry out in a scientific way the work of sewage disposal. Two classes of bacteria are brought into the municipal service, and artificial conditions are created for their rapid multiplication, so that their work can be expeditiously done. The first class of scavengers are known as "anaërobics," and are used to break down and liquefy the sewage. As they work without the presence of oxygen, air is excluded by the best artificial means by the provision of tanks. The bacteria would cease action if left too long in their own products, and therefore a steady current is usually maintained through the tanks. When the preliminary stage is done the work is handed over to another class of bacteria called "aërobics." These bacteria work with oxygen, and accordingly filters or beds are provided and the air allowed to percolate through the interstices, so that the oxygen can be supplied to the bacteria. The work done consists in making the products from the previous process available for plant life.

The possibilities of this method of sewage disposal are being realised more every year. The great problem consists in making the best artificial conditions for the rapid multiplication of the necessary bacteria. The more quickly the bacteria develop the more quickly is the work of sewage disposal carried out. It is very difficult to regulate with scientific accuracy the time which should be allotted to the various processes, and to draw a hard-and-fast line between the various operations. In Nature the various operations are so dovetailed that it is difficult to know where one process begins and another ends. The sewage engineer is, of course, working under unnatural conditions, and therefore it is only by experiment that he can find the best means of harnessing bacteria for the work of sewage disposal.

Before concluding the author must briefly refer to bacterial slumland, as represented by such germs as those producing typhoid, diphtheria, small-pox, anthrax, &c. The knowledge of pathogenic or disease bacteria has revolutionised medical science, and the methods of curing many of our diseases consist in overthrowing the particular bacteria associated with the particular disease. The disease germs themselves are not especially offensive to the body, but when they obtain access to the body the bacteria produce poisons called toxins, which are most dangerous to human life. The body appears in a marvellous way to have the power of producing antitoxins to neutralise or overcome the effect of the toxins. It is the fact which has influenced the modern treatment of disease by endeavouring to impart immunity to the body by inoculation with antitoxins.

The author has now completed a very hurried tour of the bacterial world, and has left unexplored many hidden processes and manufactures which have an important bearing on our every-day life. Bacteria influence our health, our food, our drink, and almost everything we need. They are the scavengers of the universe, the fertilisers of the soil, the breeders of disease, the manufacturers of flavours and relishes of endless variety, playing an important part in Nature's perfect cycle of endless life and change.

DISCUSSION OF MR. RANSOM'S PAPER.

Mr. E. Willis (Chiswick) said he thought every member would agree that Mr. Ransom had put in very readable form the elementary principles underlying the science of bacteriology. On the question of sewage purification by anaërobic organisms, he thought further information would be much appreciated if Mr. Ransom could supply it. With regard to sterilisation it would seem that it did not cover all that at one time [illegible] Sterilisation was not what they wanted; what they actually needed was to cultivate organisms which were not harmful to the body. They should not be taught, try to sterilise milk and other [illegible] pathogenic organisms which were largely eliminated [illegible] keep their bodies healthy.

He [illegible] which seemed, and still [illegible] to be a very serious problem in connection with water supply and sewage disposal. At Cheltenham the problem was to derive pure drinking water from the Severn, which started with the surplus water from the Vyrnwy supply, and later went down to Worcester, where Mr. Ransom, by putting in bacteria filters, was producing an effluent that seemed all that could be desired. At Cheltenham they found that the effluent contained organisms, including typhoid germs, and the question arose whether Mr. Ransom should not sterilise the effluent in order that people might safely drink the water. They could deal with the peaty, black water, but that with bacteria from Worcester was more difficult. The same problem, in a more acute form, arose in London. Within the last few weeks Dr. Houston had proposed the excess lime method of sterilisation. He was out in Singapore a while ago, and there the water supply was derived from a gathering ground at the back of the town, where rubber trees grow. The question was discussed whether the rubber trees should be tapped or not, and the corporation was divided into tappers and non-tappers. The point was that if tapping was adopted they would have a number of coolies on the gathering ground, and as a natural result there would be pollution of the water, which was filtered by ordinary sand filters, which the medical officer did not consider would secure sterility. In considering works of sewage disposal they had to consider that it was not necessary for the water from such places to be up to the drinking water standard, and therefore he thought they should not insist on the Worcester people sterilising their effluent. On the other hand, they had to look at the problem as a whole, and must remember that the people of Cheltenham derived their water from the Severn. That brought him to this point—that those who were interested in this problem should further as far as they could the recommendations of the Sewage Commission to the effect that the different watersheds should be placed under the control of water boards, which would deal with the water problem as a whole, and would have as members experts on the questions to be dealt with. Attempts in this direction had been made, more or less successfully, in the West Riding of Yorkshire. That was the point which he wished to emphasise and commend to their support—that the results of bacteriological examinations pointed to the necessity of information in the different watersheds with a view to purifying water to the drinking water standard.

Mr. Kemp said that Dr. Rideal had suggested that Worcester might sterilise the effluent before it flowed into the river. At present Worcester had no effluent, for, pending the completion of certain works, the sewage had been discharged crude into the river. In order to see the effect of that he had had samples taken at Worcester above the outfall, and at the intake at the Cheltenham waterworks. To put it shortly, the water taken at Cheltenham was rather better than that taken above where the sewage was discharged.

Mr. E. G. Mawbey (Leicester) commended the paper for putting the question in so straightforward and simple a manner. One point he thought worth emphasising was the necessity of frequent collection of house refuse. Another was the influence of bacteria in connection with roads and streets. There could be no doubt that, especially in the densely populated districts, excreta and other foul matter got into the permeable road crust and there became breeding places for germs. Therefore there was no doubt they could do a great deal to preserve the health of towns by attending to the road surfaces and keeping them clean. The author said the effect of sunlight on bacteria was very marked. Did not that show how very important was 'own planning, and that it was desirable to have open spaces and wide thoroughfares, with houses so planned that they got a maximum supply of sunlight into the rooms? Ten or twelve years ago he carried out extensive experiments at Leicester with a view to finding out at what stage septic action set in. They found they could get better results so far as the effluent was concerned when they did not carry the septic action very far, and many were now coming round to the opinion that the extreme septicising of sewage was a mistake.

Mr. G. A. Hart (Leeds) said the paper had brought to his mind that they were engineers, and the less they knew of the intricacies of the question the better. What they had to do was to take the theories of another profession and put them on a utilitarian basis. The Royal Commission had given them a lead as to what particular direction they should expect legislation on the subject to take, but it would have been a great advantage to most of them if that lead

had been given in more concrete fashion. It was more than probable, however, that most authorities on inland rivers would have to deal with this question before they got legislation, and they would have to do the best they could under existing circumstances. As in the case of the larger authorities, expenditure amounting to something like a million might have to be incurred, it was a regrettable fact that there had not been greater standardisation and better collection of data, and standards better adapted to the respective watersheds. He did not suppose there would be any benefit in putting down empirical standards which would have to be revised, but it would be an advantage if the various localities were circumscribed in more confined areas. In the case of authorities which were situated on the outfalls of rivers it was a misfortune that they had to provide protection works, while those which were higher up were polluting the stream and handing down their output for the others to work upon. The question of sterilisation had been touched upon, and they had to consider how far sterilisation might be embodied in the science of bacteriology. He noticed that the author of the paper stated that "the purification of river water for public purposes chiefly consists in the removal of the majority of the bacteria." Sterilisation would be conducive to this effect, since it would remove them all. He presumed the author was referring to water in its pristine condition; if he referred to water into which sewage effluents were taken, and if they were to regard purification as meaning the removal of bacteria from all water into which effluents discharged, then purification was more or less a phantasmal dream. The function of the engineer came in when a decision had to be made as to which was the means of removing pollution, whether by sterilisation or by removing the cause, and so securing pure effluents. So far as knowledge of bacteriological science was concerned, he thought they should content themselves with acquiring the elements of that knowledge which science had built up. The less they entered upon controversial matter the better it would be for them.

Mr. Bainbridge said the works he was associated with supplied 105,000,000 gallons of water per week, of this 65,000,000 gallons came from a river and 40,000,000 gallons from two reservoirs, one behind the other. They took particular care in flood-water time to allow the flood water to go down the by-wash and collect the clean water. They got the water from a source on the moors where there were scarcely any houses, and certainly no villages. It was very easy for an expert speaker and clever writer to construct a convincing theory, but to put it into practice was not quite so easy. They had spent a very large sum, but they were not in possession of perfection yet. They had no fewer than eleven filter-beds, but all they got out of the water was sediment and colour. Combination of districts had been mentioned. That was what they had done, and it was certain that no poor district could have spent so much. What they should strive for was by means of combination to get purity; then they got healthy bodies, and bacteria had not half the power over them as over weaklings.

Mr. W. B. Chancellor (Lichfield) thought it most important that engineers should keep to their own line, and when it was necessary call in the chemical expert, who knew far more about these matters than themselves. He had found in his own practice that the advice experts had given had been the means of saving no end of money, and he was sure that if engineers before going into vast sewerage schemes would consult men who had made a life study of these matters the result would be satisfactory to them. With regard to the sterilisation of effluents, were they not likely to have a good deal of trouble after sterilisation? He knew of a case where they had great trouble, and he was told there was more likely to be decomposition in water that had been sterilised than in water that had not been so treated.

Mr. Stainthorpe (South Africa) was inclined to favour the view that engineers had plenty to do in their own profession without taking on themselves the work of bacteriologists. To begin with, no engineer had the time and opportunities at his disposal for the work. The proper course was that which he followed when he carried out a large sewage disposal scheme in South Africa. He always worked hand-in-hand with the Government bacteriologist, and got very good results. He was interested to hear what Mr. Mawbey said upon the length of time for tank treatment. South African conditions were different from what they had at home, and he found instead of allowing twenty-four hours for treatment in tank, six hours were sufficient. He did not know how that compared with recent practice here, but he quite saw eye to eye with Mr. Mawbey on this matter, and as the years went on he believed that the heavy cost incurred now for building supplementary tanks would be unnecessary.

The President agreed with the speakers who had urged it was desirable to have joint water boards. There was an example in that county where they had the Thames, with its own board, and in the North another watershed, with its own conservancy. The difficulty that arose from dealing with the varying conditions, added enormously to the work of the local authorities concerned, and entirely prevented that harmony and that co-ordination which were most necessary in dealing with this important subject.

The vote of thanks having been carried,

Mr. Ransom, in reply, thanked all the speakers who had taken part in the discussion on his paper, which was an attempt to deal with a subject bristling with difficulty.

(To be continued.)

INSTITUTE OF CLEANSING SUPERINTENDENTS.

ANNUAL CONFERENCE AT MANCHESTER.

Mr. R. Williamson, cleansing superintendent to the Corporation of Manchester, occupied the chair, in his capacity as president, at the annual conference of the Institute of Cleansing Superintendents, which opened in that city on Tuesday of last week.

In the course of an address to the members Mr. Williamson expressed pleasure at the continued progress of the institute. Reviewing the history of the organisation, he said that it was started in 1898 with 27 members. The membership was now 148, and ninety-seven towns were represented.

THE CLEANSING OF MANCHESTER.

"The Cleansing of a Great City" was the subject of a lecture given by Mr. A. Jennison, a member of the Manchester Cleansing Committee. The gross expenditure of the Manchester Committee, he said, was £200,000 a year, and of this £123,000 was paid in wages. About 80,000 tons of street sweepings and over 200,000 tons of domestic refuse were dealt with each year, and the value of this work, from the point of view of public health, was indicated by a drop in the death-rate of the city from 26 per 1,000 in 1891 to 17·12 in 1911. The manufacture of fertilisers—of which 2,500 tons per year was sold at £3 per ton—was explained, and the work on the Carrington and Chat Moss estates was described. These estates, Mr. Jennison said, had been converted from sterility to a highly fertile state, with roads, wharves, railways and modern farmsteads, with the result that sixty-four tenants now occupied the land and paid £7,170 a year in rent. The work of street cleansing was illustrated by many interesting slides, and described in detail. There were 540 miles of roadway in the city, Mr. Jennison said, and the surface swept each year reached the stupendous figure of 709,000,000 sq. yds.

[redacted]

In a paper on this subject, Mr. W. A. Bradbury, chemist and manager of the Manchester Committee's Holt Town Works referring to the disposal of clinker from the refuse destructors, said that last year a profit of £400 was obtained from the sale of mortar made from the clinker. As to stable manure, which, he said, was a notable breeding place for flies, he suggested that if during certain periods of the year the manure were dried by similar apparatus to that employed for the fertilisers, the eggs of the flies would be destroyed and the manure would be increased in value, but he was not prepared to say whether or not farmers would take kindly to the dry form.

[redacted]

Workmen's Cottages in Hadham Rural District.—A block of four cottages built under the auspices of the Hadham Rural District Council in the parish of Braughing, was opened recently. The cost of the structures, including land and well, has amounted to £600, and the accommodation provided in each cottage comprises a living-room, kitchen, scullery and three bed-rooms. Good gardens are attached to the cottages, which will be let at a rent of 3s. 6d. per week each. A loan has been sanctioned by the Local Government Board, the period allowed for repayment being sixty years. Mr. E. T. Watts, the surveyor, designed and supervised the erection of the buildings.

BUXTON'S THERMAL SPRINGS.

ST. ANN'S WELL ALTERATIONS.

Mr. Frank Langley, surveyor and water engineer to the Buxton Urban District Council, has lately carried out alterations and extensions to the famous St. Ann's Well in that town, and the completion of the work, which has involved an expenditure of £3,000, and which took three months to execute, was the occasion of some little ceremony, the reopening being performed by the Duke of Devonshire. In the course of the proceedings, Mr. T. H. Cooper, chairman of the Baths Committee, said he should like to take that opportunity of thanking the surveyor for the able manner in which he had carried out the alterations. The work had been done to the entire satisfaction of the council, and great credit was due to him.

The task with which Mr. Langley was faced was, it will readily be understood, somewhat exceptional in character, and serves as another instance of the varying duties imposed on or demanded from municipal engineers at the present day. The investigations of the "springs" required extreme care, as hasty excavations might have caused serious consequences, and no blasting was permissible in removing the limestone rock during the work. The "springs" have been aptly termed the "life blood" of the town—hence the responsibility in carrying out the scheme.

The scheme, as now carried out, encloses the colonnade, the spaces between the piers being filled in with ashlar dressings to form windows 5 ft. wide. The inner wall forming the colonnade has been removed and two brick piers formed to support steel girders spanning the opening and supporting the roof. The enlarged room measures 50 ft. by 35 ft. 9 in. There are two entrances, one at each end of the building frontage, the space under each dome being formed into a vestibule 8 ft. square.

The rear of the building has been raised; the portion previously walled off from the public view, and then containing gas engine, pumps and so forth, has been thrown into the room by the taking down of the main wall at the rear of the pump-room. Piers support steel girders spanning the opening thus formed, carrying the roof and back line of balustrade above it, these structural alterations being in unison with the most well-timed [illegible] building.

From Photo by St. Ann's Well, Buxton *Steward & Co., Buxton*

THE WELL CHAMBER.

[illegible] side of the well chamber a small room is formed, one to be used for the chalybeate spring and the other for the attendants. The floors of these rooms, which are on the same level as the public room, are enclosed on one side by a mahogany partition with bevelled plate glazing, and on the side to the well chamber by a low marble balustrade. The well chamber floor is reached from each of the above rooms by a flight of eight steps, formed in white marble and with ornate handrail.

MUNICIPAL WORK IN KRUGERSDORP.

TOWN ENGINEER'S REPORT.

In his latest annual statement Mr. R. A. Webster, the engineer to the Municipality of Krugersdorp, South Africa, comments on the absence of a storm-water drainage scheme in that town, and explains that as a result of this most of the channelling is of exceptional size, being designed, when a road is constructed, to take as much of the storm water as possible.

Mr. Webster reports the passing of an unprecedented number of building plans. The improvement in the class of buildings is still maintained, and the generally enhanced appearance of the various townships is very marked. In the business portions of the town and suburbs many elaborate and costly improvements and additions to business and other premises have been and are being effected.

Important developments have taken place in connection with the electricity department during the period under notice, and the large increase in the working has called for very strenuous effort on the part of those responsible. There has been a steady increase in the number of consumers, the total in September last being 580, an increase of 175 upon the previous twelve months. The number of 30 Watt lamps, or their equivalent, connected to the municipal mains was 12,250, equivalent to 367½ kw., there being an increase during the year of 3,679 lamps. There are eleven power consumers, having a total b.h.p. of 76, connected with the council's mains, taking current at power rate. The highest peak load recorded during the year was 225 kw.

In connection with the water-works, which are stated to be now working satisfactorily—Mr. Webster mentions that the following tariff of charges for meters has been adopted by the council: ¾-in. meters, 2s. per month; ¾-in. meters, 2s. 6d. per month; 1-in. meters, 3s. per month. The rentals for larger meters will be fixed by the council as occasion arises. The "Sandy" filters are in good order and continue to give satisfaction.

Business Announcement.—Messrs. Herbert Morris, Limited, of the Empress Works, Loughborough, Leicestershire, give notice that from August 5th to 13th next their works will stop for stocktaking and overhaul of plant. The offices will close for the yearly holiday. A limited number of the staff will be in attendance to deal with urgent matters. Orders for pulley blocks and other stock articles will be executed from stores as usual.

The St. Petersburg Destructor.—The extensive refuse destruction plant erected in St. Petersburg by Messrs. Heenan & Froude, Limited, to Manchester to consume 150 tons of refuse per day, is on the most approved mechanical stoking type. A slide is raised, withdraws the wood of the [illegible] from the cell in one operation, a work easily performed by one man, instead of by two as [illegible] in the old style. The material to be consumed is charged into the [illegible] by means of a continuous opening at the top of the cell, and a sliding door, [illegible] by means of a [illegible] is raised from the [illegible] floor, and the [illegible] promptly pushed into the furnace. Messrs. Heenan & Froude are erecting somewhat similar [illegible] at Cardiff, at [illegible] and Belmont.

ASSOCIATION OF KENT SURVEYORS.

MEETING AT FOLKESTONE.

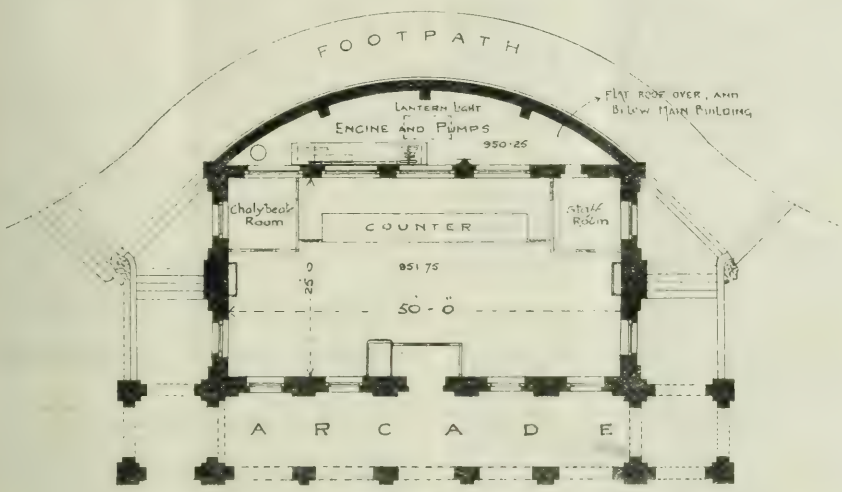
A meeting of the Association of Kent Surveyors was held at Folkestone by the kind invitation of Mr. A. E. Nichols, the borough engineer, on Saturday, June 29th, those present being: Messrs. A. E. Nichols (vice-chairman), F. Bunting, W. C. Hawke, H. W. Longdin, G. A. Butterworth, W. Banks, H. W. Barker, H. O. Jones, C. Conquest, W. L. Bradley, H. F. Jackson, F. D. McKenzie, T. A. Busbridge, and F. Harris.

The members assembled at the town hall and were received by his Worship the Mayor (Lieut.-Colonel Stephen Penfold, J.P.), who expressed his pleasure at meeting them and gave them a very hearty welcome. A tour of inspection was afterwards made of the district, the various systems of road treatment with tar and bituminous binders, etc., being examined, and the pleasure bath and the bottle of the cremation bottle, the fire station, refuse destructor—where very interesting work was being executed in concrete block making and a magnetic separator for removing nails, and so forth, was seen in operation—the meteorological department, the arrangements for sea bathing from the beach, suspension lamps for central street lighting, and the sewage outfall works all coming in for attention.

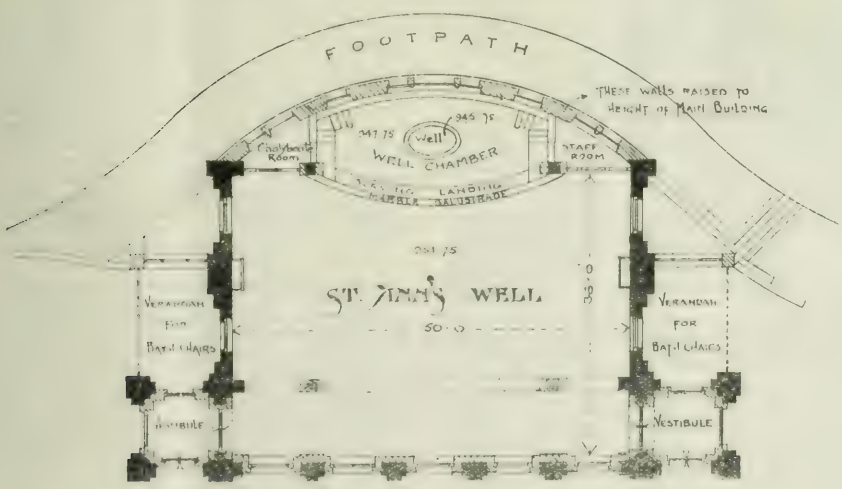
At the termination of the visits Mr. Nichols was heartily thanked for his kindness in arranging so pleasant and instructive a meeting.

New Water Supply for Aberystwyth.—Mr. J. Herbert Lewis, Parliamentary Secretary of the Local Government Board, inaugurated a new water supply for Aberystwyth last week. The work cost nearly £7,000, and includes a new service reservoir, with a 3,000,000-gallon capacity.

Road Ramming for Road Rolling.—A road rammer is being tried in France to consolidate broken stone with a view to saving time and labour as compared with the use of a steam roller alone. As described by Mr. C. Guillet, in the "Genie Civil," it consists of a number of rams, each weighing 3 cwts., and having a face of 1 sq. ft., which are raised about 2 ft. and then dropped. Four sections of road, each about ¼ mile long, have been consolidated in this way, and similar adjacent sections have been rolled in the usual manner. About 90 per cent of the stones before consolidation were too large to pass through a 1·18 in. ring. After ramming 60 per cent were still too large, and after rolling only 40 per cent were of that size. From the *Contract Record*.



Ground Plan (Before Alterations).



Ground Plan (Showing Alterations).

ST. ANN'S WELL, BUXTON.

NEW HAMPSHIRE HIGHWAYS.

GOVERNMENT INSPECTION AND REPORT: MILEAGES PER SQUARE MILE.

While the methods adopted by the United States Federal Government in its efforts to improve the road system of the Union are not necessarily those which would best repay attention in other countries, there is at the same time necessarily something, and possibly a great deal, to be learned from the study of a report such as that before us, made by a Superintendent of Construction of the United States Office of Public Roads (Mr. C. H. Hoyt), and embodying the results of his inspection of the New Hampshire highways in August of last year.

A large portion of the paper must be classed under the head of propaganda rather than as engineering literature, and many of the photographs with which the report is embellished, while they doubtless help to bring out points which are of interest to American citizens, are some of them little more than pleasing pictures illustrating the text in a somewhat vague manner, and without any special lesson for highway engineers. For instance, a picture of a bungalow, provided with hammocks, and situated beneath a shady tree at the side of a State-aid road, is intended to push home the lesson that "good highways and the automobiles make these resting places accessible"—that is to say, spend your money wisely on roads, and persons from the big towns will spend their money well in your State. But some of the illustrations are of distinct value, and important as illustrating the statements and arguments of the text.

It is worth while drawing attention to some of the facts and opinions to be found in the thirty-four pages of letterpress, especially those having a general application in addition to their local significance.

Under the head of "Maintenance," Mr. Hoyt writes: "All kinds of public highways that have ever been built require attention and repairs. Traffic requirements have become much more severe during the past five years than they were before that time. There is no such thing as a permanent road surface known to the human race. The word 'permanent' has been used largely and unwisely by those whom English writers describe as 'armchair' road builders, who are unfamiliar with the practical side of the question. The only features of road building that approach permanency in any considerable degree are the location, the grading, and the masonry structures."

With regard to small constant repair, he says: "The railroads do not employ section gangs to maintain their road-beds because it is necessary for them to proceed in that way, but because it is an economy for them to do so. When a boy tears his new coat it is usually considered economy to mend it before it gets torn worse. The same principle applies to highways."

Mr. Hoyt then draws attention to the fact that the patrol system has proved very successful in Europe, and he attributes the better condition of European roads as compared with those of the United States rather to superior maintenance than to better methods of construction.

For a description of the split-log drag and an explanation of the methods to be adopted in using it, the reader of this report is referred to Farmers' Bulletin 321 of the United States Department of Agriculture, and it may be observed in passing that split-log drag as used in America is a machine which is certainly of value to British engineers in many parts of the Empire for roads in the earlier stages of development.

It may be noted that the Summary of Recommendations includes, in addition to recommendations on administrative matters, the following as regards highway engineering: (1) The establishment of a patrol system under the supervision of a State engineer. (2) The use of the split-log drag on all earth and gravel roads. (3) The construction of reinforced concrete culverts to replace existing wooden culverts. (4) The use of hard stone in preference to gravel where there is a suitable quantity of stone and when sufficient funds are available. (5) The use of trap rock for the top course only where the local stone is suitable for the foundation course, and not for the top course.

The mileage statistics, which are of general interest, may be quoted almost in full, as follows:—

"New Hampshire has, according to the best data available, 15,116 miles of public highways, or 1·67 miles per square mile of area, which is a larger percentage than the average ratio for the United States, which is 0·75 mile per square mile of area. The ratios for the other five New England States are as follows: Maine, 0·85 mile, with a total of 25,528 miles; Vermont, 1·58 miles, with a total of 14,521 miles; Massachusetts, 2·12 miles, with a total of 17,092 miles; Rhode Island, 2·24 miles, with a total of 2,361 miles; Connecticut, 2·90 miles, with a total of 14,088 miles. For the remaining United States Arizona has the smallest ratio of all, which is 0·05 mile, with a total of 5,987 miles; and Connecticut has the largest ratio of all the States, as shown above. The district of Columbia has a ratio of 3·18 miles, with a total of 191 miles, but this can hardly be compared with the condition in other States, because the city of Washington occupies a very large part of the entire district. The State of New York has a ratio of 1·54 miles, with a total of 73,798 miles; Illinois has a ratio of 1·6 miles, with a total of 94,141 miles; California has a ratio of 0·29 mile, with a total of 46,653 miles; Florida has a ratio of 0·34 mile, with a total of 17,374 miles; Texas has a ratio of 0·46 mile, with a total of 121,409 miles, which is the largest total mileage for any of the States.

"There is another feature of these highways that is interesting, and that is their condition. Of the reported total, 2,151,570 miles of highways in the United States in 1904, only 7·14 per cent, or 153,662 miles, were reported improved—that is, indicating that they were in good condition. Of these 153,662 miles, 108,233 miles were reported to have been improved with gravel, 38,622 with crushed stone, and 6,807 with other material, such as oyster or clam shells or other material. At that time (1904) New Hampshire was reported to have 1,293 miles of improved highways, or 8·55 per cent of the total mileage of the State. Of this amount 1,175 miles were reported improved with gravel and 118 miles with crushed stone. These figures are not given because they are considered accurate, but because they are the best obtainable."

An interesting point with reference to traffic is that the roads have a much heavier traffic in one portion of the year than in the other. "Many of the roads receive the greater part of their traffic during a period of about five months—from the middle of May until the middle of October. A traffic census recently taken by the State engineer shows that nearly 50 per cent of automobile traffic on the two days that the census was taken were out-of-State cars. The three trunk lines, now nearing completion, pass through many towns that have shown their public spirit and their pride in the State by contributing their share to the construction of these highways, which are used largely by automobiles from outside the State whose owners pay no taxes in the State and from which the towns mentioned receive no direct benefit whatever. Under the present law these towns are legally but unjustly bound to maintain these roads, to be ground to pieces and worn out by foreign traffic. The last Legislature relieved this condition to some extent by making a percentage of automobile fees available for this work."

Lecture on Reinforced Concrete.—On July 3rd and 17th Mr. W. Noble Twelvetrees delivered two lectures on "Reinforced Concrete" to the students of the Crystal Palace School of Practical Engineering. The first lecture dealt with the fundamental principles of reinforced concrete construction and the general theory of beam design. The second lecture was devoted to the principles underlying the design of columns, struts, arches, and other forms of structural elements, and to various aspects of practical construction in reinforced concrete. This lecture was illustrated by specimens of various types of reinforcing steel, as well as by models and photographs of works executed in the United Kingdom.

Watthour Meters.—Messrs. Siemens Bros. Dynamo Works, Limited, Caxton House, Westminster, S.W., forward a copy of a new publication dealing with the Siemens-Gs type Watthour meter. This meter marks a distinct step forward in meter construction, as all the working parts can be replaced without tools, and the replacement of any or all parts does not necessitate recalibration. The deterioration in accuracy of the meter can usually be traced to the wearing of commutator, brushes, bottom pivot, or jewel, these being the parts exposed to wear and tear. The original accuracy of the meter is restored on the worn part being renewed. The pamphlet is very fully illustrated, and shows clearly how the renewal of the parts is carried out.

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
Alkaline Waters of the London Basin	130, 134
Appointments Vacant	151
Assistants' and Students' Section	142
Association of Kent Surveyors	139
Bacteria	129, 138
Buxton's Thermal Springs	138
Correspondence	133
Dissemination of Weather Forecasts	141
Hinckley Waterworks	133
Institute of Cleansing Superintendents	137
Institution of Municipal and County Engineers:	
Annual Meeting	134
District Committees	131
Notices	150
Institution of Municipal Engineers: Notices	150
Law Notes	143
Leigh-on-Sea New Council Offices and Fire Station	Supplement
Local Government Board Inquiries	144
Municipal Competitions Open	151
Municipal Contracts Open	151
Municipal Ice Making at Bolton	Supplement
Municipal Work in Krugersdorp	138
Municipal Work in Progress and Projected	145
New Hampshire Highways	140
Personal	148
Public Health Congresses	131
Recent Publications	150
Road Crust as an Arch	150
Tiverton Road Surveyor's "Reprimand"	131
Use of Concrete in Road Construction	130, 149

THE DISSEMINATION OF WEATHER FORECASTS.*

By H. E. CARTER.

For some time past there have appeared at intervals in the pages of THE SURVEYOR letters regarding the effect of the weather upon the work of municipal and sanitary engineers. The keynote of the correspondence has been a plea for a wider and more efficient distribution of weather forecasts from the Forecast Branch of the Meteorological Office, and such support was given to the proposal that a deputation representing a large number of municipal bodies waited upon Dr. W. N. Shaw and urged upon him the importance of their views.

Mr. Harold G. Turner, assistant engineer and surveyor of Surbiton, was, we believe, the pioneer in this movement, and his proposal was that the daily reports and forecasts of the Meteorological Office should be supplied direct to municipal engineers, and through them to the public.

Mr. Turner's suggestion was at once approved by the following engineers and surveyors: Messrs. G. Bruce Tomes, C.E. (Barnes), A. B. Lismer, C.E. (Edmonton), H. C. Fread, A.R.I.B.A. (Esher and the Dittons), S. H. Chambers (Hampton), R. H. Jeffes, C.E. (Maldens and Coombe), G. Jerram, C.E. (Merton), H. T. Mather (Surbiton), and M. Hainsworth (Teddington).

Dr. Shaw, in replying to the suggestion, recognised that trustworthy information as to future weather changes was of great service to municipal engineers. The distribution of forecasts through the Press involves unavoidable delay, and direct distribution by telegram would be much more satisfactory. He continued: "The authorisation to exhibit harvest forecasts in post offices is a first step in this direction, but under present circumstances the cost of transmission of the telegrams has to be borne locally. I understand that in Germany and Denmark forecasts are transmitted regularly to all post offices or railway stations and there publicly exhibited. I believe that a similar arrangement in this country would soon develop into an important public service, and I therefore welcome suggestions from outside which show that there is a demand for such information. Without a public demand I cannot expect the organisation which the scheme would require to be forthcoming."

The matter at once appealed to a large number of municipal engineers, and Mr. Reginald Ryves contributed a lengthy statement, setting forth the arguments in favour of such a scheme, which he regarded as a large economic gain to the country as a whole. He drew attention to the disadvantages of occasional forecasts, and said, concerning the financial position: "An annual expenditure of £10,000 would allow of telegrams being sent to about 2,000 post offices daily, supposing the post office to charge 3d. each, which should be a liberal allowance for telegrams sent in a short, simple and easily used code. If the reader would take the trouble to mark down the share of these for any part of the country he will find that the telegrams would be brought within a few miles of almost every spot, and could be brought within a very short distance indeed of the greater part of the population. As, however, farmers and small holders are the classes that benefit most from such telegrams, it is well not to lay stress upon the latter fact, but rather to make the smallest maximum distances the measure of the efficiency of the distribution. If we allow 5,000 stations for Ireland, Scotland and Wales, we are left with 5,000 for England. Taking as an example Staffordshire, which has an area of about one-twelfth that of England, and includes agricultural, pastoral, moorland and industrial areas, the allowance of 400 stations is ample, for it will be found that 350 stations command all parts of it with a maximum distance of about 3 miles. The distance is, of course, increased slightly in some parts, owing to the positions of the post offices, but there are so many ways in which the daily forecast would be passed on from mouth to mouth that this would not be a serious matter."

A regular use of the forecasts would certainly considerably reduce the losses now incurred without their aid. The agricultural community has long since realised the value of the special "harvest forecasts" prepared for their use, and the storm warnings have proved of enormous value to the mariner. The highway engineer and district surveyor would benefit considerably, especially as regards such public work as watering, sweeping, scraping and brushing the roads, the removal of snow, and the construction and maintenance of the public highways. A weather forecast available at, say, 4.30 p.m., and covering the ensuing twenty-four hours, would permit of to-morrow's work being arranged overnight, with due regard to the probable state of the weather. The value of the forecast is ever increasing as the percentage of successful forecasts has, during recent years, shown a gratifying advancement. In 1909 and 1910 the percentage of complete and partial successes reached ninety-three.

The energies of the pioneers in this movement, the work of the local Forecast Committees, and the publicity given to the matter in THE SURVEYOR, resulted in the subject being discussed by urban councils and various highways committees in all parts of the country. In almost all cases these bodies offered to co-operate in the effort to secure the benefits which the better dissemination of weather forecasts would bring. The council of the Royal Sanitary Institute passed a resolution in support of the proposition, but added a suggestion that an endeavour should be made to arrange for additional observations, so that the Meteorological Office may be able to reduce the size of the areas for which the forecasts are now given.

Mr. Frank Harris, engineer and surveyor to the Tonbridge Rural District Council, did not hesitate to say that the forecasts are not sufficiently local and definite to be of any material service. While such a statement is hardly borne out by the experience of others, there can be little doubt that the adoption of the suggestion of the Royal Sanitary Institute would enhance the value of the forecasts.

* From Symons's *Meteorological Magazine* for July.

Twickenham Proposed New School.—At a meeting of the Twickenham Education Committee on Monday there was adopted a committee's report which involves a scheme for the erection of a new school, at a cost of £11,000.

Large Reservoir for Buenos Ayres.—In connection with the sanitary improvement scheme which is now being proceeded with by the authorities of the City of Buenos Ayres, and for which no less a sum than £3,500,000 has been sanctioned by the national executive of the Argentine Government, a contract has recently been awarded the Cleveland Bridge and Engineering Company, Limited, of Darlington, for the manufacture and erection at Caballito, near Buenos Ayres, of an elevated reservoir, which will rank as by far and away the largest of the kind ever built in any part of the world. Water is to be drawn from the River Plate and pumped into the reservoir, which will consist of three tiers of wrought-iron tanks, supported on cast-iron columns embedded in heavy concrete foundations. The total capacity of the tanks will be 16,000,000 gallons.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, assoc.m.inst.c.e.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

This week answers are invited to the following questions:—

QUESTIONS.

252. Girder Bridge. Design a girder bridge to carry a 24-ft. road over a river and railway (at an angle of 60°) of two spans, 70 ft. and 42 ft. respectively. The mean height of road surface above bed of river is 21 ft. 6 in., and 17 ft. above rails, and the foundation is clay. Please show calculations and give an estimate of the cost. ("Nomad.")

260. Refuse Disposal. Where there is no system of sewers in a district, what are the best methods of collecting, removing and disposing of the fluid and solid refuse from the community?

261. Deflection of Beams.—If two precisely similar beams of rectangular section, one of cast iron and the other of wrought iron, were laid across the same span and loaded with the same load (within the elastic limit), what would be the relative deflections of the two beams?

262. Wood Paving.—What contour should be given to a wood-paved (soft wood) road 60 ft. in width? Describe the best method to adopt in fixing the screeds. (A. B.)

263. Floor Construction.—Give sections showing clearly the construction of a double floor and a framed floor respectively. ("Junior.")

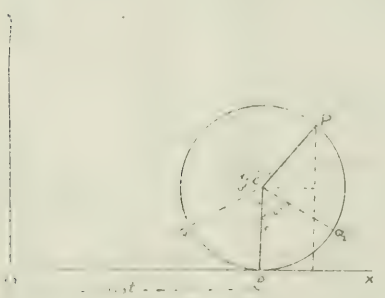
264. Concrete Beam.—A concrete beam reinforced with steel rods is to be designed to carry a distributed load of 20 tons. The span is 15 ft. Show by calculations what size of beam you would use—the method and formulæ to be as simple and short as possible. ("Greenland Farm.")

REPLIES TO QUESTIONS.

259. Mechanics.—What is meant by "Instantaneous centre of rotation"? Give an example. What points on the rim of a carriage wheel are moving at the same rate as the middle of the axle? ("A.M.I.C.E.")

The following reply has been received since our last issue:—

When a rigid body moves from one position to another in the same plane, its total displacement may be produced by a simple rotation about a certain fixed point in the plane. When these positions are successive—that is, when the time taken to move from one to the other is infinitesimal, or rather when



the angle turned through is infinitely small the point about which the rotation is made is called the "instantaneous centre of rotation." For example, in the case of the carriage wheel the point which touches the ground has no velocity, for it relative to the axle has no vertical component and also as it had a horizontal component, the point of contact would be moving along the ground, which it does not do. Therefore the instantaneous centre of rotation is the point at which it touches the ground. Let the angular velocity of the wheel be w and the radius r. Then the linear velocity of the hub $= wr$, and the linear velocity of any point at a distance r from the point at which the wheel touches the ground (*i.e.*, from the instantaneous centre) is wr. Therefore the points on the rim which have the same velocity as the hub are at a distance r from the point which touches the ground. The same result may be arrived at by a slightly different but more general method, thus: Suppose the wheel (radius r) is rolling along the ground at a uniform speed, the angular velocity of the wheel being w. Take for axes of co-ordinates the ground-line and the line perpendicular to it through the point of contact at any particular time.

The initial position of P (say) is O.

After time t, the position of P is determined by

$$x = rwt - r\sin wt.$$
$$y = r - r\cos wt.$$

Differentiating with respect to the time

$$\dot{x} = rw - rw\cos wt = rw(1 - \cos wt).$$
$$\dot{y} = rw\sin wt.$$

∴ velocity of P is $rw\sqrt{(1-\cos wt)^2 + \sin^2 wt}$

$$= rw\sqrt{2 - 2\cos wt}.$$
$$= 2rw\sin\frac{wt}{2}.$$

Distance traversed by hub in time $t = rwt$.

∴ linear velocity of hub $= rw$.

∴ $rw = 2rw\sin\frac{wt}{2}$.

$$\sin\frac{wt}{2} = \tfrac{1}{2}.$$

∴ $wt = 60$ or 300.

∴ positions of P, where it has the same velocity as the hub, are Q_1 and Q_2, where

$$Q_1\hat{C}D = Q_2\hat{C}D = 60$$

i.e., where $Q_1D = Q_2D = r$ = radius of wheel.

(G. P. S., *Linlithgow.*)

256. Leak in Drain Pipes.—What is a reasonable amount of leakage to be expected in newly laid stoneware drain pipes of 6 in. and also 12 in. diameter? State the type of joint, average depth of trench, and class of soil. Is one gallon per mile of pipe per hour a permissible amount? ("Welsh.")

All new drains, whether 6 in. or 12 in. diameter, should have joints made to stand the water test with at least 3 ft. head of water, and no leakage, however slight, ought to be passed as sound. I think the depth of the trench and class of soil have nothing to do with the soundness of the drains. In jointing the pipes, the back portion of the socket must be filled with spun yarn (dipped into cement grout) for a depth of ½ in., and the remainder of the socket filled up with cement mortar (1 cement to 1 sharp sand), and trowelled off to an angle of 45 deg. Then any cement that has found its way into the pipes should be scraped out, and at least forty-eight hours should elapse before the test is applied, so as to give the cement sufficient time to set. If the trench is found to be very damp, then patent safety joint pipes may be used, which are now made by all leading manufacturers. As regards the one gallon per mile per hour permissible leakage, I am of the opinion that this ought not to be allowed. (W. D., *Dudley.*)

258. Roof Design.—Is it necessary or advisable to allow for expansion and contraction in a roof of 50-ft. span? What is a simple and efficient arrangement for such a roof, assuming that this is required? ("Student.")

In an iron roof truss of 50 ft. span it is not usual to make allowance for expansion and contraction as the movement between winter and summer temperatures is only about $\frac{7}{16}$ in. in 100 ft., and in case of a rise in temperature a roof truss can rise in the centre and so relieve itself.

A simple arrangement, if "Student" is afraid of any expansion or contraction is to have the roof well constructed, so as to keep it at as even a temperature as possible. (W. D., *Dudley.*)

Law Notes.

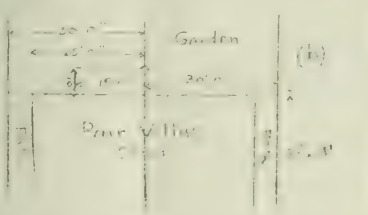
EDITED BY J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries which should be written legibly on foolscap paper, one side only, should be addressed to "The Law Editor," at the office of THE SURVEYOR, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of plans or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without redrawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

In order to avoid confusion queriists are requested to use distinctive words as nom-de-plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

BY-LAWS AS TO SPACE PAVING. "I. R." writes: The by-laws of a local authority provide as follows: "Every person who shall erect a new dwelling-house shall cause not less than 150 sq. ft. of any open space provided in connection with the premises to be paved with hard impervious and proper materials, consisting of flagging or other suitable material, properly and closely laid upon a sufficient bed of good concrete, or of other suitable material and properly jointed or with good cement concrete, or with good asphalt on a proper foundation, and so sloped to a properly constructed channel as effectually to carry away all rain and waste that may fall thereon. He shall cause such paving to be so arranged that it shall adjoin the external wall in the rear or at the side of the dwelling-house, so that, wherever practicable, it shall extend throughout to a distance of not less than 10 ft. from the said wall, and that, subject to this last-mentioned requirement, it shall extend as nearly as conveniently may be to the full width of the open space. For the purposes of this by-law the expression 'width' means in the case of



paving in the rear a measurement taken parallel to the rear external wall of the dwelling-house, and in the case of paving at the side a measurement taken at right angles to the side external wall on which such paving may abut." (*a*) Does this mean that either a builder must have a width of 10 ft. parallel with the rear external wall until he exhausts the 150 sq. ft. of paving asked for? Say, the width of a building plot is 30 ft., will a width of paving 10 ft. by 15 ft., or half-way across the plot, satisfy the by-law if the dwelling-house is 25 ft. across? (*b*) If the house is 30 ft. from front to rear, and the builder paves a 4-ft. path along the side external wall, making 120 ft. of such paving, would a strip a foot wide parallel with the rear external wall of 30 ft. suffice to make up the 150 sq. ft. to be provided? Or, in other words, if a builder elects to pave along the side external wall, must that not be taken into account in arriving at the 150 ft. to be covered with impervious paving, and if the quantity fall short of that amount, is he in any way compelled to provide more, parallel with the rear external wall, than will make up the required amount?

(*a*) The by-law is somewhat peculiarly worded, but I think it would be satisfied if a paving space adjoining and extending 10 ft. from the rear external wall and having a width of 15 ft. were provided. The words requiring "hard and open space provided in connection with dwelling-house" are important. The regulations of the by-laws with respect to the proportion that open spaces are to bear to the area to be covered are not affected by this proviso. (*b*) The exemption that "no open space contains more than 150 sq. ft.—otherwise how can 150 sq. ft." of the open space be paved? It would appear, therefore, that a path at the side of the house building site would not count as such an open space as required by the by-laws, and that a builder must pave 150 sq. ft. in any case, whether the path is an open space or not. The arrangement suggested in the query would not satisfy the by-laws.

NATIONAL INSURANCE ACT, 1911. "Yarn" writes: Will you kindly let me know whether the following are compulsorily insured under the Act? (*a*) Carters.—The carter employed by a haulier is paid by the week, who, as a rule, are given work in turns and paid by the day. (*b*) Lamplighters. The public lighting is by contract (not corporation), and the contract is let for a term of years. The lamplighters are employed by the contractor during the time up to the light-up time. (*c*) Market Hall Keeper. A person is engaged by the council as mart hall keeper and office cleaner (the latter of which he sublets), and is paid quarterly. He however devotes most of his time as inspector of waterworks, which is owned by a private company.

I assume that the Insurance Commissioners have satisfied that the terms of employment are such as to secure provision not less favourable than the corresponding benefits assigned by the Act to the insurable class, and that the employed persons are entitled to exemption under section 1 (2) of the Act. I think these are within the Act, and that the contracts "of service" within the meaning of the Act, but if it is the employed persons must apparently be insured. (*c*) Market Hall Keeper. The same question does not arise, but there is room for doubt as to the fact that the employed person has not passed the greater part of his time in the duties of office-keeper. Generally, the Act bristles with difficulties, and the only way to obtain an authoritative solution of the above and any other questions is to write to the Insurance Commissioners for their decision.

RURAL DISTRICT SURVEYOR: EXTRA REMUNERATION: PERCENTAGE.—"Per Cent" writes: Under the terms of my appointment as rural district surveyor I have a small amount of sanitary work to carry out, and my salary is apportioned as regards one-tenth for this work. Recently the council, wishing me to undertake further sanitary work, decided to pay me 5 per cent on the cost of works carried out in excess of £20, and passed a resolution to that effect. Will you please advise me whether this arrangement is legal, and, if not, how can I get paid? The amount of work fluctuates, and the council would probably not consent to an annual increase of salary, as in some years there might be no increase of work.

This arrangement is clearly illegal under sec. 193 of the Public Health Act, 1875 (see Stone's Practice, 1912, p. 1637). The only way, apparently, in which the result can be attained is for the council to increase the surveyor's salary for a specified period, the period and the amount of the increase being so calculated as to make the actual benefit equal to that which would accrue if the proposed payment were made in a lump sum. But the period for which the increase of salary is awarded must be prospective *i.e.*, must commence not sooner than the date of the resolution of the council awarding such increase. See Tomlin's Public Health Acts, 7th Edition, p. 550.

BY-LAWS: SCHOOL PREMISES: PLANS APPROVED BY BOARD OF EDUCATION.—"Velox" writes: Will you kindly inform me as to whether it is now necessary for architects to deposit plans with local authorities for new schools or additions to schools if the plans have received the approval of the Board of Education? I have it in my mind that a clause in one of the Acts passed last year makes it unnecessary for plans to be deposited if the approval of the Board of Education has been obtained.

It is not necessary. See s. 5 of the Education (Administrative Provisions) Act, 1911, by which the provisions of the by-laws made by any local authority under sec. 157 of the Public Health Act, 1875, as amended by any other Act, with respect to new buildings (including provisions as to the giving of notices and deposit of plans and sections), and any provisions in any local Act dealing with the construction of new buildings, and any by-laws made with respect to new buildings under any local Act, shall not apply to the case of any new buildings being school premises to be erected, or erected, according to plans which are under any regulations relating to the payment of grants required to be, and have been, approved by the Board of Education.

EXTENSION OF DRAINAGE.—"Beacon" writes: A rural district council, some twenty-three years ago, constructed a [illegible] which drained the sewage from seven adjoining cottages. [illegible] period, the rural council are desirous of constructing [illegible] sion. Will you kindly state whether or not the [illegible]

In my opinion [illegible]

We have to draw the attention of queriists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.

LOCAL GOVERNMENT BOARD INQUIRIES.

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INQUIRIES HELD.

Ballymoney R.D.C. (July 19th. Mr. Barnewell Crofton).—£9 129 for the erection of fifty-five cottages.—With regard to past operations under the Labourers Acts in this rural district, it was stated that 310 cottages had been built. The total amount of loans under the Labourers Acts was £64,532. Mr. Albert M'Master, the council's engineer, gave evidence as to the plans of the cottages and the suitability of the various sites selected.

Barrow T.C. (July 16th. Mr. T. C. Ekin).—£22.000 for the purposes of the electricity undertaking, and £1,250 for the purchase of land adjoining Greengate-street, for the extension of the Ramsden-street storeyard.—The town clerk, Mr. L. Hewlett, stated that the period asked for the loan of £1,250 for the storeyard extension was sixty years. The storeyard in use at the present time was purchased in 1882, when the population of the borough was 48,000. For some three or four years past it was found inadequate for its particular purpose. With regard to the application for £22.000 for the extension of the electricity undertaking, the period asked for the loan was twenty-five years.

Kenilworth U.D.C. (July 9th. Major J. Stewart).—£3,700 for the provision of a cemetery.—The proposal is to purchase three freehold fields at Roselands, and part of the land will be retained for the present for allotments. It was estimated that the total ground to be bought will last the district for sixty years.

Paignton U.D.C. (July 10th. Mr. Courtenay Clifton).—£397 for the purchase of land adjoining Dartmouth-road near its junction with Thomas Down-road for the purpose of a refuse tip.—Mr. C. O. Baines, surveyor, said the average depth of the land was 186 ft., and it was estimated that, as a tipping ground, it would last about ten years. Adjoining the road it was 2 ft. below the road level, running back to 9 ft., where it was of marshy formation.

Ramsgate T.C. (July 12th. Mr. F. O. Stanford).—£4,178 for the erection of a shelter and lavatories on the East Cliff.—Mr. G. Thorn Drury, barrister, instructed by the town clerk (Mr. A. Blasdale Clarke), stated that the shelter was estimated to cost £3,257 and the lavatories £1,921. Ramsgate, he said, like other places round the coast, existed, and must necessarily exist, to a large extent, upon the entertainment of persons who came to such places either for health or pleasure. There was, and always must be, a certain competition among the various towns to render their districts more attractive to visitors, and it was with those points in view that the corporation had decided upon that application. There had been for some time a constant demand for some shelter on the East Cliff. Mr. T. G. Taylor, borough engineer, explained the plans in detail.

Rhyl U.D.C. (July 16th. Mr. P. M. Crosthwaite).—£7,500 for the purchase of the pier. The total sum involved by the scheme, however, is £52 000, the Board of Trade having already sanctioned a Provisional Order giving the council authority, with the board's approval of plans, for the spending of £50,000 on the repairing, widening, and extending of the pier.—The town clerk, Mr. A. Rowlands, stated that the council had been granted a lease of the pier and land adjoining for seventy years at a rental during the first five years of £25, after which the rent would be £75 per annum. As soon as sanction was obtained to buy the pier, it had been definitely decided to proceed with the repairing, and afterwards with the extending. There was no doubt that Rhyl must have a pier where steamers could land. He added that during June, July, and August no fewer than 220,000 visitors were brought to Rhyl by rail alone. There was considerable opposition to the application.

Shanklin U.D.C. (July 9th. Mr. H. R. Hooper).—£1.500 for the acquisition of the Literary Institution for municipal purposes.—The surveyor, Mr. E. C. Cooper, who had prepared schemes for the conversion of the building, stated that that which was most favoured was the proposal for carrying up the annexe buildings.

APPLICATIONS FOR LOANS.

Bridlington T.C. £4,700 for workmen's dwellings.

Cambs C.C. £710 for the extension of school premises.

Driffield R.D.C.—£500 for a water supply for Nafferton.

Hampstead B.C.—£11 000 for the electricity undertaking.

Hoylake and West Kirby U.D.C.—£1,775 for private street works.

Keighley T.C.—£7 500 for the extension of public baths, and £7,900 for parks, recreation grounds, and street improvements.

Maldon T.C.—£5 680 for the erection of thirty-two dwellings.

St. Ives T.C.—£993 for defraying expenditure at the beach, purchase of foreshores, and erecting a fire brigade station.

Southend T.C.—£6,020 for making up certain streets and £1,192 for a storm-water sewer.

Southport T.C.—£10 000 for an additional intercepting sewer to provide for the development of Birkdale and Ainsdale.

Tiverton T.C.—£4,400 (in place of £3,450) for street widening.

LOANS SANCTIONED.

Dungannon U.D.C.—£4,200 for the provision of twenty-four working-class houses, repayment to be made in sixty years.

Hastings T.C.—£2 219 for paving with creosoted deal blocks.

Kenilworth U.D.C.—£260 for a street improvement.

Kingston (Surrey) T.C.—For the purposes of the electricity undertaking: £10,327 for generating plant, fuel pipe, fuel tanks, extensions to sub-stations, &c.; £1,459 for extension of engine-room; £864 for new switchboard. The board stated that in arriving at the sum of £864 they had deducted £850 in respect of the debt outstanding on the existing high-tension switchboard, they being advised that a stand-by switchboard was not necessary, and that it was undesirable that the existing board should be retained, as it was out of date and dangerous. The town clerk, Mr. Harold A. Winser, has been instructed to request the board to reconsider their decision in regard to the switchboard.

Mansfield T.C.—£1,000 for the purchase of land for a recreation ground.

Okehampton T.C.—£922 for street widenings.

Runcorn R.D.C.—£1,664 for the conversion of privies into water-closets.

Salford T.C.—£17 000 for a secondary school for boys.

Selby U.D.C.—£3,200 for the erection of fifteen working-class dwellings.

FORTHCOMING INQUIRIES.

JULY.

	£
30.—**Audenshaw.** For street and sewerage works (Mr. F. H. Tulloch)	
30.—**Barnard Castle.** For street, water and sewerage works (Mr. H. R. Hooper) ...	2,971
30.—**Grimsby.** For sewerage and sewer ventilation purposes (Mr. F. O. Stanford) ...	2,410
30.—**Winsford.** For the purposes of the gas undertaking (Mr. A. W. Brightmore) ...	3 500
31.—**Bexhill.** For sea defence works (Mr. H. Shelford Bidwell)	1,490
31.—**Bodmin.** For works of sewerage (Mr. P. M. Crosthwaite)	
31.—**Chorley.** For water supply purposes (Mr. F. H. Tulloch)	600
31.—**Godalming.** For works of paving and surface-water drainage (Mr. A. W. Brightmore)	4 552
31.—**Rotherham.** For depot and sewerage purposes (Mr. F. O. Stanford)	2,400

AUGUST.

1.—**Alfreton.** For street widening and reservoir purposes (Mr. F. O. Stanford) ...	2,100
1.—**Rotherham.** For privy conversion purposes (Mr. F. H. Tulloch)	8,604
2.—**Cainsborough.** For the provision of a bath and cottages (Mr. F. H. Tulloch) ...	1,050
2.—**St. Ives.** For water supply works (Mr. P. M. Crosthwaite)	1 837
2.—**Shoreham.** For the purchase of the town hall (Mr. Edgar Dudley)	2,200

Municipal Work in Progress and Projected.

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The following are among the more important projected works of which particulars appear below: Buildings—Birmingham, Bradford £46,500, Broadstairs £3,500, Norwich £14,766; housing and town planning—Bradford, Bridlington; roads and materials—Exmouth £20,000; sewerage and sewage disposal—Milton £10,750, Runcorn £18,500, Walsingham £10,055; water, gas and electricity—Bournemouth.—Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Ammanford U.D.C.—The tender of Mr. E. Powell, of Whitchurch, near Cardiff, at £386, has been accepted for the erection of a retaining wall at Craiggoch, to prevent incursions of the river Amman into the park.

Birmingham T.C.—The award of the assessor, Mr. A. N. Bromley, of Nottingham, in regard to the plans for the projected baths at King's Heath places Messrs. Crouch, Butler & Savage, of Newhall-street, Birmingham, first, and the premiums go to Messrs. S. N. Cooke & W. N. Twist, Colmore-row, and Messrs. Round & Weaver, Newhall-street.

Bradford T.C.—The Tramways Committee have decided to recommend the corporation to erect a new large central tramway depot, at a cost of £46,500.

Broadstairs U.D.C.—Consideration is being given to a proposal to erect a glass and iron pavilion, at an estimated cost of £3,500.

Camberwell B.C.—The Public Health Committee recommend the council to approve the plans submitted by the borough engineer, Mr. W. Oxtoby, for the proposed new buildings in connection with the cleansing station at Peckham Park-road depot, and that the construction of these buildings be carried out under the supervision of the borough engineer, at the cost estimated by him—*viz.*, £575.

Cambs C.C.—The council have accepted the tender of Messrs. Kerridge & Shaw, at £9,449, for the construction of new county offices.

Devonport T.C.—A retaining wall is to be erected for the open-air bath at Mount Wise, at a cost of £879, and twenty-four dressing-boxes provided, at a cost of £320.

East Grinstead U.D.C.—A new fire station has been completed, at a cost of £600, from plans prepared by the surveyor, Mr. W. E. Woollam.

Greenock T.C.—The council have adopted the minute of the Law and Finance Committee recommending that the erection of public baths and wash-houses be proceeded with as shown on a plan prepared by the master of works.

Greenwich B.C.—The provision of public baths for East Greenwich has been referred to the Adoptive Acts Committee.

Holland (Lincs) C.C.—The Roads and Bridges Committee recommend the council to make a grant of £2,000 towards the cost of a new bridge at Boston. The bridge is estimated to cost £6 500.

Keighley T.C.—Subject to the Local Government Board sanctioning the necessary loan, the following tenders have been accepted for the extension of the public baths in Albert-street: Mason's work, Paul Rhodes, Leeds, £2 937; joiner's work, J. Driver & Son, Keighley, £122; plumber's, T. Atkinson, Keighley, £632; painter's, Eli Thompson, Keighley, £93; slater's, Wm. Thornton, Keighley, £157; plasterer's, £752; concreter's, Jno. Cooke, Huddersfield, £841; filtration plant, Royles, Limited, Manchester, £610.

Montrose T.C.—The outbreak of dry rot in the public library is apparently more serious than one would have anticipated, judging by the report prepared by the burgh surveyor, Mr. S. L. Christie. The lending department and ladies' and juveniles' reading-rooms are the parts affected, and they are more or less totally [illegible]. The [illegible] is estimated at £900.

Norwich T.C.—A scheme for the concentration of the municipal offices has been agreed to, and a decision come to to erect new offices on the fish market site on the lines of the scheme of the city engineer, Mr. A. E. Collins, at an estimated cost of £12,800.—A new fish market is also to be erected according to the plans of the city engineer, at a cost of £1.966.

Penistone U.D.C.—The offer of 1 000 yds. of land for a site for public offices has been accepted by the council.

Rowley U.D.C.—The tender of Mr. J. Bridgwater, at £1,012, has been accepted for alterations at the Old Hill council school.

Wallasey T.C.—The scheme of the architects (Messrs. Briggs, Wostenholme & Thornely) for the new town hall on the North Meade site has been considered by the council in committee. The exterior is designed in the Renaissance style, and is of a monumental character. The total cost is estimated at £102.500.

Wandsworth B.C.—The Highways Committee recommend that the London County Council, who are to reconstruct the bridge carrying High-street over the river Wandle, be asked to re-erect in Wandsworth Park or in the proposed extension of Wandsworth Common portions of the existing bridge as a relic of old Wandsworth.

HOUSING AND TOWN PLANNING.

Bradford T.C.—The Health Committee have resolved to ask permission of the council to negotiate for the purchase of a suitable site for the immediate erection of 200 workmen's dwellings, to let at a weekly rental not exceeding 4s. 6d., and to be within the distance of a penny tram ride of the centre of the town. It is proposed that, instead of borrowing the money required for the scheme in the open market, the committee should apply to the council for a loan at a low rate of interest and on easy terms of repayment from the accumulated profits of the corporation trading departments.

Bridlington T.C.—It has been agreed to promote a scheme, estimated to cost £4,700, for the erection of twenty-four workmen's dwellings, necessitated by the demolition of many cottages for street improvements, and by the likely demolition in the near future of fifty houses in the vicinity of the Priory Church. The proposed rents are from 5s. 6d. to 6s. per week.

Burnley T.C.—It has been agreed to buy, at a cost of £19,000, 177 acres of land surrounding Townsley Park, which, with the ancient hall, is already the property of the corporation. This purchase is the first step in a town planning scheme.

Lurgan U.D.C.—The estimated cost of a housing scheme adopted by the council is as follows: Expenditure—cost of erecting fifty-four houses, £7,339 11s. 9d.; purchase of sites as per conditional agreement, £1,193 15s.; formation of footpaths, boundary walls, sewers, and water-main extension, £364; architect's fees, £108; assessor's fee for adjudging competitive plans, £21; clerk of works, £78; legal expenses, advertising and printing, £100; contingencies, estimated at 10 per cent on £8,010, £801—£10,005 11s. 9d. Estimated outlay (first year)—interest on £10,000, at 3½ per cent, £350; yearly repayment of principal (sixty years), £166 13s. 4d.; rates on fifty-four houses (estimated at £5 10s. each), at 7s. in the £, £103 19s.; property tax, £15; rent collection, £25; fire insurance, £6; upkeep and vacancies, £75—£741 12s. 4d. Estimated income (first year)—weekly rents, at 3s 9d. per house, £526 10s.; loss, £215 2s. 4d.—£741 12s. 4d. In the event of the council receiving a grant of £130 from the housing fund created under the 1908 Act, the nett loss will be £85.

Ripon R.D.C.—The council have approved the resolution of the Yeovil Town Council, that it is desirable that the Housing Acts should be amended so as to enable local authorities to borrow money from the Public Works Loan Commissioners for the construction of streets for the same period as is at present allowed for land—*viz.*, eighty years—and that the rate of interest should be £3 per cent.

Valley (Anglesey) R.D.C.—It has been agreed to consider in committee of the whole council that a site of 6¾ acres be acquired from the Cayley Trustees at Rhos, and that the surveyor take into consideration the provision of fifty cottages on the land.

PARKS AND OPEN SPACES.

Birmingham T.C. The Parks Committee propose to ask the council shortly for permission to acquire from the corporation water department a site of 11 acres between Aldridge-road and Walsall-road, for the purposes of a recreation ground for the residents on the Perry Bar side of the districts of Birchfield. Of the 11 acres 7 form a reservoir which would be suitable for boating.

Smethwick T.C.—The trustees of the donor (the late Sir James Timmins Chance) last week formally handed over to the corporation the deeds of the park at West Smethwick. The area of the park was originally about 43 acres, but this has been added to, while Mr. George F. Chance has given £1,500 towards the endowment fund.

REFUSE COLLECTION AND DISPOSAL.

Bath T.C.—The Sewering Committee have accepted the tender of Messrs. Hughes & Stirling, at £3643 [illegible] of the new refuse destructor to deal with 90 tons per twenty-four hours.

Lambeth B.C. The council have adopted a recommendation of the Wharves and Cleansing Committee to utilise the Rommany-road site for a destructor, and for the erection of other buildings. The scheme, it was recently reported, would result in fifty-six additional stokers, trouncers, carmen, &c., being employed, at a cost approximately of £4,226 per annum. The total cost of the buildings was estimated at £25,361, machinery £9,586, making a total of £34,947. It was estimated that with the destructor house refuse could be collected and disposed of at a cost of £5,038. This meant a saving of £957, as against contracting out. Slop refuse could be disposed of with a saving of £1,426.

Merthyr T.C.—The Health Committee have recommended that scavenging contracts be extended from one year to three years; that a system of night scavenging be carried out in the Merthyr Town district for six months as an experiment; and that the borough be divided into six districts for the purpose of scavenging instead of thirteen as at present.

ROADS AND MATERIALS.

Aberdeen C.C.—The road surveyor of the Ellon District Committee reports that the roads throughout the district, with some slight exceptions, have been maintained in good order during the past year, and evidence is now being shown of the advantages of applying superior materials, even although the initial cost was greater. A coat of metal of good quality lasted much longer, kept a proper surface when wet, and was freer from dust in dry weather. The system recently adopted of commencing with large stones under [illegible] as much could be done with, he considered, on the main roads, but a satisfactory foundation to get for the coat of metal, and it will also provide for the widening of the metalled surface with the necessary convexity.

Barnstaple R.D.C.—The General Purposes Committee, reporting on the question of giving assistance to the highway surveyor, Mr. A. Richards, in regard to the supervision of the roads, recommended that two foremen should be appointed to work under Mr. Richards's direction, at a salary of 25s. a week each. The Rev. A. B. S. Wrey moved the adoption of the recommendation, and Mr. Isaac seconded. The Rev. J. Dene did not think they would get the proper men at 25s. per week, but the chairman said the clerk had a letter from a man who had been on the engineering staff of Lord Iveagh, who would come for 30s. a week. The Rev. J. Dene thought the man they wanted would be a contractor, who had been a steam man at his calling. Mr. Andrew thought it an extravagant expenditure. Mr. Buckingham pointed out that the county council would not give them the establishment charges they did unless they could show proper supervision. The committee's recommendation was carried by twenty-three votes to three.

Bath T.C. With respect to what is known as the Orange-grove improvement the Sewering Committee have decided to recommend a modified scheme, which involves the clearing of the site of the houses already demolished to the Grove level, the building of a retaining wall and the continuation of the ornamental balustrade from the Grand-parade. This will cost £1,650.

Camberwell B.C.—The Works and General Purposes Committee recommend the council to support the resolution passed by the Chelsea Borough Council requesting that the Local Government Board be asked to promote legislation for securing a reduction of the maximum weight of traction engines and to make a regulation requiring that the wheels of traction engines and heavy motor cars shall be fitted with resilient tyres, and that the London County Council be asked to support this request. They have also requested the London County Council to make a by-law under sec. 6 of the Locomotives Act, 1898, prohibiting, or at least restricting, the use of locomotives on those highways where the nuisance and annoyance were chiefly felt.

Derbyshire C.C.—It has been agreed that the wages paid to adult roadmen and labourers employed by the council shall not be less, when full time is made, than £1 per week.

Exmouth U.D.C.—A scheme, by which Exmouth will be provided with a marine drive a mile in length, has been submitted to the council. The cost of the proposal, which will include a 65-ft. wide carriage drive from the Coastguard Station to the old rifle butts at Orcombe Point, will be £20,000, of which the council will be called upon to provide £8,500, Lord Clinton contributing the remainder. The details of the scheme were prepared by the surveyor (Mr. S. Hutton) and a small committee.

Finsbury B.C.—The following paving works are to be carried out during the half-year ending March 31, 1913: Goswell-road, between Dolby House and Sydney-street, carriageway with Aberdeen granite cubes, £543; Pentonville-road (south side), between Medcalf-place and Claremont-square, repave carriageway with Aberdeen granite cubes, £499; total, £1,042.

Glamorgan C.C.—Revised plans of the proposed Baglan-road diversion have been presented, the work being estimated to cost £7,093.

Islington B.C.—Mr. Didsbury, at a recent meeting, moved the following notice of motion: "That it be referred to the Works Committee to consider the present arrangements for watering the roads, so that the water carts shall not be withdrawn in consequence of a slight fall of rain, thereby leaving the roads unwatered during hot, dry days." Mr. Batty said that when the carts were withdrawn there was every indication of further falls of rain. Did Mr. Didsbury want the water-cart men to take shelter during a shower and then come out with their carts again? It was fortunate for Islington that Mr. Didsbury had not got control of the carts. Watering the roads cost £70 a day, and if the borough engineer could save £35 by withdrawing them in the afternoon he should do so. It was hazardous to forecast the weather, but only twice in the year had Mr. Barber's judgment been wrong.

Kingston (Surrey) T.C.—For the supply of granite kerb, channel and setts, and quadrants, the tender of Messrs. Wethern Bros., Limited, has been selected from eight submitted.

Leeds T.C.—A proposal has been made to spend £131,000 on improvements in connection with the extension of the infirmary, the scheme including the making of a new road, 60 ft. wide, from Calverley-street to Fenton-street. The scheme is to be submitted to the next meeting of the council.

Llandudno U.D.C.—Plans have been prepared for laying out the west front and enlarging the model yacht lake.

Mallow R.D.C.—A new road is to be constructed from Esk to the road leading to Donoughmore, at an estimated cost of £200.

Marylebone B.C.—It has been decided to communicate with the Local Government Board and the London County Council complaining of noise and vibration caused by heavy traction engines with trailers.

Merton U.D.C.—The Roads and Works Committee, having taken into consideration the question of watering private streets, reported that, having regard to the estimates of the surveyor, Mr. G. Jerram, as to the cost involved, they felt unable to make any recommendation in the matter during the present season.

Norfolk C.C.—The Joint Committee report that they have considered the question of the contributions to urban authorities for road tarring which had been referred to them by the Eastern Highways Committee, and have resolved to recommend that the contributions to be paid by the county to the urban districts for tarring the main roads in their districts be increased from 50 per cent. to 75 per cent., provided that before

any tarring is undertaken the proposed scheme is submitted to the county surveyor for his approval.—The county surveyor, Mr. T. H. B. Heslop, has reported that the roads which have been reconstructed under the Road Board grant are now in the best condition for tarring, the cost of which would be £634, being 1½d. per yard super. Although the Road Board refused in the first instance to grant anything for road tarring, they are now prepared to grant ¾d. per yard, which, in this case, will amount to £317, leaving a balance of £317 to be found by the county council.

Okehampton T.C.—The council have adopted the plans of the borough surveyor, Mr. F. J. Worden, for the widening of Mill-lane. If the roadway is made 24 ft. wide, it will be necessary to acquire 10,050 ft. of land.

Perthshire C.C.—It has been arranged to lay down tar-macadam through the villages of Comrie and Blackford, at an estimated cost of £1,414, these being main trunk thoroughfares, and the first half of the grant for the work has been obtained from the Road Board. The grant from the Scottish Office in aid of cost of maintaining roads in the Central District of the county for the past year amounted to £380, and the grants from the Road Board were £889.

West Bromwich T.C.—The Highway Committee of the West Bromwich Council recommend the purchase of a strip of land about 50 sq. yds. fronting to Great Bridge-street, near Slater-street, for the purpose of widening the street. They also recommend the acceptance of the tender of Messrs. Clough, Smith & Co. for the removal of the tramway poles from the centre to the sides of the road.

SEWERAGE AND SEWAGE DISPOSAL.

Brierley Hill U.D.C. The tender of Messrs. John Guest & Sons, of Ambleeote, at £3,115, has been accepted for the carrying out of house connections.

Cambridge T.C.—A sewerage extension, to cost £9-0, is to be carried out in Trumpington-road.

Coventry T.C.—The accounts of the sewage farm for the past year show a loss of £1,797 as compared with a loss of £1,106 on the previous twelve months.

Dorchester T.C.—It has been decided to change the present treatment of the sewage to that of broad irrigation. A 15-in. rising main will be laid from the proposed pumping station to the new irrigation area. The motive power will be suction gas plant, with engines and treble action ram pumps.

Hampton U.D.C.—The council have under consideration a scheme to make provision for the drainage of Hampton Court Palace at a cost of £1,500.

Hastings T.C. A sewer is to be constructed at Old Roar Valley, under the direction of the borough engineer, Mr. P. H. Palmer, at an estimated cost of £1,230.

Milton (Kent) R.D.C.—A report by the Rainham Drainage Committee recommending the purchase of a site for the sewage outfall works, consisting of 5 acres, for £1,062, has been adopted. The committee recommend the slate bed system of sewage treatment. The estimated cost of installing the drainage system is £9,400, which, with the cost of the site for the outfall works, and other items, gives a total of £10,750. Mr. L. B. Grant, of Sittingbourne, has been appointed engineer at an inclusive remuneration of £400.

Oswestry R.D.C.—A scheme for a supply of water to the Morda part of the district, including the construction of an additional reservoir, has been prepared by Messrs. Berrington. The estimated cost is £1,450.

Runcorn R.D.C.—A sewage disposal scheme for the Warrington suburb, estimated to cost £18,500, has been approved.

Southport T.C.—Plans have been approved for the sewering of and the construction of sewage disposal works for Birkdale and Ainsdale, at an estimated cost of £62,975.

Walsingham R.D.C.—The tender of Messrs. W. Brigg & Co., of Bradford, at £10,055, has been accepted for the construction of sewage disposal works.

WATER, GAS, AND ELECTRICITY.

Ammanford U.D.C. The tender of Mr. Pritchard Davies, Ammanford, at £615, has been accepted for the extension of water mains in various new streets.

Bournemouth T.C.—Gas lighting is to be substituted for electric lighting, and it is proposed that the gas lamps should be fixed on the tramway standards.

Dingwall T.C.—The Local Government Board have intimated to the council the urgent necessity of taking steps to improve the quantity and quality of the water supply.

Celligaer U.D.C.—A committee has been appointed to consider alternative schemes for the provision of gas or electricity undertakings.

Hornsey B.C.—It has been agreed to fit the existing lamps in Rathcoole-parade and Tottenham-lane, between Church-lane and Rosebery-gardens, with double Nico burners, at a cost of £24 18s. 9d. The additional annual cost of maintenance will be £24 17s. A similar improvement will be effected in High-street, Hornsey, between Turnpike-lane and Birkbeck-road, at a cost of £21, and an additional annual cost of £22.

Kingston (Surrey) T.C.—For the building extension to be carried out at the electricity works, and for the construction of machinery foundations at the works, the tenders of Messrs. Kavanagh & Co., at £1,200 and £787 respectively, have been accepted. The only other tender opened, that of Messrs. Powley Brothers, was withdrawn, owing to a mistake in the estimate.

Midlothian T.C.—There was a loss on the electricity undertaking last year of £941.

Oystermouth U.D.C.—Steps are being taken for the transfer of the Mumbles water undertaking to the council.

MISCELLANEOUS.

Kingswinford R.D.C.—The Coronation Committee have decided to purchase fire hose and appliances for presentation to the council.

Skegness U.D.C.—A new steam fire engine is to be purchased, at a cost of £288.

Motor Cars for Fire Brigade Superintendents.—London Fire Brigade superintendents are to be provided with motor cars instead of one-horse visiting traps, the Fire Brigade Committee of the London County Council considering that the proposal will materially increase the efficiency of the brigade.

An Opportunity for Assistants and Town-Planning Experience.—We learn from our correspondent that he has now considered the applications forwarded to him, and has communicated with two of the applicants with a view to their joining him in about a week's time. He will select two more directly the gathering of the crops gives access to the land for contouring work.

A Regal Scavenger. John William Johns, a Westminster street scavenger, was on Thursday, at the London Sheriff's Court, awarded £180 damages, with costs, against the British Motor Cab Company for injuries through being knocked down by a taxicab. Special damages were asked for, as it was claimed that he was making among clog-dancers "and his injuries would prevent him earning money in the exercise of that art.

Problems in Engineering.*—This reprint from the popular students' section of our contemporary consists chiefly of questions that have been set at the examinations of the Institution of Civil Engineers and of the Institution of Municipal and County Engineers. There is no index to the work, but the matter is classified under the heads of Mechanics and Hydrostatics, Strength and Elasticity of Materials, Theory of Structures, Surveying and Levelling, Water Supply and Hydraulics, Sewerage, Sewage Disposal, Road Making and Tramways, Building Construction and Materials, Law, and Miscellaneous. This book is calculated to be of considerable use to students in these subjects, but it would have been an advantage if the source of the questions could have been stated. The answers have in general been given rather more fully than would be the case at an examination, with the object of explaining the principles to a student without his having to refer to a text-book for them. The price brings the work within the reach of all students, and there is so much useful matter compressed into a small space that even the best-prepared candidate cannot afford to be without it.—*Sanitary Record.*

* "Problems in Engineering, with Solutions." Being Questions and Answers reprinted from the Assistants' and Students' Section of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER. First Series, 1909-10. Edited by Sidney G. Turner, ASSOC.M.INST.C.E. Price 5s. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.

PERSONAL.

Mr. R. A. Ferguson, county surveyor for the Northern Division of Donegal, has resigned, owing to ill-health.

Mr. J. H. Hill has been appointed sanitary inspector (not surveyor and sanitary inspector as at first reported) to the Ripon Corporation.

Mr. William G. Bartlett, of the engineer's and surveyor's department, Herne Bay, has been appointed clerk in the borough surveyor's office, High Wycombe.

Mr. A. Gordon Kilner, surveyor to the Sedbergh Rural District Council, has been appointed highway surveyor to the Wetherby (Yorks) Rural District Council.

Mr. R. S. Scott, who has completed twenty-five years' service as surveyor to the Bishop's Stortford Urban District Council, has been presented with a silver salver by the members of the council.

Mr. W. Hadley, surveyor, and Mr. S. Wallis, inspector to the Kettering Rural District Council, have each been voted a sum of £25 per annum towards the cost of maintaining motor cycles, to facilitate travelling over their district.

Mr. Robert Stubbs, surveyor to the Holme Cultram (Cumberland) Urban District Council, has sent in his resignation, to take effect from September 28th next. Mr. Stubbs has held office since 1874, and his resignation was received with regret.

Mr. Stewart Blount, jun., assistant to his father, the surveyor to the Market Harborough Rural District Council, was cycling down Bunker's-hill, near Market Harborough, on Thursday of last week, when a fowl ran into his machine. He was thrown to the ground, and received a fracture of the skull. He died shortly after his removal to his home at Laughton.

Major W. W. Crosby, consulting engineer, of Baltimore, has been made a Doctor of Science by the Maryland Agricultural College, in recognition of his work for the improvement of the highways of the State. On his retirement recently from the position of chief engineer to the State Roads Commission he was presented by his office staff with a silver loving cup. Major Crosby's successor is Mr. Henry G. Shirley, roads engineer of Baltimore County.

Prof. Arthur H. Blanchard, M.AM.SOC.C.E., who, as was stated in THE SURVEYOR of July 5th, has been appointed consulting highway engineer to the Board of Water Supply of New York City, has been retained in connection with the construction of the 40-mile highway which will encompass the new Ashokan reservoir. Mr. Blanchard has also recently been appointed consulting engineer to the Borough of Manhattan, of New York City, on sheet asphalt pavements, and consulting highway engineer to the New York State Highway Commission.

Mr. Archibald Currie, the city engineer of Westmount, Quebec, was born in Glasgow forty-three years ago, and was educated in that city at the West of Scotland Technical College, graduating in 1890. For three years he was assistant engineer with Sir John Aird & Sons, the well-known contractors, and then accepted an engagement with the Chinese Government as resident in charge of important engineering works in the North of China. When Admiral Sir Edward Seymour made his famous attempt to relieve the European Legations in Pekin in 1900, at the time of the Boxer uprising, Mr. Currie was his chief engineer, and for his services in this connection he received a medal and clasps. Later he was for nine years in South Africa spending six of them in Johannesburg, where he was in charge of electric railway, drainage, and road construction. Upon returning to Great Britain Mr. Currie was engaged as consulting engineer on water supply works and similar enterprises in Ireland, Scotland and Wales. Going to Canada a year or two ago, he was appointed to succeed Mr. F. L. Fellowes, now city engineer of Vancouver.

Tramway Trailer Cars for London.—The House of Commons Committee considering the London County Council's Tramways Bill on Wednesday decided to pass the clause empowering trailers, or coupled cars, limiting them, however, to the south of the Thames and the Embankment and over Westminster and Blackfriars Bridges.

Motor Wagons for Johannesburg.—The Johannesburg Corporation have ordered four motor tip wagons for use in connection with the sanitary service of the town. It is estimated that one motor tip wagon will equal in efficiency and dispatch fourteen refuse carts. The wagons will be fitted with rubber tyres, each being of 4 tons capacity and 39 h.p.

FOR OTHER ADVERTISEMENTS
See End of Paper.

RAMSBOTTOM URBAN DISTRICT COUNCIL.

WORKS OF SEWERAGE AND SEWAGE DISPOSAL.

TO CONTRACTORS.

The above Council invite Tenders for the Construction of Earthenware, Cast-iron, and Pipe Sewers, with Manholes, Flushing Tanks, Storm Overflows, River Crossings, Pump Well and Pump House, Rising Main, &c., and also for the Construction of Detritus Tanks, Percolating Filters, Humus Tanks, and other appurtenant Works at the Sewage Disposal Works, Lower Summerseat, in connection with the Lower Summerseat and Brooksbottoms Sewage.

Plans and Specifications may be seen, and Bills of Quantities, Schedule of Prices, and Form of Tender obtained, at the Offices of the Engineers, Messrs. James Diggle & Son, 14 Victoria-street, Westminster, S.W., and Hind Hill-street, Heywood, Lancashire, on and after Wednesday, the 24th day of July, 1912, on payment of a deposit of £5, which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "Sewerage and Sewage Disposal Works, Contract No. 22," addressed to the Clerk, Council Offices, Ramsbottom, are to be delivered not later than 9 a.m. on Thursday, the 15th day of August, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

JOHN W. BARLOW,
Clerk to the Council.

Council Offices,
Ramsbottom,
Lancashire.
July 17, 1912.

THE URBAN DISTRICT COUNCIL OF HINDLEY.

Applications are invited for the post of Assistant in the Surveyor's Office at a salary of £78 per annum.

Applications, stating age, qualifications and experience, accompanied by copies of not more than three recent testimonials, endorsed "Assistant Surveyor," must be sent to the undersigned not later than Tuesday, the 20th August, 1912. Candidates must have had previous experience in the department of a Surveyor to a local authority.

Canvassing for the appointment will be considered a disqualification.

(By order)
THOMAS ROBEY,
Clerk to the Council.

Council Offices,
Hindley.
July 24, 1912.

BOROUGH OF RICHMOND, SURREY.

A fully qualified Temporary Assistant is required for a few months in the Borough Surveyor's Office, in connection with the preparation of the Council's Town Planning scheme. Salary £3 per week.

Applications, with copies of two testimonials, stating age, particulars of previous experience, &c., to be sent to Mr. J. H. Brierley, Borough Surveyor, Town Hall, Richmond, Surrey, not later than Saturday, the 3rd August, 1912.

GOOD CLERK OF WORKS required by the Surrey County Council for erection of a Ferro-Concrete Bridge. Engagement about four months. Previous experience in ferro-concrete bridge construction and pile driving essential. Application, stating age and experience, with testimonials or references, and salary required, to Mr. A. Dryland, M.INST.C.E., County Surveyor, County Hall, Kingston-on-Thames.

THE USE OF CONCRETE IN ROAD CONSTRUCTION.*

By Logan Waller Page,
Director of the United States Office of Roads.

While much experimenting has been done with the object of making concrete available as a road material, the success which has attended its use as a foundation for town paving has not extended to surface work. "While this is true in general, yet there are isolated instances where concrete has been used for road construction with such a degree of success that complete success seems to be almost in sight. This fact alone, it seems to me, justifies an assumption that concrete can be made generally successful as a road material, provided sufficient care is used in the selection of materials, their mixing, laying, and curing, all of which necessitate skilled supervision."

It is too early to attempt to predict what will be the best method, but "Portland cement concrete has been used so successfully in nearly all forms of construction that it seems reasonable to expect that we cannot go far wrong in using concrete for a pavement if we adopt the best standard practice in use to-day for other types of construction." Practice usual in good concrete work should be followed, and the coarse aggregate should be such as will pass in any direction through a 1½-in. sieve, and be retained on a mesh of ¼ in. Probably a 1:2:4 mixture, or one of 1:3:5, will give good results in most cases. Since concrete which sets under water acquires greater strength than that which sets in air, it should be gauged fairly wet and the surface should be kept moist for one or two weeks. If possible, the surface should be protected from the sun by strewing over it loam, or even sawdust, straw, or shavings. A further opportunity for the concrete to acquire strength would be provided at a small additional cost by the application of a thin coat of bituminous material immediately after the temporary protecting layer has been swept off. An additional advantage of the bituminous coat would be its effect in preventing the cracks which are caused by a too rapid drying of the concrete.

As regards the provision for expansion and contraction, the best practice up to the present time seems to point to the provision of an expansion joint along each kerb, and a transverse joint at every 25 ft. Possibly the latter may be spaced further apart. A notable feature of the concrete pavement is its low cost of maintenance. Concrete pavements laid in 1907, and subjected to heavy traffic, have not required any expenditure in maintenance. "Figures collected by the Office of Public Roads relative to the cost of maintenance of plain macadam and bituminous pavements under fairly heavy traffic conditions indicate that these pavements, when properly maintained, entail an absolute maintenance charge of approximately $450 per mile per annum for plain macadam, and possibly from $800 to $1,000 per mile per annum for bituminous macadam, for 15-ft. surfaces. These figures have led me to believe that we must seek a more permanent form of pavements for country road surfaces. I hope that the concrete road will meet this requirement."

THE ADVANTAGES OF CONCRETE PAVING.

As regards the advantages of concrete paving, Mr. Page may be quoted at length:

"In the matter of sustaining normal loads the capacity of concrete pavements as compared with the capacity of ordinary macadam or bituminous macadam surfaces must be superior. Numerical data and experimental evidence on this subject are as yet meagre. It is not difficult, however, to draw certain definite conclusions when we consider the nature of the materials involved. It is well known that macadam roads have rutted under heavy loads. For ruts to develop rapidly it is quite evident that some shearing of the macadam surface occurs. Of course, rutting also takes place, because of wear and lateral displacement of stone. The capacity of concrete pavements to resist shear is relatively much greater, and we may perhaps note this is the first point of superiority of concrete over macadam pavements for sustaining normal loads.

"It is common practice to assume, in designing concrete bridge floors, that normal pressures over an area are transmitted through the slab in lines of pressure whose boundary surface is conical, with elements at an angle of 45 deg. or more with the horizontal. It scarcely needs demonstration that the same assumption cannot hold for macadam slabs—i.e., normal pressure cannot be transmitted by a macadam slab over as large an area of the sub-grade—and this, it is reasonable to record, is a second advantage of concrete over macadam construction.

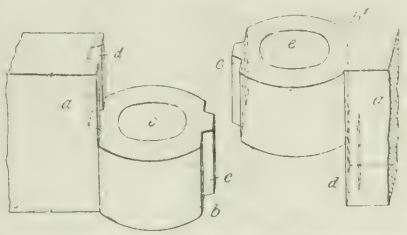
"We may, if we choose, compare concrete road surfaces with macadam road surfaces, assuming that each is an arch between kerbs. It is not difficult to see that concrete is superior as an arch in the following way: Consider the entire sub-grade carefully removed from a macadam road surface; there is some doubt as to whether the macadam surface would stand alone. On the other hand, it is easy to see the complete concrete slab crown not only standing after the removal of the sub-grade, but to also see this arch of concrete sustain considerable load without a sub-grade, so that we must admit the third superiority of concrete roads over any macadam construction in their action as an arch to sustain normal pressure."

Mr. Page concludes that, taking into consideration possible increases in the severity of traffic conditions, concrete may be a suitable and economical material for country roads.

* Points from a paper read before the American Association of Portland Cement Manufacturers.

INTERLOCKING REINFORCED SLABS AND PILES.

An interesting booklet showing the possibilities of this system has been issued by the Patent Interlocking Slab Company, of Oakley House, Bloomsbury-street, W.C. The slabs have overlapping or interlocking lugs, which have tongued and grooved connections with the abutting slab. The interlocking joints are provided with perforations so that when a number



The above sketch shows in perspective the adjacent or interlocking ends of two slabs. The tongues e lock into the grooves d; through the eyelets c are inserted reinforced concrete piles or columns, thus rendering the joint connection rigid and secure.

of slabs are assembled they may be securely locked together by means of circular reinforced concrete piles or columns, secured in the ground and passing through the perforated lugs. The invention is applicable for all manner of constructional purposes, including groynes, quays and sea walls, river retaining walls, and canal banks and culverts, and a large saving is claimed to be effected by its adoption.

Shorland's Manchester Grates. — The Sibertswold schools, near Dover, are being supplied with Shorland's warm air ventilating patent Manchester grates by Messrs. E. H. Shorland & Brother, Limited, of Failsworth, Manchester.

Sink Waste.—Messrs. J. H. Sankey & Son, Limited, Essex Wharf, Canning Town, E., have issued an illustrated pamphlet descriptive of a simple but effective sink or bath waste, which has been designed to overcome the difficulties so frequently occasioned by stoppages. The device is fitted with a removable strainer bucket, which can be thoroughly cleansed in a few seconds.

Roads Improvement Association: Council Meeting.—Colonel R. E. Crompton, C.B., occupied the chair at the July monthly meeting of the council of the Roads Improvement Association held on Thursday, the 18th inst. The decisions of the Improvements Committee of the London County Council and of the Middlesex County Council in regard to the scheme for the provision of a new western exit from London were reported. The council noted, with regret, that these bodies had not definitely taken up the scheme, and it was resolved that the association should take further action in the matter. The various arrangements made in connection with the Roads Improvement Association's opposition before the Select Committee of the House of Lords to the London County Council's proposal to run trailer and coupled tramcars were reported and approved.

SOME RECENT PUBLICATIONS.*

The Road Material Resources of Minnesota. By George W. Cooley, Secretary and Engineer, Minnesota State Highway Commission.

This pamphlet presents in a convenient form the principal factors affecting road making and maintenance in the State of Minnesota. The introduction includes a statement of the principal geographical features of the State, some important meteorological data, and the numbers of counties and townships. The rock formations and drift deposits of the State are then described, and a list of quarries and stone-crushing plants is added. The locations of rock deposits are then indicated, with descriptive data, the limestones of the Mississippi Valley, the limestones and sandstones of the Minnesota Valley, the granites and quartzites found in the same valley, and other important deposits, including granite, quartzite, trap rock and slate. Our engineer readers will not be surprised to learn that an iron ore containing about 25 per cent of iron has been used with success, though the roads are somewhat dusty in dry weather, and carry a slight coating of red mud when wet. A description of the soil, which is called "gumbo," shows that it is a material similar to the black cotton soil of India, but has no counterpart in any important deposit in the British Islands.

The report includes a description of some experimental roads, including one a description of which is as follows: "Experimental Road No. 2 was built on 1 mile of State Road No. 7, in Sherburne County, near Princeton. The surface is approximately level, and the soil very sandy. For 60 ft. in width it was cleared and ploughed, and laid out in three strips of 20 ft. each. The middle strip was turnpiked for road purposes and covered with a layer of rye straw 3 in. thick. The outside strips were planted with red and yellow clover mixed with rye, which had been cut and raked on the road bed. Owing to the lateness of planting and exceedingly dry weather during July and August the clover did not grow well, but the experiment will be continued for several years with the expectation that the introduction of this vegetable matter into the sand will so change its character as to permit the use of ordinary road machinery with satisfactory results. Already, with only a few months' experience, the farmers who use this road speak very highly of it, and applications are coming in to the highway commission for a continuance of the plan."

There is nothing new in fact, though the fact is seldom recognised, in the incorporation of a small amount of rotting vegetable material into the crust of an earthy, sandy, or gravelly road.

Records of the Survey of India, 1909-1910. Vol. I. Prepared under the Direction of Colonel S. G. Burrard, C.S.I., R.E., F.R.S. Calcutta: Superintendent Government Printing (India).

For many years the annual report of the Survey of India consisted of two parts, (1) Abstracts of Results, and (2) Narrative Reports of Executive Officers. Since the year 1900-1901 the narrative reports have been published as a separate volume, entitled "Extracts from Narrative Reports." As these reports often include discussions of data, and since the volume will be hampered if it is confined to narratives, explanatory statements will be included in it, and it will in future be known as "Records of the Survey of India."

The volume before us contains about 140 pages of letterpress, of foolscap size. The first twenty-two pages are devoted to the Topographical Survey, the work of twelve parties. The areas surveyed included parts of the North-West Province, Upper Burma, the Shan States, and Assam. The maps which accompany these reports show the areas surveyed during the year, and those previously surveyed, and the same information is given as regards triangulation. The next part relates to "Triangulation," and is accompanied by a map of India, showing the year's work and that of previous years by means of blue lines. Part III. is the report of levelling work, including the revision levelling from Rangoon to Mandalay, which, after making allowance for all probable errors, seems to point to local subsidences, and one slight upheaval. Part IV., 8 pages, is the Geodetic Survey report, including pendulum operations, the object of which was to find whether a belt of relatively high density in the earth's crust, indicated by latitude observations, is visible, and a part of the topographical features, or is concealed beneath the surface. The report of the magnetic survey, with its tables, occupies some fifty-four pages, and that of tidal operations about twenty pages. The volume is provided with very well executed index maps, and several photographs, and is in itself a record of important advances in printing and reproduction work in India.

Laboratory Manual for the Use of Students in Testing Materials of Construction. By L. A. Waterbury, Prof. of Civil Engineering, University of Arizona &c. Price 6s. 6d. New York: John Wiley & Sons. London: Chapman & Hall, Limited.

This is an exceedingly useful book, and contains a mass of valuable and practical information in a compact form.

The question of testing the various materials now used in the construction of our roads and streets is becoming daily of more and more importance, and this work gives just the information required as to what apparatus to purchase and how to use it.

Profuse illustrations are given of the necessary apparatus, and detail instructions of the manner of procedure, so that a reader without any special laboratory knowledge could easily make tests of materials with the aid of this book. Take, for instance, the tests for bituminous materials. Full instructions and drawings of the instruments are given for such tests, as (*a*) penetration, (*b*) determination of carbon, (*c*) determination of volatile matter, (*d*) ductility, (*e*) determination of bitumen, &c., and the methods of operation in each case are given in detail.

The method of testing sand, gravel and stone are also given, such as (*a*) crushing, (*b*) abrasion or attrition, (*c*) toughness, (*d*) specific gravity, (*e*) percentage of voids, (*f*) absolute and relative sizes, and the like. The method of testing other materials—such as cement, concrete, iron and steel, wood and bricks—are also given, and it is surprising that in so small a volume so much useful and practical information could be compressed. We heartily recommend it to the attention of our readers.

* A copy of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. Thomas, M.Inst.C.E., County Surveyor, Buckinghamshire.

EXAMINATION.

The October, 1912, examination will be held in Birmingham on the 10th 11th and 12th of that month.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

NORTH-WESTERN DISTRICT MEETING AT CLITHEROE.

A meeting of the Institution of Municipal Engineers will be held to-morrow (Saturday), at Clitheroe.

Programme.

10.15 a.m.—Meet at Clitheroe Station and proceed on a round of visits to the following works:—
(1) Isis Cement Company's cement works.
(2) Horrocksford Lime Company's tar-macadam works.
(3) Messrs. R. Briggs & Son's stone quarries.
(4) Messrs. J. Carter & Company's stone quarries and tar-macadam works.

1 p.m.—Meet at the town hall, where members will be received by his Worship the Mayor, Alderman C. Mitchell, and Alderman Hardacre, chairman of the Highways and Waterworks Committee.

1.30 p.m.—Lunch.

2.30 p.m.—Wagonettes leave town hall for waterworks.

5.30 p.m.—Tea in the town hall, followed by—

6.30 p.m.—Meeting, when a paper, "Municipal Progress in Clitheroe," by Mr. A. R. Bleazard, borough surveyor, will be read.

Election of district officers.

George Hayes,
Hon. District Secretary.
147 Church-street,
Westhoughton, Lancs.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

ASSISTANTS TO COUNTY SURVEYOR.—July 27th.—West Sussex County Council. £130—£150.—Mr. H. W. Bowen, county surveyor, 23 North-street, Horsham.

CLERK OF WORKS.—About middle of July.—Essex County Council. £3 3s. per week.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

HIGHWAY SURVEYOR AND INSPECTOR.—July 27th.—Wantage Urban District Council. £140 per annum.—Mr. E. B. Ormond, clerk.

CLERKS OF WORKS.—July 29th.—For the construction of covered service reservoir of concrete.—Mr. W. Fiddian, civil engineer, Stourbridge.

FOREMAN.—July 29th.—East Grinstead Urban District Council. 30s.—35s.—Mr. W. E. Woollam, engineer and surveyor.

CHIEF ASSISTANT.—July 29th.—Corporation of Clydebank. £120 per annum.—The Town Clerk, Municipal Buildings, Clydebank.

CLERK OF WORKS.—July 29th.—Newburn Urban District Council. £2 10s. per week.—Mr. G. Wilkinson, clerk.

INSPECTOR OF NUISANCES.—July 29th.—Elham Rural District Council. £120 per annum.—Mr. B. C. Drake, clerk, Hythe, Kent.

PERMANENT WAY FOREMAN.—July 30th.—Pontypridd Urban District Council. £130—£150 per annum.—Mr. J. Colenso Jones, clerk.

OUTFALL WORKS SURVEYOR.—July 30th.—Clayton Urban District Council. 25s. per week.—Mr. B. Ashton, clerk.

FIRST ASSISTANT SURVEYOR.—July 30th.—Pontypridd Urban District Council. £100—£140 per annum.—Mr. J. Colenso Jones, clerk.

ASSISTANT OUTDOOR FOREMAN.—July 31st.—30s. a week.—Surveyor, Town Hall, West Didsbury.

ENGINEERING ASSISTANT.—August 1st.—Corporation of Salford. £104 per annum.—Mr. L. C. Evans, town clerk.

WATERWORKS INSPECTOR.—August 1st.—Corporation of Loughborough. 38s. per week.—Mr. Albert H. Walker, borough surveyor and waterworks engineer.

WORKING FOREMAN.—August 1st.—Ardsley Urban District Council.—Mr. C. McNaughton, clerk.

CLERK OF WORKS.—August 3rd.—Corporation of Hyde. £3 per week.—Mr. T. Brownson, town clerk.

ROAD FOREMAN.—August 3rd.—Kirkcaldy Town Council. 35s. per week.—Burgh Surveyor.

TEMPORARY ASSISTANT.—August 5th.—Easington Rural District Council. £3 per week.—Mr. G. Waterhouse, Easington, Durham.

CLERK OF WORKS.—August 5th.—Chesham Urban District Council. £2 10s. weekly.—Mr. P. C. Dormer, engineer and surveyor.

CLERK OF WORKS.—August 7th.—Matlock Urban District Council. £4 4s. per week.—Mr. R. Taylor, clerk. Prescribed application forms can be obtained on application to Messrs. James Diggle & Son, engineers, 14 Victoria-street, London, S.W., and Hindhill-street, Heywood, Lancs.

SURVEYING ASSISTANT.—August 10th.—Borough engineer's office of a large Midland town. £130.—Box 1,174, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

TEMPORARY TRAMWAY ASSISTANT.—August 10th.—Engineer's office of large Midland town. £140.—Box 1,173, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

ASSISTANT ENGINEER.—August 31st.—Darjeeling Municipality, India. 150 rupees monthly.—The Chairman.

CHIEF ENGINEER AND COUNTY SURVEYOR.—October 7th.—London County Council. £2,000.—Mr. Laurence Gomme, clerk.

BUILDING INSPECTOR AND SURVEYOR'S ASSISTANT.—No date.—Paignton Urban District Council. £2 weekly.—The Surveyor.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

CARDIFF.—August 6th.—Designs and estimates for fire station.—The Town Clerk.

GOOLE.—September 1st.—Competitive designs and estimates for municipal offices, for the urban district council. Two premiums (£30 and £15).—Mr. R. Tyson, clerk.

CHORLEY.—September 9th.—Designs for a school, for the corporation.—Mr. J. Mills, town clerk.

GLASGOW.—October 29th.—Preliminary sketch designs are invited by the corporation for the extension of the municipal buildings. Honorariums of 100 guineas to five selected designs.—Mr. John J. Burnet, A.R.S.A., 239 St. Vincent-street, Glasgow, is assessor.—Applications to the clerk, Mr. J. Lindsay, town clerk.

HUDDERSFIELD.—October 31st.—Designs for laying out certain areas as a town planning scheme, for the corporation. Premiums of 100, 50, and 25 guineas.—Mr. J. Henry Field, town clerk.

RANGOON.—Designs for the new municipal buildings. Honorariums of £300, £200 and £100 are offered.—Messrs. Ogilvy, Gillanders & Co., Sun-court, 67 Cornhill, E.C.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

Buildings.

CLITHEROE.—July 27th.—For repairs and decorating work at public buildings, for the corporation.—Mr. A. R. Bleazard, borough engineer.

KENT.—July 27th.—For repairs to county school, and alterations to technical institute, for the Education Committee.

STAFFS.—July 27th.—For the erection of a council school, for the Education Committee.—Mr. G. Balfour, County Education Offices, Stafford.

COVENTRY.—July 27th.—For extensions to the market hall, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

BURNLEY.—July 27th.—For the concrete work in the repair of the sewage tanks, for the rural district council.—Mr. H. Pritchard, engineer.

ROTHERHAM.—July 29th.—For repairs and asphalting work at a council school, for the Education Committee.—Mr. J. A. Mair, secretary.

WEST SUSSEX.—July 29th.—For the erection of school caretaker's quarters, for the county council.—Mr. L. Thompson, secretary, Thurloe House, High-street, Worthing.

PORTSMOUTH.—July 29th.—For works at the Municipal College, for the corporation.—Mr. A. H. Bone, architect, Cambridge-junction, Portsmouth.

NORTHWICH.—July 29th—August 14th.—For the erection of public baths and wash-houses, for the urban district council.—Mr. J. A. Cowley, clerk.

LLANDOVERY.—July 29th.—For the construction of new intake and filtering gallery, and laying steel main at the water supply works, for the corporation.—Mr. H. Alfred Thomas, town clerk.

PAISLEY.—July 30th.—For the erection of conveniences and gateway, for the corporation.—Master of Works, 13 Gilmour-street.

BIRMINGHAM.—July 30th.—For the erection of a tramway depot, for the corporation.—Chairman of the Tramways Committee.

HAMMERSMITH.—July 31st.—For the erection of sanitary conveniences, for the borough council.—Mr. H. Mair, borough surveyor.

MONTGOMERYSHIRE.—July 31st.—For improvements and alterations to a school, for the Education Authority.—Mr. L. Phillips, clerk, Newtown.

ST. HELENS.—July 31st.—For the erection of a public library, for the corporation.—Mr. A. W. Bradley, borough engineer.

BIRMINGHAM.—July 31st—August 26th.—For the erection of buildings in further extension of the council house, for the corporation.—Mr. E. V. Hiley, town clerk.

ILKLEY.—August 2nd. For the erection of an annexe to the King's Hall, for the urban district council.—Mr. F. S. Eckersley, clerk.

HAMILTON.—August 5th.—For the erection of new municipal offices, for the corporation.—Mr. P. M. Kirkpatrick, town clerk.

SOMERSET.—August 6th.—For the erection of an infants' school, for the county council.—Mr. C. H. Bothamley, secretary, Weston-super-Mare.

CHESHAM.—August 7th.—For the construction of an open-air swimming bath, for the urban district council.—Mr. P. C. Dormer, engineer and surveyor.

WEST RIDING.—August 9th.—For the erection of a school at Silsden, for the Education Committee.—Education Architect, County Hall, Wakefield.

ABERDARE.—August 10th.—For the erection of thirty-two tenement dwellings, for the urban district council.—Mr. T. Phillips, clerk.

HUNTS.—August 10th.—For the enlargement of a secondary school, for the Education Committee.—Mr. S. G. Cook, clerk, County Education Offices, Huntingdon.

MERTHYR.—August 12th.—For the erection of forty-eight dwellings, for the corporation.—Borough Architect, Town Hall.

SOUTHEND.—August 17th.—For the erection of a lodge and refreshment-room, for the corporation.—Mr. E. J. Elford, borough engineer and surveyor.

Iron and Steel.

BELFAST.—July 29th.—For the supply of steel pipes and specials, for the corporation.—Mr. R. Meyer, town clerk.

WOOD GREEN.—July 31st.—For the supply of unclimbable wrought-iron fencing and six pairs of gates, for the urban district council.—Engineer and Surveyor.

SALFORD.—July 31st.—For the supply and erection of cast-iron standards and wrought-iron gas tubing.—Borough Engineer.

VALETTA.—August 1st.—For the supply of pipes and castings, for the Director of Contracts.—Crown Agents for the Colonies, Whitehall-gardens.

BOMBAY.—For the supply of about 20 miles of steel pipes of about 48 in. diameter, for the municipality.—Mr. H. J. Trivess Smith, hydraulic engineer.

BEDLINGTONSHIRE.—For the supply of 100 yds. of 15-in. steel tubes, coated, in 18-ft. lengths, for the urban district council.—Mr. Charles D. Forster, joint clerk, 24 Grainger-street West, Newcastle-on-Tyne.

Roads.

BURNLEY.—July 27th.—For the execution of a road improvement, for the rural district council.—Mr. H. Pritchard, surveyor.

ORMESBY.—July 27th.—For making-up work in certain streets, for the urban district council.—Mr. Alfred H. Sill, 15 Albert-road, Middlesbrough.

WEST RIDING.—July 27th.—For kerbing, channelling, pitching, surface-water drainage, and walling, for the Highways Committee.—The County Surveyor, County Hall, Wakefield.

WITHAM.—July 29th.—For the use per day of steam roller and scarifier, for the urban district council.—Mr. W. P. Perkins, surveyor.

WITHAM.—July 29th.—For the supply of granite, for the urban district council.—Mr. W. P. Perkins, surveyor.

NEW SARUM.—July 29th.—For works of making up, for the corporation.—Mr. Francis Hodding, clerk.

EAST PRESTON.—July 29th.—For steam rolling the district roads, for the rural district council.—Mr. A. Shelley, clerk, Littlehampton.

CHESTER-LE-STREET.—July 29th.—For the construction of a new road, for the rural and urban councils.—Mr. W. Ayton, highway surveyor.

SWANSEA.—July 29th.—For the construction of a new road, for the rural district council.—Mr. E. Harris, clerk.

NEWBURN.—July 29th.—For making up certain streets, for the urban district council.—Mr. T. Gregory, surveyor.

BROMLEY.—July 29th.—For the supply of Guernsey or Leicester granite and basalt, for the corporation.—Mr. F. H. Norman, town clerk.

SALISBURY.—July 29th.—For making-up work, for the corporation.—Mr. W. J. Goodwin, city engineer and surveyor.

STRATFORD-ON-AVON.—July 29th.—For the supply of broken and unbroken road macadam, for the corporation.—Mr. Roden Dixon, borough surveyor.

WATFORD.—July 30th.—For making up certain footpaths, for the urban district council.—Mr. W. Hudson, clerk.

TYNEMOUTH.—July 30th.—For road construction work, for the corporation.—Borough Surveyor.

WOODFORD.—July 30th.—For the supply of granite and steam rolling, for the urban district council.—Mr. W. Farrington, surveyor.

BIRMINGHAM.—July 31st.—For the reconstruction of part of St. Margaret's-road, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

HAMMERSMITH.—July 31st.—For making up a thoroughfare, for the borough council.—Mr. H. Mair, borough surveyor.

HOVE.—July 31st.—For paving and other works, for the corporation.—Mr. H. H. Scott, borough surveyor.

LANARK.—August 1st.—For repairs to Craig-street, for the District Committee of the Middle Ward.—Mr. W. E. Whyte, district clerk, Hamilton.

BARNET.—August 1st.—For works of repaving, rekerbing and channelling in High-street, for the urban district council.—Mr. Henry W. Poole, clerk.

NEWCASTLE (Ireland).—August 1st.—For steam rolling main and district roads, for the urban district council.—Mr. D. Curran, town clerk.

BARNET.—August 1st.—For making up of private street, for the urban district council.—Mr. Hy. W. Poole, clerk.

SURBITON.—August 1st.—For private street works, for the urban district council.—Mr. F. W. Wood, clerk.

WANSTEAD.—August 1st.—For retopping about 3,600 yds. super. of footway with Derbyshire limestone tar paving, for the urban district council.—Mr. Bruce Blewitt, clerk.

TEDDINGTON.—August 3rd.—For making up certain roads, for the urban district council.—Mr. M. Hainsworth, surveyor.

BOLLINGTON.—August 5th.—For the supply of 300 tons of granite macadam, for the urban district council.—Mr. S. Knight, clerk.

LANCHESTER.—August 6th.—For tar-grouting work, for the rural district council.—Mr. W. Cumming, highway surveyor.

CHINGFORD.—August 6th.—For making-up work, for the urban district council.—Mr. L. C. Bowen, clerk.

SUNBURY-ON-THAMES.—August 6th.—For the supply of granite, for the urban district council.—Mr. H. F. Coales, surveyor.

BUNGAY.—August 8th.—For the supply of Mountsorrel or Quenast granite, for the urban district council.—Mr. P. J. Sprake, clerk.

CHICHESTER.—August 29th.—For making up with granite macadam about 10,000 super. yds. of London-Portsmouth road, for the corporation.—Mr. J. W. Loader Cooper, town clerk.

CASABLANCA.—August 29th.—For the improvement of several roads, for the Special Committee of Public Works.—The President, Comité Special des Travaux Publics, Dar En Niaba.

CASABLANCA.—August 31st.—For the construction of public roads, for the Moroccan Adjudications Commission. Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

SOUTHWELL.—For the supply of non-poisonous dust preventives.—Mr. H. Blewitt, district surveyor, Allerton, Notts.

Sanitary.

HOOLE.—July 27th.—For works of sewage and making up back passages, for the urban district council.—Mr. A. E. Caldecutt, clerk, 17 Newgate-street, Chester.

SELBY.—July 27th.—For the cleansing of open sewers, for the rural district council.—Mr. J. Townend, clerk.

BYSHOTTES.—July 27th.—For laying sanitary pipes and manholes, for the urban district council.—Mr. A. A. Luxmore, 5 North Bailey, Durham.

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

Sewage Disposal at the Sanitary Congress.

During recent years this subject has played a prominent part at the annual congresses of the Royal Sanitary Institute, which numbers among its members many engineers, surveyors, medical officers of health, and others eminent in their several professions and keenly interested in the modern developments of sewage treatment. It was thus natural that such occasions should be utilised to describe the results obtained by recently introduced new methods, and to make known further developments or new theories. The reports of the Royal Commission on Sewage Disposal alone furnished matter for numbers of papers and many animated discussions, and the opportunities offered at these annual congresses for public and private consideration of the many points which arose, and the numerous problems awaiting solution, undoubtedly assisted, to a large extent, the rapid progress which has been made in recent years. This rate of progress could not, however, continue indefinitely, and the number and character of the papers connected with sewage disposal at the annual congress in York this week are indications of the fact, already recognised in many quarters, that we have at last reached that point where future developments will be mainly concerned with details only of the methods of treatment now in general use, or of modifications necessary to meet the requirements of exceptional conditions.

Of the four papers that have been under consideration, and which we print on another page, the first refers in a very general way to the disposal of sewage in rural districts, and the second revives the controversy of land versus so-called "artificial" methods of treatment. The third describes an interesting process of sludge treatment, and the fourth a somewhat unusual method of extending a sea outfall. There is nothing radically new in any of the papers, but they are none the less interesting. One phrase in Mr. A. Rodwell's paper is extremely important and needs special emphasis, especially in connection with small works in rural districts. Mr. Rodwell prefers a certain simple method of treatment for isolated houses "*if attended to regularly.*" Most engineers will agree with us that *all* methods of treatment need regular attention. The best designed scheme will fail if not properly managed, while an imperfectly designed scheme will often yield excellent results if it is carefully worked. Too many statements have been made in the past as to the automatic action of tanks and filters, and it would tend to prevent many failures in the future if engineers would make it clear to their clients that all works, large and small, require regular and careful attention in order to secure the best results. Another feature of this paper is the number of instances quoted in which the discharge of partially treated, or even untreated, sewage into a river failed to cause any nuisance or serious pollution, excellent evidence of the efficacy of purification by dilution when carried out under suitable conditions.

The paper by Messrs. Hindle and Whitaker, in which they describe the method they adopted at Penrith for dealing with sludge, may be of use in cases where similar conditions exist, but the time required for the wet sludge to dry—six weeks—appears to us to be capable of reduction by the adoption of properly arranged draining beds, and the period of twelve months needed for the sludge to attain its most beneficial condition as manure, after removal from the beds, would prevent the adoption of this system in many cases. The purification of the sewage at Penrith, after preliminary treatment in tanks, is accomplished by irrigation on land, and this scheme might be taken as lending support to the arguments set forth by Mr. Manley in his paper upon "The Advantages of Land over Artificial Schemes." It must, however, be borne in mind that the land at Penrith, as described by the authors in the paper referred to above, is "eminently suitable for filtration purposes, consisting of a deep bed of gravel, which is overlaid with about 2 ft. of fibrous soil." This is the kind of land which the Local Government Board would certainly consider as "suitable" for land treatment, and it is the impossibility of securing land of this character, in most cases, which has necessitated the construction of the "artificial" schemes referred to by Mr. Manley. Indeed, the subsoil at Penrith is simply a natural percolating filter, and all artificially constructed schemes are the means adopted to secure suitable filtration areas in places where nature has not provided them. Mr. Manley considers the old requirement of the Local Government Board for a certain area of land for all sewage disposal works a "very wise precaution," but he does not lay sufficient emphasis upon the word "suitable," and this is exactly the reason why so many schemes sanctioned by the Board in the past failed to produce the required results after a time. The best example of land treatment quoted by the author is that at Aldershot, and the description of the subsoil given in the paper—sand and gravel—shows that it is of a "suitable" character. As 120 acres are under cultivation, and the estimated daily flow is 1,000,000

gallons, the volume of sewage dealt with per acre is only 8,334 gallons, or about $1\frac{3}{4}$ gallons per square yard per day! When it is taken into consideration that about fifty times this quantity per square yard can be satisfactorily treated upon artificial filters properly designed and managed, it will be seen that even if "suitable" land were available everywhere, the very much smaller area required for "artificial" methods may, in many cases, render their adoption desirable, apart from any other considerations. The friends of land treatment will probably point to the case of Dorchester, where, as reported in our issue of last week, the town council have decided to change the present treatment of the sewage to that of broad irrigation, in support of their arguments, but we feel certain that the present-day scientific methods of sewage purification will never be abandoned in favour of the old rule-of-thumb system of treatment on land, irrespective of its character.

* * *

The Utilisation of Road Sweepings.

It has been the custom in the past for gardeners to welcome the offer of road sweepings for their gardens, especially in cases where the soil was of a "heavy" character, but the enormous increase of motor-driven traffic in recent years has given rise to doubts as to whether this material is as suitable as it used to be for the purpose in question. Some may have thought that the oil droppings from motors may even have rendered the road sweepings of to-day actually harmful to garden plants. So far as we are aware it does not seem to have occurred to anyone in this country to investigate the matter in a proper manner, and we have to thank the Government of the U.S.A. for definite information on the subject. We are indebted to our esteemed contemporary the *Engineering Record* for particulars of a report prepared at the instance of the Bureau of Soils of the Department of Agriculture dealing with the value of road dust and sweepings as fertilising material. The material was studied from the point of view of its organic and inorganic constituents, and its effect upon plant life. Different samples were tested, such as those produced by hand sweeping, by machine sweeping, and from a heap which had been accumulating for some time and in which the organic matter was partially decomposed. Hand sweepings showed the greatest content of nitrogen, potash and phosphate, but all three constituents were less than those contained in ordinary horse manure. Experiments as to the effect upon the growth of plants were made with all three samples, and at the same time, for purposes of comparison, with untreated soil, and with soil to which good stable manure had been added. Wheat was grown in these mixtures for 30 days and the plants were then cut and weighed. Compared with the weight of the plants grown in untreated soil, the increases were as follows:—5 per cent in the case of decomposed sweepings, 10 per cent. in the case of machine sweepings, 31 per cent with hand sweepings and 46 per cent with stable manure. It was considered that these results indicate that, while road sweepings are beneficial, they are not so efficient as good stable manure.

In order to ascertain what effect, if any, the lubricating oil in the sweepings had upon plant life, the mineral oil in three similar samples was extracted and found to be as much as 1·7 to 2 per cent. When added to the distilled water mixed with nutrient solution in which young wheat seedlings were growing, it was found to reduce the growth to an extent varying from 10 to 20 per cent. Further experiments were then made with the same samples of sweepings *after* the oil had been extracted, and it was found that the fresh road sweepings were both quite as beneficial as the stable manure, and the decomposed only very slightly less efficient. The authors of this report, Messrs. Skinner and Beattie, have suggested that it might be worth while to consider the possibility of recovering low-grade lubricating oil from road sweepings, more particularly in towns where there is much motor-driven traffic. Whether this will be found to be economically practical or not, it is evident from these experiments that the introduction of motors for propelling road vehicles has considerably reduced the value of road sweepings as a fertilising material, and may even have rendered it deleterious to plant life in places where this type of traffic has largely superseded the use of the horse-drawn vehicle. The investigators who carried out these experiments deserve much credit for the admirable manner in which they dealt with the subject and for the very clear manner in which the results are arranged and explained in their report.

* * *

The Berlin Congress.

In another column will be found a report of the excellent address which was delivered by Mr. P. C. Cowan, M.INST.C.E., in his capacity of president of the Municipal Engineering, Architecture and Town Planning Section of the Congress of the Royal Institute of Public Health held in Berlin at the end of last week. It would be difficult to suggest a more appropriate *venue* for such a congress, inasmuch as the interest which the German people have shown in all matters pertaining to the science of health, and their very substantial contributions to its advancement are generally recognised. Mr. Cowan pointed out the very extensive character of the field which has to be covered by the modern municipal engineer, and proceeded to offer some observations on its more salient features, such as scavenging, water supply, drainage and housing. He laid special emphasis on the paramount importance of an efficient service for the removal of waste products. After all, the modern city is a huge living organism, and if it is to be maintained in a healthy condition full provision must be made for the elimination of noxious waste matters of every kind. This involves the establishment of schemes for the removal and disposal of house refuse, drainage, sewerage, sewage disposal and street cleansing. The term "scavenging," thus interpreted in its widest sense, includes a very large proportion of the matters which come within the ken of the municipal engineer, and from a public health point of view we agree with the opinion expressed by Mr. Cowan that the most important duty of a town authority is scavenging.

Another matter of obvious importance to which Mr. Cowan devoted considerable attention was the question of water supply. A plentiful supply of pure water is nowadays such a common thing that its value is often not appreciated. Consequently, waste is an all too frequent occurrence, and public opinion is only aroused on the rare occasions when an adequate supply fails from drought or some other cause. In dealing with sewers and drains, Mr. Cowan spoke of the opinion which has been expressed in some quarters that the intercepting trap — now commonly placed on the house drain just before it joins the sewer to prevent the passage of air from the sewers into the house drains—may safely be omitted, and ventilation of the sewers, as well as the house drains, permitted through the soil pipes. We agree with his opinion on this point that the intercepting trap can only be safely dispensed with when plumbing, house drainage, and sewer construction have been brought up throughout the country to the standard of the best modern practice, by more scrupulous inspection and testing than are at present usually secured. A very interesting and varied address concluded with some observations on housing, and an expression of confidence in the improvements which may be achieved by the application of the Housing and Town Planning Act.

* * *

The Prevention of Smoke.

The case which was recently decided by a Divisional Court in which the Greenwich Borough Council unsuccessfully proceeded against the London County Council in respect of an alleged

smoke nuisance at the electric power station belonging to the latter body has again drawn attention to a matter of considerable public importance. The excessive emission of black smoke is not only inconvenient, but disagreeable in the extreme. Moreover, when smoke is given off from a fuel there is a loss of carbon monoxide and other combustible gases, indicating imperfect combustion and consequent waste. It took considerable time to educate large fuel consumers to the fact that the greater portion of the smoke going out to pollute the atmosphere was really waste heat, and could be employed to great advantage in their own boilers, but within the last few years there has been a remarkable development in the utilisation of coal under the steam boiler, and to-day many steam plants are burning bituminous coals practically without smoke. This is largely due to improvements in the design of the furnaces and more care on the part of the firemen. In fact, it is now generally realised that coal can be burned practically without smoke if the equipment is properly designed and adjusted. In order to secure this desirable result the coal should be supplied to the furnace in small quantities at frequent intervals. The more nearly the feed approaches a continuous and uniform supply the better the results. Further, the air supply should be slightly in excess of the theoretical amount required, and it should be admitted through the fuel bed, with an auxiliary supply admitted at the front or rear of the furnace to burn gases from the coal. The temperature in the furnace should be sufficiently high to ignite the gases given off from the fuel bed; and there should be a fire-brick combustion chamber of sufficient dimensions and so designed as to cause the thorough mixture of the gases and air, permitting complete combustion before the mixture reaches the boiler surfaces. If these precautions were generally observed the smoke nuisance would be practically non-existent, and the expense of costly legal proceedings would consequently be avoided.

* * *

Town Planning in America.

One of the most remarkable characteristics of the modern town planning movement is the world-wide nature of the activity which it has engendered. In practically every European country and in America the question of a more rational method of town development has been the subject of discussion and conference, in many cases resulting in the evolution of practical schemes. In order to keep abreast of this subject, therefore, it is necessary to watch the progress of events abroad as well as in this country, and we make no apology for referring to the National Conference on City Planning which was recently held at Boston. The problem of the city in America is really very much like that which presents itself for solution here. It consists broadly of two distinct parts—the overcrowded centre and the control of suburban development. The Mayor of Boston in his address to the conference sought to emphasise the practical urgency of the problem, and clearly pointed out that we are working not for the purpose of ventilating our personal opinions, or of sketching vaporous visions of a city beautiful, which is to be brought into being somewhere, somehow, at some future stage of the world's progress, but for the purpose of bettering conditions of life in any existing city, and wherever tens of thousands and hundreds of thousands of men are living under conditions that are admittedly far from ideal. He also called attention to the necessity for cheap transportation if town development is to proceed on modern lines, and acknowledged to the full the part which the municipal engineer ought to play in regard to town planning schemes. There is a notion, all too prevalent still, that city planning is purely a question of landscape architecture, but those who have had to do with the actual work of municipal government, realise that dependence must be placed upon the municipal engineer for the laying out of subways, streets, sewers and water systems, which are in a sense the skeleton over which the great organism of a city is developed.

* * *

Sanitary Progress and the Law.

In connection with the Annual Congress of the Royal Sanitary Institute, the usual conference of engineers and surveyors to county and other sanitary authorities took place on Tuesday last. These conferences have proved of great usefulness in the past as providing a medium for the interchange of ideas upon those parts of the duties of a municipal engineer which fall more particularly within the scope of the work of the Sanitary Institute. This year's conference, which was presided over by Mr. A. D. Greatorex, M.INST.C.E., the borough engineer and surveyor of West Bromwich, was no exception to the rule. The presidential address, which will be found *in extenso* in another column, dealt with the more salient features of modern sanitary progress, and contained an appeal which we cordially support for a codification of the Public Health Acts. As we have said in these columns on more than one occasion, the fact that the law is contained in a large number of statutes together with the frequency of legislation by reference, and the enormous number of decided cases which have created a vast body of "judge-made law," render it impossible for any but the expert to understand or indeed to discover what the law is on any desired subject. Surely the time has arrived for the unravelling of all these tangled threads, and for placing on the Statute Book a comprehensive consolidating Act which will in itself embody the whole of the existing law on matters affecting the public health.

* * *

An Anomaly.

The city of Toronto has the unenviable distinction of being probably the largest municipality in the British Empire whose city engineer is not a technical man and has never had any engineering training or experience. This extraordinary position has arisen owing to the appointment as Commissioner of Public Works at Toronto of a gentleman who, although apparently well qualified for the discharge of the duties of this purely administrative office, is certainly not qualified to bear the designation of city engineer, which is for some reason given to him, although the whole of the technical work in connection with the city's administration is in the hands of a qualified gentleman who has to be content with the title of acting city engineer. It seems not only anomalous but actually unfair that the man who carries out the duties and bears the responsibilities which usually attach to the office of city engineer does not possess the title to which he has every right. Nor does it seem other than disadvantageous to the gentleman who has the official title of city engineer, that, so far as the duties of the office are concerned, he must depend entirely upon a subordinate. It can hardly be that such a position makes for efficient administration, which ought to be the only consideration in a matter of this kind.

* * *

An Interesting Calendar Competition

In "Minutes" in our issue of June 7th (page 817) appeared an announcement inviting competition for a prize of £10 offered by Messrs. Josiah Smart & Son, of 53 Victoria-street, Westminster, for a suitable design for their next year's calendar. A fair response was received, and the designs have been duly adjudicated upon by the three judges—Mr. H. Percy Boulnois, M.INST.C.E., Mr. C. Spurrier Mason, of THE SURVEYOR, and the Editor of that journal. As a result there was no difficulty in unanimously placing first the design sent in by Mr. F. C. E. Gradicky, of Manchester, who therefore receives Messrs. Smart's award.

Municipal Engineering, Architecture and Town Planning.

By P. C. COWAN, D.Sc., M.Inst.C.E., Chief Engineer to the Local Government Board for Ireland.

[At the Congress of the Royal Institute of Public Health, held in Berlin at the end of last week, Mr. Cowan delivered the following address as president of the Municipal Engineering, Architecture, and Town Planning Section.]

My first duty is to express my high appreciation of the honour of being president of this important section of a memorable congress, held under the most favourable auspices in this Imperial city. The invitation extended to the Royal Institute of Public Health to hold a session in Berlin was most gladly received and accepted, and our best thanks are due to the high officials and distinguished scientists who have planned the arrangements for our edification and pleasure which are set out in the programme of the congress.

I think I voice your thoughts when I say that we come to this great centre of national activity with the minds of inquirers and students, and with little inclination to pose as teachers, though we hope that the present occasion of sympathetic intercourse with a highly esteemed and kindred people may be to some extent of mutual benefit. In thinking of Germany, our minds are impressed by the high character, courage, efficiency, and discipline which have placed this country in the forefront of civilisation and compelled the admiration of the world.

King Frederick William, after the battle of Jena, said: "Germany must regain by intellectual power what she has lost in material power. For this purpose it is my desire that everything possible may be done to extend and perfect the education of the people." With such a national ideal, it is not to be wondered at that, after the storms and stress of a century, the German race is strong on land and sea, and that, throughout the wide Fatherland, under a succession of wise rulers, science and the arts have been cultivated and applied for the common weal to a degree which has never been surpassed.

I cannot resist the temptation to quote, in this connection, from a speech made by the late Prince Consort Albert when the preliminary arrangements for the First International Exhibition of 1851 were being made, as it indicates the fine product of German education, and sums up the ideal purposes of international congresses. He said:—

"I conceive it to be the duty of every educated person closely to watch and study the time in which he lives, and, as far as in him lies, to add his humble mite of individual exertion to further the accomplishment of what he believes Providence to have ordained. Nobody who has paid any attention to the particular features of our present era will doubt for a moment that we are living at a period of most wonderful transition which tends rapidly to the accomplishment of that great end to which, indeed, all history points—the realisation of the unity of mankind—not a unity which breaks down the limits and levels the peculiar characteristics of the different nations of the earth, but rather a unity the result and product of those very national varieties and antagonistic qualities. The distances which formerly separated the different nations and parts of the globe are gradually vanishing before the achievements of modern invention, and we can traverse them with incredible ease; the languages of all nations are known, and their requirements placed within the reach of everybody. On the other hand, the great principle of division of labour, which may be called the moving power of civilisation, is being extended to all branches of science, industry, and art. While formerly the greatest mental energies strove at universal knowledge, and that knowledge was confined to the few, now they are directed to specialities, and in these again to the minutest points; but the knowledge acquired becomes at once the property of the community at large. Science discovers the laws of power, motion, and transformation; industry applies them to the raw matter which the earth yields us in abundance; art teaches us the immutable laws of beauty and symmetry, and gives to our productions forms in accordance with them."

The Prince ended his speech, which, after nearly three-quarters of a century seems full of wisdom and hopeful suggestion fitted for the present day, with an aspiration that the exhibition would evoke feelings "of deep thankfulness to the Almighty for the blessings bestowed on us already here below," and lead to "the conviction that they can only be realised in proportion to the help which we are prepared to render to each other, by peace, love, and ready assistance, not only between individuals, but between the nations of the earth."

Our section includes the great subjects of municipal engineering, architecture, and town planning, each of which affords an unbounded scope for study. You will, therefore, readily agree with me that in the short period for which I have the honour to address you I can only deal in a light and general way with a few points which appear to be of special interest, and that I must be careful not to detain you long from the consideration of the carefully prepared papers on individual subjects with which we have been favoured by the authors.

MUNICIPAL ENGINEERING.

Municipal engineering is a wide term, only slightly less extensive than the word engineering. The conditions of life in our modern cities and towns require the application of engineering ability in almost countless directions. Evidently engineering of a systematic kind was first called into being when men ceased to be nomadic, and planted their homes together on some carefully chosen spot convenient for the supply of water and food, and easy of defence. Since those remote days an immense development of engineering, architecture, and town planning has taken place, with results which are magnificently manifested in Berlin and other German cities. There is, however, much to be done before the conditions of life in town and country can be deemed satisfactory, and there are many unsolved problems in sanitary and social work to which our energies should be unceasingly directed in fulfilment of the paramount law—the welfare of the people.

Hippocrates, the most celebrated physician of antiquity, more than 2,000 years ago, gave as the cardinal hygienic formula—"Pure air, pure water, and a pure soil"; and after all these centuries we know nothing to add to it as a working rule for the sanitarian. In their various spheres, embracing the provision and maintenance of ways and means of transit, the orderly and convenient disposition of healthy houses, the supply of water, and the removal and destruction of waste matters, the true function of the engineer and architect is to fulfil the ancient prescription in as dignified and economical a manner as possible, and in all cases with the beauty of fitness.

SCAVENGING.

The most important duty of a town authority, in my opinion, is scavenging. This idea was enunciated many years ago, but is still insufficiently regarded. Nothing is of greater benefit to the health of a community than the systematic and speedy removal of all waste organic matters from the vicinity of dwellings. In no other direction can the expenditure of skill, energy and money be more profitably directed than in perfecting the arrangements for public and domestic scavenging to get rid of foul liquids, solids and dust from streets and houses. The importance of this part of municipal engineering has been emphasised by the science of bacteriology, and comparatively lately by the recognition of the potency of flies as carriers of infection. The public authorities in Germany are to be congratulated on their adoption over wide areas for many years of asphaltic roadways, which are smooth, impervious and admirably adapted for perfect scavenging, and, moreover, ideal for motor traffic. The importance of the dust nuisance on roads and streets was always great, but it has been accentuated by the revolution in means of locomotion which has taken place in recent years, and the attention of engineers is now earnestly directed to its abatement. This can be best secured in towns by the adoption of smooth pavement, as free from joints as possible, and by thorough cleansing with the aid of water. When, for local reasons, the roadways cannot be sluiced with water, they should at least be sprinkled before being swept. Unless this is done, much of the dust is disturbed and scattered without complete removal.

Dry sweeping of streets, as well as dry sweeping and dusting in houses, should be abandoned as far as possible, as it is often worse than useless.

WATER SUPPLY.

The supply of good water in ample quantity and in a convenient manner is one of the most important tasks of the municipal engineer. The value of such a supply is not sufficiently appreciated by most people, and only strikes them on the rare occasions when it is cut off. Until comparatively recently, carelessness with regard to the quality of the water supplied to towns, and as to its exposure to contamination after delivery to the consumers, was very general, and even to-day it largely prevails. In America large quantities of water are distributed in a very liberal manner, but sufficient care is not always taken with respect to its purity. In the British islands the supply of water for domestic purposes, though more limited, is not charged for according to the quantity used, as is the case in Berlin, and, as a consequence, in many towns there is great waste, which throws an unnecessary burden on the community. Evidently a moderate supply of good quality is much more valuable than a large supply of doubtful purity, but it is exceedingly difficult to get some town authorities to be sufficiently energetic in the prevention of waste, though ample powers in this respect have been afforded to them by the general statutes and by by-laws made under them.

TYPHOID FEVER.

The incidence of typhoid fever, more than that of any other disease, is a test of sanitary conditions, and experience throughout the world has demonstrated that in many cases the provision of a pure water supply has reduced the mortality from this terrible scourge by 75 per cent. In the British islands, catchment areas for water supply, varying in extent from 10 to 70 square miles, have been purchased by the corporations of twelve cities for the purpose of preventing any risk of pollution. In Berlin, Copenhagen, Edinburgh, Hamburg, London, Paris and Rotterdam, which are supplied with carefully filtered water, the average death-rate in recent years from typhoid has been less than 10 per 100,000, which shows that in these great cities water-borne typhoid has been practically eliminated. To eradicate the disease completely—and this is confidently hoped for—it is to other causes that our attention must now be turned, bearing in mind that typhoid is a filth disease, and is frequently carried by milk and other foods that have been in contact with "carriers," convalescents, or sufferers.

Lecturing on this subject a quarter of a century ago, the late Prof. Fleeming Jenkin said a prosecution ought to be instituted with respect to each case of typhoid fever, and this statement can scarcely be gainsaid when the terrible nature of the disease and the fact that it is the typical preventable disease are considered. Prof. Sedgwick says: "Every case of typhoid fever comes from somebody's ignorance or neglect."

Mr. Whipple, an American consulting engineer, who has made a special study of this disease, says: "Not long ago an action was brought against a Western city to recover damages because of the death of a person from typhoid fever, caused, it was alleged, by the infection of the public water supply. The suit was lost. There are some who believe, however, that the time will come when such suits will not be lost, when the public authorities will be held legally as well as morally responsible for deaths due to infected water."

The Public Health Acts in force in England and Ireland definitely provide that "a sanitary authority shall provide and keep in any waterworks constructed or purchased by them a supply of pure and wholesome water," and also afford a way of compelling a defaulting authority to perform its duty.

Despite these and other excellent provisions in the Public Health Acts, progress in sanitary improvements in Great Britain has been disappointingly slow and ineffective, as many authorities insufficiently recognise that liberal expenditure for the improvement of the health of the people is usually profitable in every sense, though much of the profit is yielded indirectly. It is not, therefore, remarkable that in the National Insurance Act, which is to some extent modelled on the corresponding legislation in Germany, and which comes into operation this year throughout the British islands, a new and drastic provision is made by which a sanitary authority is made liable for compensating in money any loss falling upon an insurance society on account of excessive sickness due to the failure of the sanitary authority to exercise its remedial powers under the Public Health and Sanitary Acts.

WATER FILTRATION.

The application of mechanical filters for the purification of water is common in America, and is extending in Great Britain, but recent careful investigations in England and Scotland show that their suitability in special cases can only be judged by very careful chemical and bacteriological tests. The old-fashioned gravity sand filter is still most generally used, though it is, in some important ways, a defective arrangement, requiring, as Koch and other distinguished experts have pointed out, scientific skill and attention to secure uniformly good results. The most promising recent development is the arrangement of filter-beds in a series, in which the water passes successively through coarse, medium and fine materials, separately contained in the different filters. With this arrangement, the inevitable disturbance of the quality of the filtrate due to the cleaning of the filters is considerably postponed with great advantage, and the filters can be allowed to ripen before being used after cleaning without serious inconvenience. The classical work of Dr. Houston, Director of Water Examination, Metropolitan Water Board, London, has recently made great additions to our knowledge of questions affecting the purity of water, and has demonstrated the great value of prolonged storage. In other quarters, especially in France and Germany, considerable advances have been made in this field, with relation to the sterilisation of water by ozone and chlorine, and by ultra-violet rays from electric lamps. The last-named method is inexpensive, as the consumption of electricity is small, and it appears to be specially suitable for the treatment of waters which are free from turbidity. With turbid waters, it could probably be used with great advantage after preliminary sedimentation or mechanical filtration. The most important point to note is that all methods of water purification require, and are worthy of, constant expert supervision.

SEWERS AND DRAINS.

The water carriage system for the removal of foul wastes from buildings is now almost universally adopted, and is undoubtedly the most sanitary and economical. Until about thirty years ago little care was taken to prevent the passage of foul air into houses from the drains and sewers, and though, perhaps, having regard to recent knowledge, the early estimates of the evil effects of such air were exaggerated, it is clearly of great importance to exclude it from houses. Great improvements in sanitary fittings and in house plumbing and drainage have been secured in recent years, but they have not yet been generally applied, and the subject is worthy of the most scrupulous attention. In the best British practice, heavy iron pipes are now used for house drains, and the whole work is thoroughly tested by means of an air pump and pressure gauge. Increased care is being given to the construction of sewers to ensure that they shall be quite impervious, smooth, rapid in delivery, convenient of access for inspection, and properly ventilated. The British Public Health Acts require that, "Every sanitary authority shall cause the sewers belonging to them to be constructed, covered, ventilated, and kept so as not to be a nuisance or injurious to health." The improvements secured in house drainage and town sewerage have been so great during the last thirty years that it is considered by many authorities that the intercepting trap—now commonly placed on the house drain just before it joins the sewer to prevent the passage of air from the sewers into the house drains—may safely be omitted, and ventilation of the sewers, as well as the house drains, permitted through the soil pipes. My opinion on this point is that the intercepting trap can only be safely dispensed with when plumbing, house drainage, and sewer construction have been levelled up throughout the country to the standard of the best modern practice, by more scrupulous inspection and testing than are at present usually secured.

The great subjects of sewage disposal and the prevention of the pollution of rivers still present many unsettled questions, but the general situation has been greatly eased by the interim reports of the Royal Commission on Sewage Disposal, which, though appointed in 1898, has not yet concluded its labours. The problems involved are, however, still difficult, and call for the exercise of much professional skill in the selection of suitable methods according to local circumstances. I am very glad that a paper on this sub-

ject by one of the honorary secretaries of this section, who is specially qualified to deal with it, will be presented to you. I would also take this opportunity of expressing the high appreciation of British engineers of the valuable research and practical work done in this sphere by Dr. Dunbar, of Hamburg, and other German scientists.

In Berlin the community has the good fortune to have available large areas of land suitable for the treatment of sewage, and the sewage farms of this city have an area of nearly 70 square miles, and are managed with great energy and efficiency. Mr. Albert Roechling, M.INST.C.E., in a recent exhaustive account of this system, states that, apart from capital charges, there is a profit on the working of the farms of about 11s. per 1,000,000 gallons of sewage, but that, taking capital charges into account, the nett cost of the purification of the sewage is about £6 per 1,000,000 gallons.

LIGHTING.

The questions of lighting and means of transport are so important for the health and convenience of the people, and especially for town dwellers—who in England and Wales constitute 78 per cent of the total population—that for a moment I venture to refer to them. In the realm of the lighting engineer rapid progress continues to be made, and the keen rivalry between the electrical engineer and the gas engineer has been productive of much benefit to the public. Prosperity still attends most well-managed gasworks, though the sale price of gas has fallen greatly. From one very successful works at Widnes, in Lancashire, gas is supplied at less than 1s. per 1 000 cub. ft. In different parts of London and other large cities the streets are equally well lighted by gas and electricity, and at approximately the same cost. It should be noted that the principal means for this beneficent contest, the metallic filament lamp, and the incandescent mantle, were given to the world by Germany.

TRANSPORT.

The advent of the internal combustion engine has brought about another contest in efficiency and economy, which is greatly affecting the transit question. Railway and tramway companies are now being pressed by the competition of motor vehicles, and this is immensely to the advantage of the working classes, by freeing them to a large extent from the necessity of living in congested centres. Trackless trolley systems have not yet made any headway in the British Islands, mainly on account of the question of road maintenance, and rapid progress in this direction is unlikely, as motor-buses can now be run at an inclusive cost of less than 6d. per mile.

HOUSING.

One of the greatest problems for the sanitarian is the proper housing of the working classes. An initial difficulty is the high cost of a good house of even minimum dimensions, compared with the rent which the poorer working man can afford to pay. Until recent years, block buildings were in favour in the British Islands among pioneers of housing reform, but the modern view is quite opposed to their erection. They are costly to build and to maintain, and do not satisfy the people, who wisely prefer to live where they and their children can readily step from the house into the open air. The average weekly rent per room in the houses of the working classes has been recently authoritatively stated as follows:—

In the United States of America, 2s. 6d.; in Germany, 2s.; and in England, 1s. 6d.

Alderman Thompson, of Richmond, says: "It must be acknowledged that the subsistence wage of the unskilled worker is not sufficient to allow him to pay the mere interest on the bricks and mortar which form his dwelling. Under present circumstances, it is almost impossible to house the very poor in really healthy houses so as to make a commercial profit. The raising of the standard of building, and the enforcement of structural sanitation by Model By-laws have, while making the houses more habitable, added considerably to overcrowding, and every act of the sanitary reformer will make the problem of housing the very poor more acute."

With the aid of cheap Government loans, 1s. rent per room will meet all charges when the total cost of the house does not exceed £10 per room. Many cottage schemes have been carried out at about this figure, but in block or tenement houses erected by the town authorities the cost per room is, on an average, more than £50 per room.

An interesting experiment was made some years ago by the city engineer of Liverpool in the construction of houses for the working classes with very large concrete slabs, one of which formed a complete wall or floor of a room, but the experiment was not economically successful, on account, no doubt, to some extent, of its limited scale. Further effort in this direction appears to be very desirable, especially as by reinforcement of the concrete the necessary strength in the floors and walls could be secured with a great reduction in mass.

There are a few rays of hope which lighten the dark problem of the housing of the working classes. The progress made in the garden cities and town planning movements must gladden the hearts of the pioneers, who, overcoming almost insurmountable difficulties, have at last convinced the workaday world. The Housing and Town Planning Act of 1909 is one of the most far-reaching and beneficent of the numerous statutes enacted for the improvement of social conditions in Great Britain. It fulfils the aspirations long cherished by many disinterested and clear-minded philanthropists, and in some large schemes in England, notably that in Sheffield, the difficulties in applying the Act, which were prophesied as insurmountable by the few remaining supporters of the doctrine of *laissez faire*, have been overcome with ease. We are fortunate in having before us a valuable paper on this subject by Mr. Thomas Adams, of the English Local Government Board, who is especially connected with the operations under the new Act. Another excellent new movement, "Co-Partnership in Housing," is now well established in England, and I heartily commend the lines of its work to the study of all who are interested in the question. This system happily combines the benefits of wholesale dealing and management with elements which foster self-reliance and secure the active individual co-operation of the members of the society in maintaining the houses and their surroundings in good order. Some of its cardinal merits are that it is economically sound, and practically independent of State or municipal aid, that it fosters and develops manly qualities and good citizenship, that it is suited for large or small areas, and can be adapted and expanded according to local requirements.

In conclusion, gentlemen, I congratulate you on the good fortune which has brought us to Berlin, where there is so much to learn from the results of that public spirit and high sense of duty which are so marked a feature of German civic life.

SEWAGE DISPOSAL AT WEST BRIDGFORD.

OPENING OF NEW WORKS.

A new system of sewage treatment at West Bridgford was inaugurated on Wednesday of last week, and it is believed that the problem which everywhere is becoming increasingly difficult has been solved by the progressive Nottingham suburb for at least the next ten years.

For the past fourteen years the contact system has been in operation at West Bridgford; now, when the necessity has arisen for extending the capacity of the plant, the percolating system has been adopted. The contents of the sewers are pumped into septic tanks and thence passed by travelling sprinklers over clinker beds.

The sprinklers, which are of the rectangular type, and which were supplied by the Ames-Crosta Sanitary Engineering Company, Limited, 12 Victoria-street, Nottingham, are, as is well known, absolutely automatic in their action, working day and night without any attention.

The works are now designed to treat nearly 1,000,000 gallons per day, which is three times the dry-weather flow of the parish, and they occupy only 3 acres of land, though the council possess about 18½ acres, which is used for the disposal of dry refuse, and so forth.

The formality of setting into motion the new plant (which has cost about £4,000) was performed by Mr. G. T. Lovell, the chairman of the Sewage Farm Committee. At a luncheon which followed, the surveyor to the council, Mr. W. Pare, to whom much of the credit for the successful carrying out of the scheme is due, was the subject of complimentary reference.

The "Ex-Pupils' and Assistants' Column." "L. V." writes: I must ask you to withdraw my advertisement from your "Ex-Pupils' and Assistants' Column," as it has been the means of my obtaining a good appointment under the — corporation as assistant surveyor. I had five answers in all—a testimony to the value of the column.

Royal Sanitary Institute.

ANNUAL CONGRESS AND EXHIBITION AT YORK.

In addition to many foreign and colonial Governments and home Government departments, county, town and district councils, universities, and various professional societies, to the number of some 500, are represented at the twenty-seventh annual congress of the Royal Sanitary Institute, which opened on Monday at York. The proceedings commenced at the Mansion House, where a reception, which was largely attended, was held by the Lord Mayor (Alderman Norman Green), the presidential address being delivered in the evening at the Festival Concert Rooms by the Archbishop of York. Among the bodies who sent delegates, or whose officials were present at the congress, were the following: Arbroath (Mr. P. C. Smith, burgh surveyor), Banbury Rural District Council (Mr. H. Gander, surveyor), Barrow-in-Furness (Mr. Alderman John Charles, J.P., chairman, Health Committee), Bath Rural District Council (Mr. F. W. Kelway, surveyor), Battersea (Mr. T. W. A. Hayward, borough engineer), Beeston Urban District Council (Mr. J. Roger Anderson, J.P., chairman), Belfast (Mr. J. Munce, M.INST.C.E.), Berwick-upon-Tweed (Mr. Robert Dickinson, borough surveyor), Bingley Urban District Council (Mr. Hiram Bottomley, surveyor), Birmingham, Tame and Rea District Drainage Board (Mr. John D. Watson, M.INST.C.E., engineer to the board), Carnarvon (Mr. Edward Hall, borough surveyor), Cottingham Urban District Council (Mr. J. H. Hanson, surveyor), Devon County Education Committee (Mr. P. Morris, A.R.I.B.A., architect to the committee), Evesham (Mr. H. S. Harvey, borough surveyor), Exeter (Mr. T. Moulding, M.INST.C.E., city engineer), Farnham Urban District Council (Mr. R. W. Cass, surveyor), Grimsby (Mr. H. Gilbert Whyatt, ASSOC.M.INST.C.E., borough surveyor), Halifax (Mr. J. Lord, M.INST.C.E., borough engineer), Harrogate (Mr. C. E. Rivers, ASSOC.M.INST.C.E., borough engineer), Heckmondwike Urban District Council (Mr. J. Saville, surveyor), Hereford (Mr. J. Parker, ASSOC.M.INST.C.E., city surveyor), Hipperholme Urban District Council (Mr. G. Wharton Thompson, surveyor), Institute of Sanitary Engineers (Mr. A. J. Martin, M.INST.C.E., and Mr. E. R. Palmer), Institution of Civil Engineers of Ireland (Mr. P. C. Cowan, M.INST.C.E., president, and Mr. W. Kaye-Parry, F.R.I.B.A., M.INST.C.E.), Institution of Municipal Engineers (Mr. Henry C. Adams, ASSOC.M.INST.C.E.), Institution of Municipal and County Engineers (Mr. A. D. Greatorex, M.INST.C.E., and Mr. J. Walker Smith, M.INST.C.E.), Institution of Water Engineers (Mr. W. H. Humphreys), Leicester (Mr. E. G. Mawbey, M.INST.C.E., borough engineer), Malton Urban District Council (Mr. W. A. Jackson, surveyor), Meltham Urban District Council (Mr. F. W. Littlewood, surveyor), Middlesbrough (Mr. S. E. Burgess, M.INST.C.E., borough engineer), Mirfield Urban District Council (Mr. Edwin Gill, surveyor), Richmond (Yorks) (Mr. H. W. Marsden, surveyor), Royal Institute of British Architects (Mr. Edwin T. Hall, F.R.I.B.A., and Mr. John Slater, F.R.I.B.A.), Royal Institute of Architects of Ireland (Mr. A. E. Murray, R.H.A., F.R.I.B.A., president), Skipton Rural District Council (Mr. Ascough Rodwell, surveyor), Society of Architects (Mr. W. S. Braithwaite and Mr. F. T. Penty), Society of Engineers (Prof. Henry Adams, M.INST.C.E., Mr. E. J. Silcock, M.INST.C.E., and Mr. C. T. Walrond, ASSOC.M.INST.C.E.), Sunderland (Mr. J. W. Moncur, M.INST.C.E., borough engineer), Surveyors' Institution (Mr. Frank Gott, Mr. E. S. Cox and Mr. F. Massie), Wallsend (Mr. George Hollings, borough surveyor). Mr. F. W. Spurr, the city engineer, who has rendered very considerable assistance in connection with the local arrangements for the congress, was among the many representatives of York present, and among the Colonial delegates was Mr. T. W. Stainthorpe, ASSOC.M.INST.C.E. (South Africa).

Following the reception at the Mansion House, an adjournment was made to the Guildhall, where a public luncheon took place, the Lord Mayor presiding. In the course of the proceedings the toast of "The Royal Sanitary Institute was proposed by the Archbishop of York, who said he regarded it as a privilege to welcome to that illustrious city men and women who represented one of the greatest social movements in the history of the past fifty years. In the absence of the chairman of the council (Mr. H. Percy Boulnois) who it was explained had an important engagement in London, Dr. Louis Parkes (vice-chairman) responded to the toast. Replying subsequently to the toast of "The Lord Mayor and Corporation of the City of York," proposed by Colonel J. Lane Notter, treasurer of the institute, the Lord Mayor said that, personally, he regarded the members of the congress as the harbingers of a brighter existence, as apostles of a policy of brighter things and a better side of living.

PRESIDENTIAL ADDRESS.

In his inaugural address to the congress the Archbishop of York remarked that sanitary progress had halved the death-rate and doubled the average duration of life. He would like some people to remember that when they complained, as they did, that while the death-rate was decreasing every other rate had gone up—(laughter)—they could not save 6,000 lives in twenty years and double the average duration of life without being willing to pay for the benefits. The point to be considered about rates was not how high they were, but what service for the individual and for the community they were procuring. It was well to remember that it was difficult to exaggerate the saving of life and suffering which had been brought about by sanitary progress. It would be idle to deny that there was much still to be done in the way of sanitary reform. Hitherto they had been occupied with the prevention of disease; now they must strive more earnestly towards the goal of the development of life, or, in other words, they were passing from the negative to the positive stage of sanitary progress, in which they must strive not only to eliminate preventable causes of disease from the environment of the people, but to fill that environment with the resources of healthy life. In particular, there was need of advance in regard to the all-important question of the housing of the people. It was not enough to destroy slums; they needed great vigilance to prevent the creation of slums in the future. The centre of the problem now was not so much the old cities and towns as the new industrial areas. There already they had received a sufficient legacy of evils in the last fifty years. They had seen under the pressure of population houses, villages, towns built haphazard; the houses erected, the streets filled up before any adequate provision had been made either for sewage or the supply of water, and in which the streets had been laid out without any plan or purpose. Now they had the advantage of experience; they had the discoveries of sanitary science, and they had the benefits of legislation, and the recent Act of 1909 placed the coping stone upon the long series of Public Health Acts. Therefore they had none of the excuses which their forefathers could plead. They might well say that they acted sometimes in ignorance, sometimes because they had no adequate powers, but in their own present case all these excuses failed. If they sinned they were sinning against the light for the future. Let it be understood that bad housing was not a fault or a misfortune. It was a crime. And when they used the strong term crime they meant that the responsibilities must rest upon those who purported to carry them, and they would rest primarily not upon the builders, who were only asked to do as quickly as possible what had to be done, but upon the local public authorities and the public opinion which stood behind them.

CONFERENCE OF ENGINEERS AND SURVEYORS.

The conference of engineers and surveyors to county and other sanitary authorities which, as usual, was held in connection with the congress, took place on Tuesday morning, the meeting place being the Exhibition Buildings. Mr. A. D. Greatorex, M.INST.C.E., borough engineer and surveyor, West Bromwich, was the president of the conference, and delivered the following

PRESIDENTIAL ADDRESS.

I appreciate very much the honour of being called upon to preside over this meeting; at the same time it

is with some diffidence that I endeavour to address you, knowing as I do well the attainments, both practical and scientific, of the modern municipal engineer and surveyor. I am none the less reluctant to undertake so onerous a duty as to address an audience of engineers, every one of whom is an expert in the science of sanitation and therefore quite conversant with every-day sanitary practice and knowledge. My reluctance is not materially reduced when I contemplate that practically every subject pertaining to the daily routine of municipal engineering has been so thoroughly considered and so ably discussed that I found a difficulty in discovering a subject of novelty and interest sufficient to engage your attention for a brief period this morning. We might, however, with advantage review the position and character of sanitary science and practice in the light of present-day experience, and see if we could extract any useful lesson which would assist us to solve some of the many problems in sanitary knowledge still awaiting solution.

Nearly all great changes are brought about by one of two causes, revolution or evolution, be they physical, political, social, or economical, and the change in sanitary practice is no exception to that well-known law. Improvement in health is a personal matter to each of us, for we have all a keen interest in living as long as we can. But life, unless accompanied by health and vigour, would be a burden rather than a blessing. Moreover, this conservation of health and vigour is now, and will be still more so in the future, in our hands; therefore a responsibility is placed upon us of no mean dimensions, and I think you will agree that it is to our interests to demonstrate our knowledge and skill in the science and practice of our profession, so that the public repose confidence in us and trust us to provide for them immunity from the many dangers and diseases incidental to our social and industrial conditions. To appreciate to some extent the advance in sanitary science and practice we enjoy, beyond that ever dreamed of by our ancestors, it is desirable to compare the past with the present, and to deduce therefrom in what direction we may hope and expect improvements and reform in sanitary science and practice in the near future.

IMPROVEMENTS IN SANITATION.

The process of evolution from the open drain to the socketed, highly-glazed, non-porous, water tested, disconnected, and ventilated drain of the cottage to-day is little short of a revolution. Vast as the improvements have been, we are still far from perfection in this particular branch of our profession. In the matter of sanitary conveniences the evolution from the pail to the fully developed, modern pedestal water-closet in extent and magnitude amounts to a revolution, but the changes have been, if slow, the surer and safer process of evolution. Perfection, however, in this appliance has not yet been attained, and greater changes will be called for in the not far-off future. In the matter of sanitary appliances, the later tendency has been in the direction of simplicity and cleanliness, the florid designs and decorations upon which have given place to the severely plain and simple, they being more easily kept clean, and therefore free from the baneful attacks of malevolent microbes, which, according to our scientific teachers, exist in millions in the very dust resting thereon.

The domestic bath is now considered essential to all self-respecting citizens; even so late as the middle of the nineteenth century, fixed domestic baths were a rarity in the residences of the aristocracy, and in the houses of the peasantry were unknown. That evolution has influenced the character and scope of domestic baths is patent to all of us, and you can readily appreciate the extent to which the use of the bath is now utilised. This, however, has been mainly influenced by the facilities to easily obtain a plentiful supply of hot and cold water, and the introduction of a constant water service has made the bath both popular and beneficial.

POLLUTION OF RIVERS.

It is many hundreds of years since our ancestors began to turn their domestic refuse into the flowing rivers. That the baneful practice is still in operation we have ample evidence in the present filthy condition of the rivers passing through many of the important towns in this country. A generation has gone by since the force of public opinion was directed to the danger of public health by the pollution of rivers and watercourses of this country, and Parliament in its wisdom made it unlawful to so dispose of either animal or vegetable refuse. This law is still most flagrantly evaded. How it is evaded we will not stop to inquire. The Rivers Pollution Prevention Act, 1876, prohibits the passage of sewage into streams, and enacts that it shall be an offence to continue the pollution. The pollution of rivers is now mainly due to manufacturing refuse, which can be, to a very great extent, avoided by previous treatment of the refuse without involving an unreasonable cost to those who cause the pollution. As regards the standard of purity to be attained before discharging a liquid into a river, it is difficult to arrive at an agreement that will apply fairly to all rivers.

A distinct advance was made by the passing of the Local Government Act of 1888, which gives county councils power to enforce the Rivers Pollution Prevention Act, 1876, and which enables the Local Government Board to issue Provisional Orders to form joint committees representing interests affected, and investing them with the powers of the Rivers Pollution Prevention Act, 1876, to deal with any river or part of it. Under the powers conferred by sec. 14 of the Act of 1888, the Mersey and Irwell Joint Committee was constituted in 1891, and a similar board was formed for the whole of the rivers in the West Riding of Yorkshire. In 1893 an important amendment was enacted in explanation of sec. 3 of the Rivers Pollution Prevention Act. The Mersey and Irwell Joint Committee obtained an Act in 1892, which gave them a simpler form of procedure than under the Act of 1876, and conferred on them the power to fix a specific time within which sewage disposal works should be undertaken. In 1894 the Conservancy Board for the West Riding of Yorkshire obtained an almost similar Act.

This legislation indicates the course that can be adopted in other places with a view to speedily cure the long-felt evils of the pollution of streams and rivers, not only by sewage, but by manufacturing refuse, the admission of which in an unpurified state into rivers often greatly increases the difficulty of dealing with sewage at outfall works. Some towns compel manufacturers to treat their waste water before it leaves their works, and this should become more the rule. No efforts should be relaxed to prevent the streams from being employed as vehicles for carrying off sewage or manufacturing refuse, and a high standard of purity should be maintained, both from a sanitary and æsthetic point of view.

SEWAGE DISPOSAL.

The researches of science demonstrate that sewage can be made practically innocuous, and until it fulfils this condition it should be prohibited from being put into any river or public watercourse, and any infringement of the law in this respect should be strongly dealt with. The importance attaching to the efficient disposal of sewage cannot be over-estimated, and its suitable treatment has played for many years an all-important part in public health matters. To trace the history and developments that have taken place in this subject would occupy too much of your time to-day, but I cannot leave the subject without briefly referring to the many important changes that have taken place in the last quarter of a century.

The early attempts of dealing with water-carried sewage were in the direction of sewage farms and land irrigation. Then followed purification by precipitation with the aid of various chemicals and other processes too numerous to mention. The sludge derived from chemical precipitation processes used to be regarded as a source of wealth, and much attention was bestowed on the subject by those who hoped to obtain the theoretical value of the fertilising ingredients contained in it; but these anticipations have not been realised. The practical conclusion is that sludge has no recognised value to justify its being regarded other than as a product to be got rid of in the simplest and cheapest way. No doubt in time science will establish a better and simpler way of dealing with this troublesome question. The biological treatment of sewage in properly constructed bacteria beds has been a triumph of latter-day science; but he would be a bold man who declared we had reached in this respect the pinnacle of perfection.

If a town is situated close to the sea it is sometimes considered to be in a more advantageous position than inland towns respecting the disposal of sewage, as it only has to be discharged into the sea. That is not a safe assumption, as the experience of many watering places proves; and I am of opinion that in time it will be found not only an advantage, but a necessity, for the sewage of many of our seaside towns being dealt with inland, and only the effluent being discharged into the sea.

SANITARY LAWS.

In the early days of our history the sanitary laws were very few, and did not provide for the scattered population of the country. As civilisation advanced and populations increased it became necessary that special legislation should be resorted to for the supply of greater powers for improving the external conditions of towns, and otherwise, for the public good, but no general measure was provided for the public until the year 1845. In 1848 a Public Health Act was passed, the important provision of which was the establishment of the General Board of Health. Experience showed that this Act required amendment, and the Local Government Act was passed in 1858. This Act enlarged the powers conferred by the 1848 Act, but was further amended by the Amendment Act of 1861. In 1866 a sanitary Act was passed to amend and improve the law relating to public health. In 1868, two years later, a further Act was passed, which made further extensions of the powers contained in the earlier Act, and this was followed in 1869 by the Sanitary Loans Act, the Sanitary Act of 1870, and the Amendment Act of 1874. In 1875 the Public Health Act was passed, and this can justly be considered the magna charta of our health, and to those who brought it about our best thanks are due. The main purpose of the Act of 1872 was the reorganisation of the local authorities, and it did not attempt to codify or consolidate the law relating to public health; this was accomplished by the Act of 1875.

The Act of 1875 was a complete code of the existing sanitary law of England, and is so well known to you that it is unnecessary to describe it here in detail. Since its passing, however, the law relating to sanitation has been considerably extended and modified. Has not the time arrived when a new and thoroughly up-to-date public health Act should be placed on the statute book in place of the many and various Acts and amendments?

Much has been done in the past through the agencies of the powers conferred by the various Acts of Parliament referred to, the energy and ability of the *personnel* of the various councils who consider them, and the officials upon whom devolves the duty of administering them. Still much remains to be done if the homes of the people of this country are to be brighter, disease swept away, and prosperity to become the keynote of the nation.

MUNICIPAL ENGINEERS' DUTIES.

At the first conference of engineers and surveyors, held in 1892, Mr. H. Percy Boulnois, who presided, exhibited a diagram of the six principal branches of municipal engineering, divided into the various sub-branches, under which the work of a municipal engineer is carried out. Since then, consider what changes and advances have been made in many of the branches of engineering, and the great and varied duties placed upon that official by Acts and other regulations. Has the same advancement been made as regards his status and official recognition by not only the local authorities, but the public whom he serves? In the majority of cases they have not, nor will they, until the public eliminate party politics from municipal affairs, and pay less attention to the man in the street, who does not and cannot understand the internal working of the many subjects which come before the councils for consideration. So long as party strife continues in our municipal affairs it is hopeless to attempt to get the best results.

Year after year public authorities are called upon to undertake more work, the anxieties of official life, the constant strain, the feeling that a well-earned income is grudged by many, makes the position of all officials more difficult. It is high time that all public officials should bind themselves together to bring about a proper and adequate remuneration for services rendered. At the same time no person should hold an appointment unless he is fully qualified and competent to fulfil the duties, no matter how small or unimportant the district may be, for the village of this decade may be the important town of the next, and a neglected district in these days of intercommunication, without efficient official equipment, may be a source of danger to larger districts, or even to the nation at large.

It is to be hoped that these remarks will not be misunderstood or misjudged by the public; but twenty-five years of public life have taught me many lessons, and I should be wanting in my duty to the rising generation of officials if I did not endeavour to do my little towards making their lot brighter and more prosperous than the lot that has fallen to many in the past. We in this country are responsible for the welfare and prosperity of nearly one-third of the human race. We are also responsible to posterity to improve the physical condition of the people of our country, whereby the race may be enlightened and improved, and thus be fitted to govern this great Empire. Individually we perhaps cannot do much, yet each of us can, in our humble way, contribute our mite to the common stock of human happiness, progress and prosperity, and so leave to our sons, and their sons, examples of sanitary practice which will contribute to the health of this great nation.

The subjoined papers afterwards came before the meeting for discussion:—

SEWAGE DISPOSAL IN RURAL DISTRICTS.

By Ascough Rodwell,
Engineer and Surveyor, Skipton Rural District Council.

This subject covers a wide field, too wide for its thorough investigation in the limited space allotted to this paper; so, to facilitate matters, the author takes the liberty of referring to a rural district (as a typical one) with which he has had some acquaintance.

This district is in some parts very scattered, while in others the contributory places consist of mills and streets, making them really urban in character. In these latter cases proper sewerage schemes are inevitable. The closets are principally on the water-carriage system, and the sewage containing comparatively little trade effluent is easily dealt with by settling tanks, the effluent being treated on land (if suitable land is available) by some type of percolating filter, or by contact beds.

For villages, the disposal works should be as simple as possible, as in very few instances only can a man be fully employed in looking after the works. In every case the sewage should pass through some form of settling tank to intercept the solids; and preferably with the tank in two sections, so that the sewage can be turned into one section while the other is being cleansed. The liquid may then be turned on to the land, or dealt with by percolating filters or contact beds.

For small village installations the author has used the ordinary rectangular trough distributor, having a central self-acting tipper, with double compartments, so that when one becomes full, and the contents are tipped over into the distributing shoots, the other compartment is in proper position for being filled in its turn. This apparatus is very simple, and only needs periodical attention and oiling about once a week. For larger villages the "Ideal" distributor (Tuke & Bell's) has been used. This is an open trough revolving distributor, the rotating motion being given by two pawls, working on a toothed base wheel, and actuated by a central tipper bucket. Each time this tipper becomes full, its consequent tilting action brings one of the pawls into contact with the toothed wheel, causing the distributor to swing round; at the same time the liquid flows into the revolving troughs. One edge of the trough arm being serrated, the liquid is divided and spread in fine streams over the surface of the filter. For beds of over 15 ft. diameter the author has fixed perforated-pipe arm distributors of the following types: Adam's, Candy-Whitaker's, Farrer's, and Ham, Baker's, also Mather & Platt's open trough; all doing good work.

For filtering media, broken bricks, broken stone, river gravel, clinker and honeycombed slag have been principally used, and the depth of the filter varied from 4½ ft. to 6 ft., according to the fall available to the outfall.

For isolated houses, the methods of dealing with the sewage are many. Some of the mansions have up-to-date sedimentation tanks, slate beds with automatic dosing valves, and everything of the latest type, while others (especially farmhouses) simply drain on to the nearest available land and distribute the sewage over the surface by open channels cut in the turf, the course of the channels being diverted on to new ground as circumstances require. Some farmhouses are provided with bath, water-closet, &c., and frequently the sewage is discharged into the ordinary manure tanks, which also takes the drainage from the farm buildings, the contents of the tank being pumped out into barrel carts and distributed over the meadow land in the usual way. The author does not advocate this method, as the tanks are usually not cleaned out often enough, and consequently the odour of the con-

tents becomes very offensive, and is still more pronounced during the emptying of the tank.

A small concrete sedimentation tank having a capacity of about twenty-four hours' flow with submerged inlet and outlet pipes and a filter of sand, fine gravel, or engine ashes will give excellent results, and, if attended to regularly, is a far more preferable method of dealing with the sewage of isolated houses. Also the self-contained tank and filter arrangements now made by two or three firms for the purification of sewage from country houses and isolated buildings are compact and effective; and only in very exceptional circumstances, where the contents can be regularly and frequently taken away, should the old type of cesspool be permitted. Of course, many houses have the ordinary block privy, they have no bath, so the only sewage is from the kitchen slop-stone, and the liquid from here is very frequently discharged into the nearest stone drain or brook. This may be termed the easiest way of disposing of the sewage, and certainly the old saying "out of sight, out of mind" is very applicable. The author has known a village of 90 or 100 houses dealt with in this way, until the river authority came along and insisted upon a proper scheme of sewering; the people were quite content; they enjoyed good health, and, notwithstanding the fact that the stone drains all emptied into the stream which ran through the village, the stream was simply alive with trout, and the fishing of the river just below was regarded as one of the best lengths in Yorkshire; the chances of one's election as a member of the local fishing club being very remote.

At one village of about 200 inhabitants where sewage works have been established, the treatment is by simple tanks, the effluent being turned into open channels on to the land. One day the author received a complaint from the river authority that it appeared from a report by the inspector the effluent from —— works discharged into the river was not satisfactory, and would he be good enough to see the matter was attended to at once, &c. He immediately visited the works, and certainly the effluents where it joined the river was a trifle cloudy, but about a yard away from the effluent pipe was a group of some of the finest trout he has ever seen (most of them, he estimated, would turn the scale approaching 1 lb. each), all their noses were pointing in one direction, waiting for some tasty morsel coming down the pipe.

In another case, where the drainage of a village of about twenty houses simply consisted of stone drains discharging at different points into the river, the council had their attention called to the "serious pollution," &c. It was plain to see where the various drains terminated at the river, but the water in the river was beautifully clear, and, out of mere curiosity, the author had a sample of water taken below the village (this was after the river had received all the so-called pollution) and sent for analysis. The following is the footnote on the report:—

"This is a very soft water of moderate organic purity, suitable for both drinking and domestic purposes."

These two instances are mentioned simply in support of the contention "that there ought not to be the same rigid requirements as to the standard of purity of the effluent from small rural villages (where the quantity of sewage effluent is, comparatively speaking, [illegible] drop in the bucket") as is necessary for towns where the quantity discharged into the stream is, of course, much greater.

When, however, the effluent has to be discharged into a small stream (which in summer time is probably dried up) the standard of purity should, of course, be higher. The author has in his mind an instance of this kind, where the effluent was discharged into a stream below a weir belonging to a corn mill: when the mill was working, all the water flowed along the mill race to the mill. Thus there was no water in the stream itself, except the effluent from the sewage works, and this being the only water supply for the cattle pastured in the land alongside the stream below the works it was absolutely necessary that the effluent should be as pure as possible.

The modern methods of dealing with sewage by tanks, bacteria beds, &c., has enabled disposal works to be placed much nearer the houses than was permissible when the method of treatment was by broad irrigation, or even intermittent filtration over land. Also the area of the land required for the works is much smaller. The council have just recently completed disposal works for two villages, the combined population being over 600. The works consist of sedimentation tanks, percolating filters, storm-water tanks and filter sludge beds, hydrant tank and tool house, and the whole area, including fence walls, measures less than half an acre.

SEWAGE TREATMENT.—ADVANTAGES OF LAND OVER ARTIFICIAL SCHEMES.

By John Manley.

The practical and economical treatment of sewage is an interesting subject, which concerns everybody, is inexhaustible, and, like the poor, always with us.

Many books have been published, many papers read, many lectures given, much discussion taken place, and many opinions formed which have frequently changed, as to whether land treatment, some artificial scheme, or a combination of both is the most economical and effective.

The cry, "Back to the land!" is one which we have all heard, again and again, and is not inapplicable to the subject before us. It is satisfactory to note, and the writer claims this to be one of the advantages of land, it is always ready to receive and able to deal with whatever humanity offers. It is further claimed that land is permanent, and as a medium for the purification of foul matter has held its own through all time. On the other hand, much-advertised artificial schemes of fifteen to twenty years ago have sunk into oblivion. We hear nothing now of the "Ducat" or "Scott-Moncrieff" processes, and very little of the "Cameron" process. Although such schemes, constructed at very great expense to the authorities concerned, may be working with more or less satisfaction to those authorities, yet they have not been generally adopted or copied by engineers acquainted with them.

From the Public Health Act of 1875 passing into law to a very recent date, it was the invariable practice of the Local Government Board to refuse sanction to any loan for sewering or sewage disposal works, where there was no provision of a suitable area of land for sewage outfall works (usually called a sewage farm); a very wise precaution, because such land not only provided a site for whatever works might be adopted, but also for the deposit of house refuse where it could be properly dealt with, and if properly laid out would deal with the sewage in all exigencies, accidents and instances where artificial schemes failed. But recently the Local Government Board, with its present president, has not strictly adhered to this rigid stipulation. The agitation against it was very strong for many years, and led to the appointment of a Royal Commission on May 7, 1898, with Lord Iddesleigh, C.B., as president, to inquire and report:

I. (1) "What method or methods of treating and disposing of sewage," &c., "may properly be adopted," &c. (2) "If more than one method may be so adopted, by what rules, in relation to the nature or volume of sewage, or the population to be served or other varying circumstances or requirements, should the particular method of treatment and disposal to be adopted be determined"; and

II. "To make any recommendations which may be deemed desirable with reference to the treatment and disposal of sewage."

The first result was the issue of a short interim report in 1901, which expressed the opinion that downward filtration and broad irrigation were the best means to adopt; the Local Government Board's rule for insisting on land was a good one; stiff clay land was unsuitable, but no land was useless, much depends on the depth of top soil, but a larger area helps.

The report then dealt with artificial processes then in use—*viz.*, closed and open septic tanks, chemical treatment, subsidence tanks, contact beds and continuous filtration, in various combinations; arriving at the conclusion that it is possible to do with artificial schemes in some cases (Leeds and Manchester), but no general rule was possible for dispensing with land.

At the Health Congress at Exeter, August, 1902, Lord Iddesleigh is reported to have said: "They (the commission) would soon, he hoped, be able to publish the results of a prolonged investigation into the treatment of sewage on land; their experts were now making elaborate parallel examinations of some of the processes of filtration by artificial means. . ." "The subject was inexhaustible." The position seems to be much the same to-day. The commission is still investigating, but has issued seven reports of which, for the purpose of this paper, the fifth is interesting. It refers to 144 meetings and the examination of 204 witnesses.

On page 18, we read: "It is true that at (several towns are named), and elsewhere, crude sewage has been satisfactorily purified in filters with almost complete absence of nuisance, but at most of these places

this plan has been abandoned, because of the rapid choking of the filters." Page 22: "As regards the second claim, we find as a result of a very large number of observations, that the sewage issuing from septic tanks is, bacteriologically, almost as impure as the sewage entering the tanks." Page 44: "In the majority of cases we think it would be better to adopt chemical precipitation, rather than septic tanks, as the preliminary process for very strong water-closet domestic sewages."

Contact beds and percolating filters, with sprinklers or other distributors, are more favourably spoken of, the latter being the more efficient. After very exhaustive detail automatic gear, loss of capacity, construction, dimensions, size and grading of filtering material, cost, &c., and a general summary favourable to percolating filters, except that they are more liable than contact beds to nuisance from smell and flies, we find these general conclusions—*viz.*:—

"We are satisfied that it is practicable to purify the sewage of towns to any degree required, either by land treatment or by artificial filters, and that there is no essential difference between the two processes, for in each case the purification, so far as it is not mechanical, is chiefly effected by means of micro-organisms."

"The selection of a method of sewage disposal should depend primarily on local conditions."

"If a sufficient quantity of good land, to which sewage can gravitate, can be purchased for about £100 an acre, land treatment would usually be the cheapest method to adopt."

"In cases where only clay land is available, it would generally be cheaper and more satisfactory to provide artificial filters."

In comparison of effluents "judged by chemical analysis," the report says: "Both classes of effluent possess similar qualities."

As regards eight farms not eliminating suspended solids, the average purification was about 98 per cent as regards seven contact-bed plants, but eliminating suspended solids 93·4 per cent.; as regards six installations of percolating filters, after eliminating suspended solids, was 99·4 per cent.

There is one other great disadvantage in contact beds and percolating filters, which applies to a great number of cases—*i.e.*, where a low-lying district, or area, gives a low gradient to the stream which has to receive the effluent. Land treatment presents no difficulty. Screening and detritus chambers can be made shallow, and the carriers' follow the contour lines, but the depth of each contact bed or percolating filter must be added where adopted, often necessitating raising the sewage.

Attention is now invited to successful instances of land treatment. First, small towns:—

(1) Redruth (Cornwall). Designed by the late Silvanus W. Jenkin, M.INST.C.E., and carried out in 1889-90. Population about 10,000. Twenty acres of land, let at a small rental to farmers, who took all responsibility. The effluent discharging into a small stream by the side of a main road, the stream finding its way to Portreath, a small harbour 3½ miles distant. The writer inspected and reported on it in 1892 and 1895.

(2) Wokingham (Berks). Three small sewage farms, an aggregate area of 13 acres; population 5,000. The writer took charge of them in 1897 as borough surveyor. The Thames Conservancy take samples of the effluent periodically, and exact a high standard. The soil being stiff clay made it difficult, and chemical precipitation had been introduced; but by cultivation of the land, collecting and burning house refuse, then putting the ashes on the land, its quality was soon improved, and it was found possible to do without precipitation. Contact beds have, however, since been constructed for a portion of the sewage only. Last year the corporation purchased over 20 acres of adjacent land.

As examples of greater magnitude, reference may be made to the Berlin sewage farms (43,009 acres). (Notes prepared by Mr. H. Alfred Roechling, M.INST.C.E., F.G.S.*) Here we are told of the successful disposal of sewage from a population of 2,137 034 by land treatment, with a profit of 11·1s. per 1,000,000 gallons on the working expenses.

A better example, or rather one more likely to be followed, is the Aldershot Camp Farm, with which the writer is better acquainted. This for seventeen years has been managed by Lieut.-Colonel A. S. Jones, V.C., M.INST.C.E., of whom the writer referred to in the last paragraph says in a book published ten years ago: "Colonel Jones has done more than any-one else living to establish correct views on sewage farming." This farm consists of 131 acres, but allowing for roads, buildings, &c., 120 acres are under cultivation. It dates from the return of the troops from the Crimea in 1856. When Colonel Jones took it in hand in May, 1895, the farm was in bad repute and was in a bad condition, having been for fourteen years leased by the War Office to a tenant who paid rent, but failed to satisfy the Thames Conservancy. These conditions were soon altered, and for fifteen years have been ideal. The subsoil is sand and gravel, the surface nearly flat, all under-drained by 3-in. pipes 12 yds. apart, the main drains 6-in., 9-in. and 12-in., the effluent gathered to one point, whence it flows in an open dyke about 250 yds. to the river Blackwater, which also receives the effluent from Aldershot Town, 1 mile or so above. The carriers (nearly all land furrows) follow the contour of the land, having been carefully levelled, are about 20 yds. apart, and are reformed every two years. The population is usually 30,000, the estimated daily flow 1,000,000 gallons. The Connaught Hospital, with medical officers' and nurses' quarters, quite new buildings, are within 200 yds. of the farm boundary, and are supplied with milk from the farm, which also supplies other hospitals.

The sewage is received at four points, known as Wellington lines (15-in.), Stanhope lines (15-in.), Marlborough high-level (12-in.), Marlborough low-level (12-in.), each of which has catchpits (or detritus chambers), screens, and subsidence tanks, from which the sewage passes on to the land; the deposits are mixed with manure from cows and sold or used on War Department land at the Royal Military College and Remount Depot. Rye grass is sold and delivered at 30s. per ton if within 2 miles, beyond two £2 per ton, if fetched at 20s. per ton.

The buildings consist of a good house for farm bailiff, six good cottages, offices for manager and bailiff, a well-designed and appointed dairy, two stables of six stalls in each (one being for large cart-horses, the other for cobs), two houses of superior design, each for twenty-four dairy cows, with 1,000 cub. ft. per cow, a yard and shed for bullocks, and an engine-house, which contains a 4-horse power engine to work chaff-cutter, &c., a vertical boiler, which provides steam for boiling and steaming all dairy utensils. Special precautions are taken by boiling all dairy churns and vessels once a week in summer, and once a fortnight in winter, thereby insuring perfect sterilisation. All produce is weighed, and records elaborately kept, each cow (usually forty are kept) is numbered, and its milk weighed separately, morning and evening, the record for June 26th averaged 17·18 lb. in the morning, 15·36 lb. in the evening, or 3·16 gallons per cow for the day; the cows are usually purchased soon after calving, kept as long as profitable, then sold for feeding. Young bullocks are also bought when a year old, kept a year, then sold at a profit of from £4 to £5. There is also a store sow with its young pigs always kept to consume dairy washings and waste. Rye grass is the principal product, but root crops are also grown. About thirty hands are employed, and the farms of Sandhurst Royal Military College, Pirbright and Ewshot Barracks (at each of which one man is kept), are administered and worked from the camp farm. The writer went over it on a fine day (June 27th) and a wet evening, after a heavy rainfall (July 2nd), and found its appearance excellent and the effluent free from smell, colour or offensive taste.

* See THE SURVEYOR, November 17, 1911.—Ed.

ONE SOLUTION OF THE SLUDGE PROBLEM.

By ARTHUR HINDLE, M.INST.C.E., and P. HOLT WHITAKER, ASSOC.M.INST.C.E.

Of the many difficult problems which the sewerage engineer is called upon to solve none gives him more anxiety than the one connected with the satisfactory disposal of sludge.

The authors (in common with other engineers who are called upon to advise local authorities as to their sanitary arrangements) have been faced with this difficulty, and at some sewage disposal works recently carried out under their guidance have installed a system of treating the sludge, which has proved so efficient as to justify them in giving a brief description thereof, in the hope that it may be of some interest to their professional colleagues. The system referred to was provided at the sewage disposal works, which the authors designed and carried out for the Penrith Urban District Council.

Before explaining the system of sludge treatment it

will probably assist in following the description if a brief explanation of the scheme of sewage treatment adopted is first given.

Penrith is a market town in Cumberland, and has a population, according to the last census, of 8,993. There are no works or manufacturers beyond two small breweries, so that, with this exception, the sewage is purely domestic.

The original sewerage works for Penrith were carried out in the year 1850, and comprised a system of main sewers and sewage disposal works on the broad irrigation system on a large area of land known as Westmorland Holme, situate near Eamont Bridge, about 1 mile from the centre of the town.

The new works, which are now practically completed, comprise an entirely new system of main and subsidiary sewers throughout the town, an outfall sewer about 2¼ miles in length, including crossing of the river Eamont (which was done by means of a gravitating cast-iron pipe carried by a lattice girder bridge of 120-ft. span), and sewage disposal works on lands forming part of Whinfell Holme, which were acquired from Lord Hothfield, the price being fixed by arbitration. An area of 25 acres was acquired, but only about 12 acres have as yet been laid out. The subsoil is eminently suitable for filtration purposes, consisting of a deep bed of gravel, which is overlaid with about 2 ft. of fibrous soil.

The sewage treatment consists of sedimentation in tanks and filtration through land on the intermittent downward principle. There are four circular sedimentation tanks, each 40 ft. in diameter and an average of 7 ft. 6 in. deep, so arranged as to enable them to be worked on the quiescent or continuous-flow principle, either separately or in series, as circumstances dictate. Inlet and outlet channels, junction wells and controlling valves are provided.

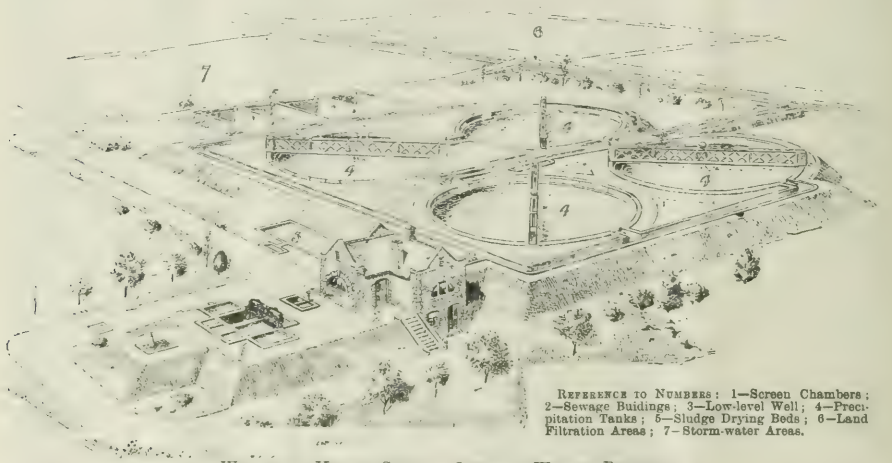
Before entering the tanks, the sewage passes through screening chambers, which are arranged in duplicate and fitted with Stott's revolving screens. Between the screening chamber and the mixing buildings there is a dividing well whence the storm water flows to specially prepared areas. Three times the dry-weather flow passes to the works for full treatment, and three times passes to the storm-water beds. The buildings comprise mixing-house, small engine-house, with oil engine and pump, store-room, and office. Up to the present time it has not been found necessary to use any precipitants, but arrangements are made in the mixing-house therefor should their use ever be required.

After leaving the tanks the effluent passes over aëration weirs, thence into a main carrier, and is subsequently distributed by means of subsidiary carriers over the land filtration areas, which are underdrained with 3-in. agricultural tiles, the number depending upon the nature of the subsoil in each area, and these in turn are connected to a main effluent drain, which discharges the purified effluent into the river Eamont, a well-known fishing river.

The levels of the outfall works were such as did not permit of the sludge being drawn off from the bottom of the tanks so as to gravitate to the sludge drying beds. It was therefore necessary to provide some means of lifting it to the desired level without, if possible, incurring the cost of pumping. This was accomplished by utilising the head of water in the tanks for the purpose of forcing the resultant sludge to the drying beds, and to assist in this object an apparatus known as Fidler's revolving scraper was placed in each sedimentation tank.

The Fidler scraper arrangement is intended to facilitate the removal of sludge without interfering with the continuous working of the sedimentation tanks and to deliver the sludge at a level only a few inches below the top water level of the tank. The scraper, by means of which the sludge is directed to a sump in the bottom of the sedimentation tanks, is helical in form; it is attached to and supported from a lattice girder, and is rotated by gearing fixed at the side of the tank adjacent to a sludge discharge chamber so as to give opportunity for careful regulation of the discharge. When it is desired to remove the sludge the scraper is revolved and the sludge directed into the central sump from the bottom of which it is forced to the sludge drying beds. Valves are provided on the several pipes to regulate and control the flow.

The sludge drying beds are four in number, each 25 ft. long by 10 ft. wide by 6 ft. deep; they are constructed of brickwork, backed on the outer side with concrete: the floors are made of concrete laid with proper falls in the direction of the drains. Each bed is provided with doors, constructed in sections, extending the full width of the bed at the lower end, which can be raised or lowered at will as the material in the beds increases or decreases. Cross walls are formed of perforated boards laid in grooves, so as to be easily adjusted.



Reference to Numbers: 1—Screen Chambers; 2—Sewage Buidings; 3—Low-level Well; 4—Precipitation Tanks; 5—Sludge Drying Beds; 6—Land Filtration Areas; 7—Storm-water Areas.

Whinfell Holme Sewage Outfall Works, Penrith.

When the sludge is about to be emptied from the sedimentation tanks, a layer of straw, litter, dried weeds or the like is first laid in each tank or compartment in such a manner that the whole surface of the bed is covered, the litter is also drawn slightly up the sides of the beds or compartments, as well as round the vertical, perforated pipes or shafts. These perforated, vertical pipes are about 6 in. in diameter, in lengths of about 2 ft., provided with sockets and spigots so that they can be built up in continuous shafts from the floor to the top of the bed as it is being filled. A layer of sludge, to the depth of 4 to 6 in., is then run on to the litter, which acts as a filter, the litter allowing the liquid to filter through and find its way to the perforated pipes, which in turn are connected to drains laid on the floor of the beds. This operation of filling the beds alternately with litter and sludge is repeated until the bed or compartment is filled, when operations are transferred to the next bed. The liquor draining from the sludge beds is conveyed to a well, and is then pumped (by the oil engine and pump previously referred to) into the feed channel of the tanks for retreatment. As the beds are being filled the increasing weight compresses the sludge and litter, thus forming, after proper settlement, a firm bed of manure, which is easily handled and is very portable. A layer of litter is always placed on the top of a layer of sludge to obviate any nuisance from smell

which one usually expects to arise from open sludge beds or lagoons.

The authors were assisted by the surveyor to the Penrith Urban District Council, Mr. J. J. Knewstubb (member), who acted as resident engineer throughout the construction of the sewerage works, and who has supplied, for the purpose of this paper, the following information:—

Population dealt with in the scheme, 8000.

Daily dry-weather flow per twenty-four hours, 290,000 gallons.

Quantity of wet sludge passed on to the beds per day, 2½ tons average.

Quantity of dried sludge taken out of the beds per day, 16 cwt. average.

Quantity of dried sludge removed from the beds and sold per annum, about 300 tons average.

Quantity of litter used in the beds per year, 70 tons.

Length of time occupied in drying the wet sludge. This varies according to the season but averages about six weeks.

Length of time occupied in filling one bed, about four weeks. This again varies according to the time of the year, and atmospheric conditions.

Rate of consolidation, varies according to depth of bed.

Length of time required for the dried sludge to attain its most beneficial condition as manure after removal from the beds, twelve months.

The sludge is sold by open tender every year, and the average price per cartload realised has been 1s. 9d. per load.

The authors are informed that the manure removed from the sludge beds after treatment under this system is most beneficial for use on land growing turnips and mangolds, and also gives good results for clover and seed grass at any time and almost under any condition. It has also been found to be an excellent material for ploughing into land of a light character.

No additional expense is placed upon the council in dealing with the sludge, as the operation of filling the beds is performed by one of the regular men employed on the farm, and occupies but an infinitesimal portion of his time. The emptying of the beds is undertaken by, and at the expense of, the purchaser of the dried sludge, who also provides and brings to the beds part of the litter required; this, of course, being a consideration of the purchase price.

So far as Penrith is concerned the sludge problem has been solved; the authors have, however, up to now hesitated to supply any description of the system as they were desirous it should have a fair and ample trial before doing so.

This description is given purely from an engineer's point of view, apart from that of the chemist. There is, however, the practical side of the question in that the farmers of the district are competitors for the dried material.

The works were completed in the latter part of 1907, were formally opened on, and have been in continuous operation since, March 19, 1908.

(To be continued.)

"A Note on the Extension Seawards of the Gynn Outfall Sewer at Blackpool," by Mr. John S. Brodie, M.INST.C.E., which was also presented to the meeting, will be found on a later page of this issue.

THE HEALTH EXHIBITION.

About one hundred firms are represented at the Health Exhibition which is being held in connection with the congress. Although perhaps not as large as some of those of former years, the display is one which is likely to prove of the highest interest to the small army of sanitarians who are making their home in York this week, for the exhibits illustrate all sides of public health work, from large appliances for town water supply and drainage, measures for the prevention of disease, down to the various sanitary fittings of the house and home, and even smaller matters relating to personal health and comfort. On Saturday afternoon—two days before the commencement of the congress itself—the exhibition was opened by Prince Arthur of Connaught. His Royal Highness was received by the Lord Mayor of York (Alderman Norman Green), the chairman of the Local Committee of the congress, the chairman of the council of the Royal Sanitary Institute (Mr. H. Percy Boulnois, M.INST.C.E.), the chairman of the judges (Mr. W. C. Tyndale), the town clerk of York (Mr. Henry Craven), the director and secretary of the institute (Mr. E. White-Wallis), the local secretaries of the congress, among whom are Mr. F. W. Spurr, the city engineer and surveyor, and the chairman of the Congress Committee (Mr. H. D. Searles-Wood). In an address to Prince Arthur, which was read by Mr. Percy Boulnois, appreciation was expressed of the honour conferred upon the institute by the presence of his Royal Highness. It was pointed out that the institute, founded nearly forty years ago, had now a membership exceeding 4,000, and had since its formation carried on a large work in promoting a knowledge of sanitation and health, not only in Great Britain and Ireland, but also in the Empire of India, the Dominion of Canada, the Commonwealth of Australia, the Union of South Africa, in New Zealand, and other parts of the British Empire. In declaring the exhibition open, Prince Arthur quoted Lord Rosebery's recent observation that this was "an age of congresses—some eminently useful and others superlatively superfluous." He felt sure all would agree with him that the present one came into the category of the eminently useful ones. They owed a great debt of gratitude to the Royal Sanitary Institute for having awakened public opinion to an appreciation of the vital necessities of good sanitation, and he hoped that the exhibition he now had the pleasure of declaring open would serve as an additional means of education.

His Royal Highness afterwards made a tour of the exhibition.

SOME OF THE EXHIBITS.

ADAMS-HYDRAULICS, LIMITED.

This well-known York firm are "showing" on a somewhat modest scale at Stand 47. Their exhibits consist wholly of photographs and prints; none the less, these quite effectively indicate the nature of the company's works and are deserving of examination by visitors.

WILLIAM BOBY.

At Stand 41 Mr. Wm. Boby, of Salisbury House, London, E.C., exhibits his automatic continuous water softener and purifier. The type "K" water softener, which is exhibited at work, is especially adapted for domestic supplies in households, being made in capacities from 200 gallons per day upwards. The machine is designed so that it requires attention at infrequent intervals. The Boby type "K" softener is substantially constructed of steel, bronze and other materials suitable for the purpose, enabling it to supply softened water for all household purposes, including potable water, and water in such a condition as to reduce household labour and use the minimum of soap. The type "K" softener is also constructed of proportions suitable for dealing with the supplies of public institutions, and of such bulk as to treat the entire water supplies of towns. A distinctive feature of the machine is that no reagent solution is employed, the attention required taking the form of simply placing some powder in a circular box.

CHADDOCK VENTILATION COMPANY, LIMITED.

The above-named firm, whose business address is 22-25 Cornhill, Wapping, Liverpool, are the inventors and manufacturers of automatic window ventilators, which, as is practically illustrated at Stand 71, are mechanically adjusted on a plenum basis in such manner as to enable the operator to regulate the direction of air movements and avoid discomfort to inmates of a room. A free-running, sliding sash provides a good weather joint, at the same time affording facilities for cleaning both sides of the glass from inside the building.

CLAUGHTON BROTHERS, LIMITED.

Sanitary fittings in considerable variety are on view at Stand 61, which is in the occupation of Messrs. Claughton Brothers, Limited, Sanitary Lead Works, Bramley, Leeds. The exhibits here include the "Niagara" patent lead-lined syphon cistern or water waste preventer (horizontal type), the "Japkap" patent syphon water waste-preventing flushing cistern (vertical type), the "Adaptable suspension" washdown closet, with slop top and lead trap, a silent-filling ball valve for flushing cisterns, and so forth. Improved lead foot traps for a large variety of closets, and "Enterprise" cast-lead junctions, with several kinds of sockets and connections to closet soil pipe. Cast-lead soil pipe terminals, sockets, and cast and

wrought lead rain-water heads, gutter and ornamental work, are other features of the stall.

COBRA DRAIN AND PIPE CLEANSER, LIMITED.

This firm, whose offices are at 21 Lepper-street, Belfast, are represented at Stand 69, their exhibit being the "Cobra" drain cleaner. The apparatus in question is intended for overcoming stoppages in sanitary and other pipes without opening up or otherwise disturbing the latter. The obstruction can be caught and withdrawn by means of the toothed jaws or head attached to a flexible-steel tube or spring,

Boiler with cylinder detached.

Boiler and cylinder with casing.

which is specially constructed to pass any bends met with. Through the tube passes a flexible pull with handle, which, upon being pulled, causes the toothed jaws to open and grip, fastening firmly upon any obstruction met with, and holding it until withdrawn.

DARLINGTON CONSTRUCTION COMPANY, LIMITED.

The Darlington Construction Company, Limited, of Bank Top, Darlington, are exhibiting a small building illustrating the various methods in which they construct their composite hospital, sanatoria and school buildings. The outer wall is divided into three sections, one panel having roughcast cement work, another panel "Eternit" sheeting on the outside, and a third panel weather boarding. The inside of the building is lined with "Eternit" fireproof sheeting, and the roof of the building is also covered with "Eternit" tiles (terra-cotta colour). The firm are also exhibiting various models showing packings used between the outer and inner covering of the walling, and a small model of a bungalow, with "Eternit" tiles on the roof. This stall (No. 39) is a joint exhibit of the above company and Messrs. G. R. Speaker & Co., of 29 Mincing-lane, London, E.C., British agents for "Eternit" tiles and sheets.

WM. DOVE & SONS.

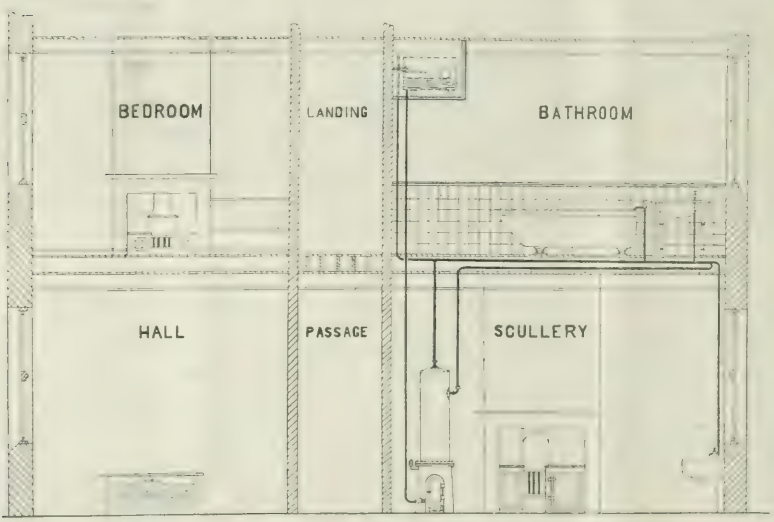
One of the most effective exhibits is that arranged at Stands 59 and 60 by Messrs. Wm. Dove & Sons, ironmongers and hot-water engineers, of Parliament-street, York. The complete fireplaces which have been fitted up make a particularly fine show, while various types of stoves, baths, hot-water boilers and radiators are other items of interest.

WILLIAM HARRIMAN & CO., LIMITED.

A large space has been taken by Messrs. Wm. Harriman & Co., Limited, Newcastle-on-Tyne, the sole manufacturers of Barron's patent sanitary specialities, the firm's exhibits—which are to be found at Stand 29—including closets, stoneware traps, sewer interceptors, channel bends and benchings, stable gullies, rain-water receivers, waste-water preventers, and "Newham" false floor tiles for ventilating and draining bacterial filters and contact beds.

HYGIENIC CONSTRUCTIONS AND PORTABLE BUILDINGS, LIMITED.

The above-mentioned firm, whose offices, works and showrooms are at Stockholm-road, South Bermondsey, London S.E., are the manufacturers of the well-known portable "Doecker" buildings for hospitals, schools, sanatoria, bungalows, offices and portable buildings. A number of models illustrative of the system are to be seen at Stands 3 and 5. As was recently explained in these columns, the buildings are constructed in two types—strong construction and light construction. They consist of sections fastened together with patent hooks and clips, are thoroughly portable, notwithstanding their great durability, and, with reasonable care, are claimed to last as long as fifty years. They are well lighted and splendidly ventilated and embody the maximum of comfort and the requirements of modern hygiene.



Jones & Attwood's "Batheater" System of Hot-water Supply

IMPROVED SANITARY APPLIANCES COMPANY.

At Stand 46 the attention of visitors to the exhibition is directed to this company's latest sanitary improvements in the form of cantilever sink traps and adjustable cantilever water-closets. The first-mentioned apparatus is a combination of a cantilever to carry the sink, a trapped waste pipe, inspection and cleaning arm, and head on back of wall to receive other waste pipes, glass lined inside, galvanised or enamelled outside. The adjustable cantilever water-closet comprises

the soil-pipe junction, branch piece and trap, all in one casting, and is so arranged that only one joint requires to be made, instead of four as at present. This branch piece tapers 3 in. at the trap to 4 in. at the soil pipe, so that it will not stop up. The inside is glass lined. Both the cantilever and earthenware basin can be set to any angle or plan to suit various required positions the soil being thus conveyed in a straight line direct to the perpendicular soil pipe. The firm's address is Queen's College, Paradise-street, Birmingham.

JONES & ATTWOOD, LIMITED.

One of the most striking and, apparently, the largest exhibit is that of this well-known Stourbridge firm of hydraulic engineers (Stand 52). Two large working models are shown illustrating the application of the "Sewage Wheel" to circular and rectangular beds suitable for the sewage disposal for a country house, or for the largest schemes covering many acres, with efficiency and economy. Fixed sprinklers of various types are other products of the firm, in addition to sluice valves, adjustable discs and ratchet penstocks, screw-down penstocks, disc valves, floating-arm outlets, and screens. Heating apparatus for domestic hot-water supply and for the warming of buildings forms another important branch of the company's work. The "Bath-ater" boiler and circulating

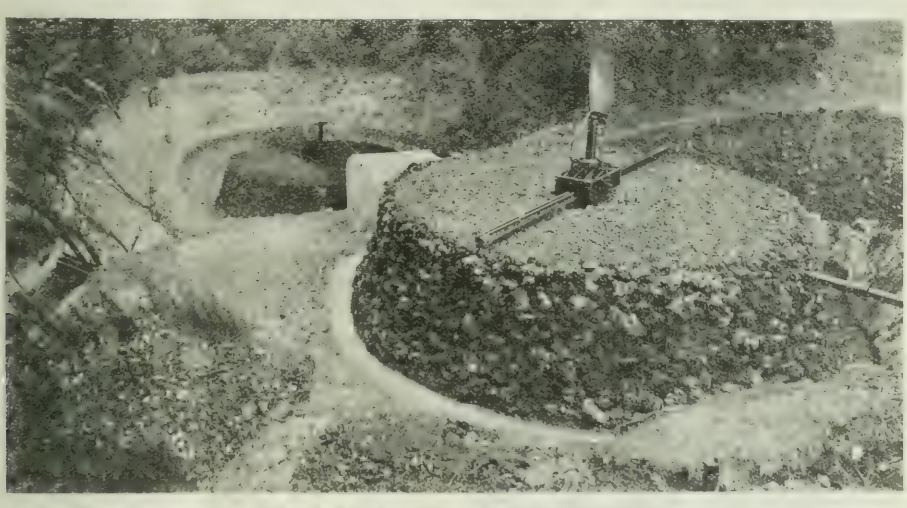
damp courses, and so forth, and specimens of "Lithofalt" asphalt paving blocks, 9 in. by 4½ in., of different thicknesses, and with plain or grooved surface, for carriageways, form an interesting display at Stand 72. The firm have recently supplied to the Hampstead, Poplar, Folkestone, and other borough councils about 125,000 super. ft. of their blocks for carriageways in these boroughs. Under their method of laying these blocks direct on to the concrete, the borough engineers have found it possible, under their own supervision, and by the direct employment of their council's workmen, to lay an average of about 75 super yds. per man per day. By obviating the necessity for putting in a special bedding material, and on account of the facility with which these blocks can be handled, the cost of laying is, under this method, stated to be reduced to about 3d. per super yd., all labours included.

McDOUGALL BROTHERS.

Disinfecting fluids and powders are among the exhibits of Messrs. McDougall Brothers, Port-street, Manchester, at Stand 53.

MOULE'S PATENT EARTH-CLOSET COMPANY, LIMITED.

Sundry models and articles at Stand 70 illustrate Moule's patent earth-closet system for domestic and municipal sanitation. The business address of the



Tuke & Bell's "Ideal" Sewage Distributor.

cylinder combined may be specially referred to. This is intended for fixing in kitchen or scullery, and designed particularly for use with hard waters containing much sediment. The cylinder can be easily removed, exposing the whole interior of the boiler and cylinder, so that every portion can be thoroughly cleaned, thus prolonging the life of the boiler.

KIRTLEY & SON, LIMITED.

At Stand 62, Messrs. Kirtley & Son, Limited, Mowbray Buildings, Sunderland, are showing the "Mowbray" patent earth-closet hatch. This has a metal frame and a steel door. The frame is built in the wall, flush with the face of it. The door closes tightly on the sole plate, and this largely prevents liquid matter oozing out, defacing the brickwork. The doors slide in a groove, and do not project into the street. They open to the full size, and cannot be lifted out and taken away. The "Mowbray" tipping ashbin is opened by the scavengers from outside with a key, and tipped right over so as to allow the contents to fall into a receptacle beneath, which is then simply lifted up and emptied into a cart standing alongside.

LIMMER ASPHALTE PAVING COMPANY, LIMITED.

Specimens of the Limmer Asphalte Paving Company's raw mineral rock asphalt, with photographs of the processes of mining and manufacture, samples of the rock as reduced to powder, and also in mastic form, models showing the application of the company's products as roofing, flooring, horizontal and vertical

firm is 2 Guildford-street, Russell-square, London, W.C.

ROBESON PROCESS COMPANY.

The exhibit of the Robeson Process Company, patentees and sole manufacturers of glutrin road binder, 17 Fenchurch-street, E.C., includes specimen footways, which have been treated with the company's glutrin road binder, adjoining the bowling green in the exhibition grounds. Photos are shown of various road and footway works where glutrin has been employed as a binder in England, France, Egypt, and other countries, also samples cut from actual roads treated by this process. Glutrin is a liquid binder, which is applied by means of water vans or hand sprinklers, water being added. Its use avoids any discoloration or smell, while firmly binding the constituent parts of the road or path, and rendering it proof against the action of heat, frost and moisture. It is harmless to animal and vegetable life, and to fish, and does not make a slippery surface. For use on private estates glutrin will, it is claimed, be found an ideal binding medium.

"RONUK," LIMITED.

One of the first stalls to claim the attention of visitors to the exhibition is that of "Ronuk," Limited, sanitary polish manufacturers, of Portslade, Sussex. The stand (No. 2) is to be found on the right-hand side immediately after entering the building, and the exhibits include specimens of flooring prepared and polished by "Ronuk" improved sanitary methods; hospital "Ronuk" concentrated, and hospital "Ronuk"

liquids and "Ronuk" special staining, for colouring and hardening the surface of ordinary deal flooring previous to polishing.

"SANITAS" COMPANY, LIMITED.

The whole of the preparations of this firm are on view at Stand No. 1, including "Sanitas," "Creocide," "Okol," "Soldis," and carbolic disinfectants, Sanitas air purifier and sawdust, disinfecting inhalers and fumigating appliances, "Sanitas-Formigators," formic sulphugators, Kingzett's patent sulphur candles and sulphugators, Kingzett's patent preserved peroxide of hydrogen, Sanitas, carbolic, creocide, and pine soluble water-cart blocks, sanitary wax polishes, and soaps and [illegible]. The company's address is Lockley-street, Limehouse, London, E.

TUKE & BELL, LIMITED.

Sewage disposal and other apparatus form an interesting display at the stand of Messrs. Tuke & Bell, 69 Leadenhall-street, London, E.C. The firm's exhibits include the centre column and annular tank of a Carlton revolving distributor for a filter-bed 80ft. in diameter, the "Ideal" patent distributor for a filter-bed 9ft. in diameter, their semi-septic patent [illegible] tank and filter for small isolated dwelling-houses, and the "Grip" manhole cover and frame, with a 20-ft. clear opening. The first-mentioned machine is guaranteed to revolve with a 3-in. head of liquid above the holes in the distributing arms. The crown piece revolves on ball bearings, and roller bearings are provided at the base, so that friction is reduced to a minimum. The "Ideal" distributor has been proved to be exactly what is wanted for schemes in the country, as there are no holes to clog up, and it will go on working for weeks at a time with practically no attention. It is made up to 50ft. in length. Installations of the septic-tank and filter are now in use all over the country, and are stated to be giving the most satisfactory results, both as regards the effluent obtained, and with regard to the disposal of the solid matter, which forms a scum on the top of the tank, and has only to be removed three or four times in the course of a year. The "Grip" manhole cover, by means of concentric rings round the frame, is claimed to preserve the surrounding road material. When, however, the latter does eventually wear away, an inclined plane of road metal is formed to the edge of the cover, thus preventing any shock.

WEBB LAMP COMPANY, LIMITED.

At Stand 42 the Webb Lamp Company, Limited, 11 Poultry, London, E.C., show in operation their widely used sewer ventilating lamp, fitted with air meter indicating the amount of work done. Webb's patent non-return inlet ventilators for sewers, sewage tanks, and so forth, and silt dredgers, cleaning tools, are other exhibits of interest. In addition, the firm have placed on view an excellent selection of their gun-metal fittings for public buildings, these including hydrants, branch pipes and standpipes, the "Galvo" chemical fire extincteurs, and the "U.B.E.L." sprayer for disinfecting, whitewashing and other purposes.

LIST OF AWARDS.

SILVER MEDALS.

Wm. Boby, Salisbury House, London, E.C.—Type "K" water softener.

British Sanitary Company, 341 Bath-lane, Glasgow.—Earth-closets.

Chaddock Ventilation Company, Limited, 22-25 Cornhill, Wapping, Liverpool.—Reversible locking windows.

City of York Electric Lighting Department, 8 Clifford-street, York.—Hygienic value of exhibit of electrical appliances.

City of York Electric Lighting Department, 8 Clifford-street, York.—"Tricity" electric cooker.

Jones & Attwood, Limited Stourbridge.—Mono rail sewage distributors.

Model Abattoir Society, 25 Craven-street, W.C.—Model abattoir.

Beacon Light (Valveless) Gas Generator, Limited.—The "Beacon Light" [illegible] gas generator.

[illegible]

[illegible]

Y.E. Dutton Gas Lighting Company, Dewsbury.—Y.E. "Dutton" gas lighting apparatus.

BRONZE MEDALS.

Claughton Brothers, Limited, Sanitary Lead Works, Leeds.—Sanitary lead work.

Wm. Dove & Sons, Parliament-street, York.—"Ideal" domestic hot water boiler.

Wm. Harriman & Co., Newcastle-on-Tyne.—Stonework trap for chemical laboratory sink.

Wm. Harriman & Co., Newcastle-on-Tyne.—Access bend to foot of soil pipe.

Improved Sanitary Appliances Company, Queen's College, Paradise-street, Birmingham.—Adjustable cantilever soil-pipe arm.

Jones & Attwood, Limited, Stourbridge.—Bath heater boiler and circulating cylinder.

Kirtley & Son, Limited, Mowbray Buildings, Sunderland.—Mowbray earth closet hatch.

Kirtley & Son, Limited, Mowbray Buildings, Sunderland.—Mowbray tipping ashbin.

Limmer Asphalte Paving Company, Limited, Caxton House, Westminster.—Mastic asphalt for roofs.

Moule's Patent Earth-closet Company, Limited, 2 Guildford-street, Russell-square, London, W.C.—Earth-closets with "Chucker" action.

McDougall Brothers, Port-street, Manchester.—Disinfecting liquids.

Parsons & Sons, 8 Endell-street, Long Acre, London, W.C.—Sanitary enamels.

Ronuk, Limited, Portslade, Brighton (Sussex).—"Ronuk."

"Sanitas" Company, Limited, Lockley-street, Limehouse, E.—Sanitas bactox.

Sanitaries, Limited, Statham-street, Pendleton, Manchester.—The bath basin.

Slack & Brownlow, Abbey Hey, Gorton, near Manchester.—"Brownlow" spanner.

J. H. Shouksmith, 132 Micklegate, York.—"Health water" pipes.

John Walker Steel, 31 Northgate, Hartlepool.—Wind adjusted shelter.

Austral Window Balance Company, 3 Macdonald-lane, Corporation-street, Manchester.—The "Austral" window.

"Don" Fanlight Opener Company, 101 Leadenhall-street, London, E.C.—The "Don" fanlight opener.

"England" Works, 120A North-street, Leeds.—All steel cloak-room fittings.

Cobra Drain and Pipe Cleanser, Limited, 21 Lepper-street, Belfast.—The Cobra drain cleanser.

J. H. Walker & Co., Layerthorpe Bridge, York.—Terra-cotta goods, paving bricks and stonework.

Webb Lamp Company, Limited, 11 Poultry, London, E.C.—"Galvo" chemical fire extincteurs.

Webb Lamp Company, Limited, 11 Poultry, London, E.C.—Webb's sewer ventilating lamp.

DEFERRED FOR FURTHER CONSIDERATION.

Thomas Howse, Limited.—Paints.

Slack & Brownlow.—Brownlow germ filters.

Tuke & Bell.—Sewage distributors, &c.

A discussion on the new sewerage scheme for Lewes, with special reference to the discharge of effluent into tidal streams, will be opened by Mr. D. Roberts, the borough surveyor, at a meeting of the Royal Sanitary Institute to be held at Lewes on October 4th next.

Business Announcement.—Messrs. W. F. Stanley & Co. Limited, the well-known surveying, [illegible] drawing, optical, meteorological, and scientific instruments, and wholesale drawing office stationers, have opened a branch at 68 Queen-street, Glasgow.

Building By-Laws.—"Borough Engineer" is considering the revision of the building by-laws in force in his district, and would be glad to know of other towns which have recently revised their by-laws, and now have an up-to-date set. "Borough Engineer" says it is desired to go a good deal further than the Local Government Board Model Building By-laws, especially with regard to construction of roofs, floors, and so forth.

The Road Board and Road Improvements.—Mr. Masterman (Financial Secretary to the Treasury), replying to Mr. C. Bathurst in the House of Commons, said the grants made by the Road Board for works classified as road widenings and improvement of carriageways amounted to £73,180, but a considerable expenditure on the widening of metalled portions of carriageways was included in miscellaneous works of road crust improvement. The board proposed to apply [illegible] funds to such purposes in those cases which they might think should take precedence of other applications.

Institution of Municipal Engineers.

ANNUAL NORTH-WESTERN DISTRICT MEETING.

The annual meeting of the North-Western District of the Institution of Municipal Engineers was held at Clitheroe on Saturday last, when an attendance of over forty members and friends was recorded. Among the members present were Messrs. A. R. Bleazard (Clitheroe), F. W. Platt (Salford), J. W. Sunderland (Norden), J. H. Hopkinson (Chorley), A. Darlington (Billinge), A. Dempsey (Eccles), F. M. Hindle (Chadderton), C. H. Blakeway (Heaton Norris), T. S. Snorma (Liverpool), J. Whitaker (Burnley), G. Hayes (Westhoughton, honorary district secretary), and B. Wyand (secretary of the institution). Among the visitors were J. Wallman (Salford), V. W. Laithwaite (Turton), B. Boothman (Clitheroe), E. Arnold (Clitheroe), J. Helliwell (Clitheroe), H. W. Asman (Clitheroe), R. Barrett (Clitheroe), R. Hartley (Clitheroe), C. T. Welch (Clitheroe), J. Bolton (Clitheroe), C. Spackman and C. Spackman, junr. (of the Isis Portland Cement Company). The town council was represented by Alderman C. T. Mitchell (mayor), Councillors J. Cowman, W. W. Whiteside, J. Thornber, A. W. Musson and Greenwood, W. S. Weeks (town clerk), and J. H. Taylor (borough treasurer).

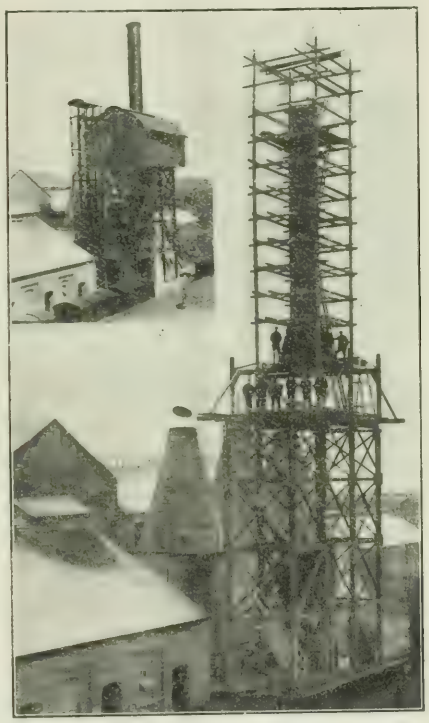
The party assembled at Clitheroe Station, and proceeded on a round of visits to the works of the Isis Portland Cement Company, the Horrocksford Lime Company's tar-macadam works, and Messrs. J. Carter & Co.'s stone quarries and tar-macadam works. The visit to the first-named works was particularly interesting, and the following notes are based upon the remarks made by the managing director of the works in receiving the visitors and upon notes taken during the round of the works.

SOME NOTES ON THE ISIS PORTLAND CEMENT WORKS.

These works are situated on a branch line from the Blackburn and Hellifield section of the Lancashire and Yorkshire Railway, and have exceptionally good transit facilities. The raw materials, limestone and clay, are obtained from land adjoining the plant. The limestone is quarried from the beds of the lower carboniferous formation, and varies considerably in its physical properties, some of the beds being extremely hard and crystalline, others amorphous and softer. The percentage of carbonate of lime varies from about 92 to 96 per cent. The clay is an alluvial deposit resting on the lower slopes of the limestone.

The clay as brought in is slightly roasted in heaps under large sheds, each heap when finished representing a month's requirements. The stone is delivered into works in wagons containing about 10 tons, the contents of each are sampled, and the carbonate of lime determined before unloading. The clay is free from lime, consequently the composition of the stone being known a simple calculation gives the correct proportion of each material. The mixture is by weight, is finely crushed in a swing jaw-crusher, and elevated to hoppers above the grinding mills. The grinding is in two stages. In the first, a somewhat coarse, gritty powder is obtained by grinding between burr stones. This is finished by tube mill to such a fineness that less than 5 per cent of residue is left upon a sieve having 40,000 meshes to the square inch. At this stage the composition of the mixture is checked, the percentage of carbonate of lime being determined in samples taken at intervals. By the method employed a determination accurate to within quarter of 1 per cent can be made in seven minutes. The raw meal or flour, as it is technically called, is received into a series of tall receptacles or silos, which not only serve for storage, but also as mixers. By means of extracting-worms a constant stream of previously ground material is drawn out, and is returned with the stream coming from the mills, while other worms are employed to extract that required for the next step of process. The material extracted is collected into one conveyer, at the delivery end of which it is mixed with about 10 per cent of water. The damp mixture is elevated to a floor above the presses, and by these it is formed into bricks which are passed directly to the kilns, of which two types are at present in use. An older one which works intermittently,* and for which a portion of the succeeding charge is dried in chambers by heated air obtained during the burning of the preceding one, and one shaft kiln just set to work. This works continuously, bricks as taken from the presses and coke being continually charged at top, while clinker is drawn below.

The kiln itself is constructed of steel plates lined with fire bricks, and it works with natural draught, special arrangements having been made to ensure a sufficient air supply, and consequently rapid burning and cooling of the charge. The charging floor is carried on an enclosing structure built up of broad flange beams, which also supports the chimney quite independently of the kiln. This is lined with specially made thin fire-bricks built in cement. The plates are bolted together, and the accompanying view shows the method employed for erection. A bolted scaffold formed of light quartering was carried up with each belt of plates, and firmly clasped to them. This at once served for lifting and bolting the plates and for putting in the lining. This type of kiln is being



Shaft Kiln in course of Construction at Isis Portland Cement Works.

(Inset shows completed kiln.)

repeated with some slight modifications. Our illustration shows the completed kiln. The older ones are in course of alteration to work continuously. The grinding of the clinker is in two stages, as in the case of the raw material. The whole plant is driven by a Pollit & Wigzell compound condensing engine of 450 i.h.p. The lighting is by arc lamps, power for these being obtained from a separate engine.

Leaving the Isis, the party proceeded to inspect the tar-macadam manufacturing plant of the Horrocksford Lime Company, Limited. In the absence of the manager, the members were shown round by the engineer (Mr. R. Parkinson) and the secretary (Mr. H. Parkinson). The process of manufacture was demonstrated and lucidly explained. The crude coal tar is stored in tanks having a capacity of 250 tons, and is mechanically pumped to three large distilling pans

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* Described in Redgrave & Spackman's "Calcareous Cements," 2nd edition, p. 152.

(capacity 1,500 gallons), which are heated by steam coils to a temperature of from 220 to 250 deg. Fahr. Thence it is transferred to the mixer and comes in contact with stone which has previously been screened and passed through a continuous revolving dryer measuring 42 ft. by 3 ft. diameter, the drying being effected by means of warmed plates and hot air. The mixer has a capacity of from 10 to 15 tons per hour, according to the gauge of material, or from 100 to 150 tons per day. Messrs. Parkinson were cordially thanked for their kindness, the party expressing themselves as delighted with the excellence of the plant.

At the conclusion of the visits of inspection the delegates repaired to the "Swan and Royal" Hotel, where they were entertained to lunch, at which the mayor (Alderman C. T. Mitchell) presided.

The Mayor said he esteemed it a great privilege to have the honour, during his mayoralty, of welcoming to the ancient borough of Clitheroe so important a body of men as the Institution of Municipal Engineers. It was sometimes said of Clitheroe people, and it was pretty generally thought among more modern and go-ahead communities, that they were a backward and antiquated lot. He was afraid that, to some extent, they must plead guilty, whether it was creditable to them or not. They seemed content to jog along in a moderate sort of way—to "hasten slowly"—and he was afraid they had no desire to rival the feverish activities of some of the more modern towns. That did not mean, and he did not wish it to be inferred, that they were indifferent to progress. Clitheroe was a very old town, and the atmosphere of an old town conduced, perhaps, a little bit to sleepiness and sluggishness, and a desire for repose rather than activity. He pointed out that a 1d. rate in Clitheroe only produced about £180, and it was impossible to do a great deal on that. Unlike many towns, they were confronted with the "higgledy-piggledy" arrangements of their ancestors. They had to contend with narrow roads and corners that needed to be cut off, but he thought they were progressing and doing something to make the crooked straight and the rough places smooth. He trusted that as time went on they would have more of the comforts and conveniences of modern towns. At all events, they had always the satisfaction and pleasure of beautiful scenic surroundings, of which he trusted the party would see something during the afternoon. There was an old saying that Clitheroe was noted for its "Lime, Law and Latin." With regard to lime, they had seen something of it that morning, and in regard to law, they had had one or two lawyers who had left behind them an amount of something like six figures. As to Latin, they were in a short time going to lay the foundation-stone of a new grammar school, which had long been badly wanted. The school was for both boys and girls, and he trusted the secondary education of the town would receive an impetus through the new building, and that the children would thus have the same advantages as those possessed by children in other places. Alderman Mitchell went on to say he did not think they realised how much the country was indebted in its daily life to men like those who were present that day. The question of good roads, an adequate water supply, and the best sanitation touched them at every point, and he did not think that real and sufficient gratitude was given to the gentlemen of their profession who did so much for the community in that respect. He did not desire to encroach upon their time that afternoon, but he could not sit down without expressing acknowledgment on behalf of himself and the members of the corporation to Mr. Spackman for his hospitality. Their thanks were also due to Mr. Spackman for opening his works for inspection, and he was sure they had all been much interested in the visit to the Isis and the other works.

Mr. E. W. Platt (Salford) proposed that a hearty vote of thanks be accorded Mr. Spackman for the very kind manner in which he had received them, first at his works, and secondly at the luncheon. He did not think there was one subject or one material with which they, in their profession, had to deal more important than Portland cement. Therefore it was absolutely essential that every one of them should know definitely and thoroughly what was the best process of its manufacture. They all, in their student days, became familiar with the text-books on the methods of manufacture, and they owed great debts of gratitude to Grant and those men who had written so eloquently and thoroughly upon the material. Then, in their later days, they were thankful to the Associated Manufacturers of Portland Cement, and also to the Engineering Standards Committee for its excellent manual or standard specification for Portland cement. That day, however, they had had an opportunity of seeing the actual article in course of manufacture, and of having explained to them the proportions of which Portland cement was composed and the methods of testing it. Therefore each one of them would be more familiar than ever as to how to test Portland cement, and they would be better able to understand what the Standard Specification meant. He spoke with thankfulness of Mr. Spackman's kindness, because it was part of his (the speaker's) duty to test the cement supplied to the Salford Corporation. In the course of that duty, some years ago, he had a pleasant surprise. Two samples of Portland cement were submitted to him: one was very highly priced and the other very low, so low, in fact, that the committee who had advertised for contracts were doubtful about it. He did not know where the samples came from, but they were tested according to the specification, and the cheapest cement fulfilled the standard to a greater extent than the higher-priced article. He afterwards found that the cheap cement was manufactured by the Isis Cement Company. They would understand, therefore, how closely interested he was when he visited the works. Alluding to the mayor's remarks as to the town being antiquated, he did not think the corporation was antiquated, and he was absolutely certain that their method of manufacturing Portland cement was not antiquated. Alderman Mitchell had also said that the town was "higgledy-piggledy," but they had become so used to straight lines in towns that they hardly understood the picturesqueness of a curved line and all that an undulating road meant. At Clitheroe they had an opportunity of making their town beautiful. In the natural lime, which could be manufactured into marketable stone and Portland cement, they had the nucleus of manufacture, and, with the beautiful country around them they had an opportunity of practising the beneficent art of town planning. If they studied that matter thoroughly they would find their roads so picturesque that in the future they would not consider Clitheroe a "higgledy-piggledy" town.

Mr. J. W. Sunderland (Norden) seconded the proposition, and declared that the more they knew about cement the better they would be for it.

Dinner over, the members made a move for the free library, where, prior to boarding a couple of wagonettes which were to take them to West Bradford, *en route* for the waterworks, they were photographed. Heavily-laden clouds had by this time begun to sweep over Pendle Hill. Nevertheless, the journey commenced, and a most adventurous one it proved. The route was *viâ* Waddington, where the gardens, which at present are a blaze of colour, were greatly admired. Shortly after leaving the village the clouds began to discharge their contents. Those members of the party whose trust in the weather was so complete as to cause them to leave coats and umbrellas at home began to have serious misgivings, and, although there was a prospect of having an object-lesson as to how Clitheroe's water is obtained, they did not appear to view the prospect with equanimity. After leaving the wagonettes the lightning flashed and thunder rolled in a most businesslike manner, and as the storm began to gather strength the party made a dash for shelter. A farmhouse appeared as a haven of refuge, and a number were glad to seek shelter in the shippon. Rain then began to fall in torrents, and it continued for quite half an hour. The going subsequently was decidedly damp, and the uncomfortable conditions detracted somewhat from Mr. Bleazard's interesting description of Clitheroe's unique water supply. In fact, everybody was thankful when the wagonettes were reached.

On arriving at Clitheroe again an excellent tea was generously provided in the mayor's parlour by Alderman Mitchell.

Mr. Platt proposed a vote of thanks to his Worship, and he included the corporation in the resolution. He said they had been greatly interested in what they had seen that afternoon. It was certainly unique that a local authority should have control of a waterworks where the supply was derived entirely from springs. He did not know of any other authority that was in a similar position. Mr. Bleazard had also informed them that the waterworks were capable of extension at very little cost. In fact, all that would be needed would be to raise the levels of the present reservoirs, while there were other sources which had not yet been tapped. That, in itself, showed the great need for the conservation of water supply.

Mr. G. H. Hopkinson (Chorley) seconded the motion, which was cordially agreed to.

Alderman Hardacre replied on behalf of the corporation, and the mayor said it was a great pleasure to welcome them to the old borough.

Owing to the lateness of the hour, Mr. A. R. Bleazard, the borough surveyor, was only able formally to present the following paper, no discussion or comment being possible.

MUNICIPAL PROGRESS IN CLITHEROE.

By A. R. Bleazard.
Borough Surveyor.

Clitheroe is I think unique for the reason that it possesses a history which towns many times its size might envy. Though on the very fringe of the big cotton manufacturing centres, it is situated in one of the most beautiful districts of Lancashire or Yorkshire, and it is also a thriving business town, although one is at a loss as to whether it would be right to say that Clitheroe is more progressive as a business or a residential town.

It was known in early times as Clyderhowe, a name partly Ancient British, partly Saxon, and probably derived from Cled-dur (a hill by the water). It seems to have possessed considerable importance in the time of Henry I. A castle was built in it on an elevated limestone rock by Robert De Lacy the first, in the reign of Henry II. It played no important part in national affairs until it was held by the Royalists in the later stages of the Civil War. It was also dismantled in 1649, and is now represented only by the keep and old walls, which serve as a familiar landmark in the neighbourhood.

From 1348 to the Restoration the manor at Clitheroe belonged to the Duchy of Lancaster. It was given by Charles II. to General Monk, and belongs at the present time to the Duke of Buccleuch.

The town is a borough by prescription, and until the first Reform Act returned two members to Parliament. By that Act it was deprived of one of its members; and after the last Redistribution of Seats Act it became merged in the Clitheroe Division of the county (present member, A. Smith, Esq.).

The town was up to the passing of the Municipal Corporations Act, 1835, governed by two bailiffs and a court of inquiry in the nature of a common council. Since that Act it has been governed by the mayor, four aldermen and twelve councillors. It is possessed of fine regalia, including a grand silver-gilt mace presented to the borough by General Monk, with the arms of the out-burgesses or country gentlemen in and about Clitheroe engraved thereon.

This mace is borne before the mayor on special occasions. The rest of the regalia consists of a silver punch-bowl, 16½ in. high and 9 in. in diameter, on which is inscribed "The Drinking Cup for the Bailiffs and Burgesses of the ancient Borough of Clyderhowe, the gift of Sir Thos. Stringer, Knight Recorder of the borough and burgess for four Parliaments, 1681;" two other cups, and a large silver goblet, presented by Colonel Aspinall, of Standen Hall.

Modern Clitheroe, while retaining some reminders of the past in the shape of picturesque gabled houses, is a go-ahead town bent on making the most of its natural advantages, and on supplementing these, where desirable, with artificial improvements.

GENERAL STATISTICS.

The area of the borough is 2,385 acres; the number of inhabited houses at the last census was 2,895, and the population exactly 12,500; the rateable value is £49,942; the assessable value is £45,765. The district rate is 3s. 6d., and the poor rate (including county and elementary rate), 3s. 2d.; total rate, 6s. 8d. in the £.

SEWERAGE AND SEWAGE DISPOSAL.

Until recent years the drainage of the district was in a very defective condition, most of the sewers being stone-built culverts emptying into the brooks which run through the town. This state of things could not be allowed to continue, so the corporation applied and obtained Provisional Orders amounting to £22,000 for resewering the whole of the town, also for a sewage farm and purification works.

The farm is 75 acres in extent, of which about 70 acres are adapted for purification purposes. The whole of the land is under-drained with 12-in. main drains, and 6-in. and 4-in. subsidiary drains, the subsidiary drains being 4-ft. deep and 11 yds. apart, laid in herring-bone fashion, and conducted to inspection chambers. Most of the land has sufficient fall to allow the effluent to be, if necessary, again brought to the surface at the inspection chambers for a further filtration.

At first, when the works were started, it was considered that the only tanks necessary would be detritus tanks sufficient to take the heavy matter, but it was very soon found that this was not sufficient. New settling tanks were built by me in 1901, with a capacity of 130,000 gallons.

About two years ago the corporation entered into an agreement to treat the effluent from a proposed new dye and bleach works to be erected in the town. It was evident that the existing plant could not cope with these extensive works, and also the gradual conversion of the pail-closets to the water-carriage system, so I was instructed to prepare a scheme for remodelling and extending the present sewage works. These extensions consist of three new settling tanks, each 76 ft. by 53 ft. and 6 ft. deep, with a capacity of 450,000 gallons, four 80-ft. diameter sprinkler beds, 6 ft. deep, and seven sludge pits or drying beds, each 100 ft. long and 20 ft. wide.

The new tanks are being formed by earth embankments excavated from the site, which is good stiff clay. This, I find, is making a very satisfactory tank, and much cheaper than brick walls; the floor and sides afterwards will be concreted with 6 in. of cement concrete rendered to a smooth surface. The tanks are so constructed that the flow can be either continuous from one tank to the other or intermittent.

The sludge is conveyed by gravitation from the tanks to the drying beds by 12-in. earthenware pipes encased in concrete. Each bed is under-drained and covered with 2 ft. of clinker, with a layer of fine sand at the top, and the underdrains empty on the land for further filtration. Before entering the beds the sludge is treated to a 5 per cent of milk of lime. So far these beds have given us every satisfaction, and the sludge can be satisfactorily wheeled out in barrows. The most important point to bear in mind, I think, is that not more than 1 ft. of sludge in depth is put in each bed at one filling.

The sprinkler beds have not yet been commenced. This district being an agricultural district, all the land is used for grazing purposes, and for the year ending March 25, 1911, £192 12s. was received for cattle grazing on the farm, which is nearly £3 per acre. The sewage works is situated on the banks of the river Ribble, which at Clitheroe is a very fine fishing river, and under these circumstances the purification of the sewage at Clitheroe is at all times a responsible undertaking. I am glad to say the corporation have been alive to this, and have spared neither trouble nor expense to turn a satisfactory effluent into the river, and for the last two or three years the samples taken by the Ribble Joint Commission have invariably been among the *good*.

The main sewers vary from egg-shaped brick culverts, 3 ft. 6 in. by 2 ft. 4 in., to 12-in earthenware pipes. Practically all the main sewers have been relaid, and the work of connecting the houses to these new sewers is still being proceeded with. The water-carriage system is gradually replacing the old tub system of excreta removal. There were at the end of March last 2,049 closets and latrines on the water-carriage system, and 1,233 on the pail system. All the sewers are ventilated at each end, and periodically flushed. The length of the main sewers is about 12 miles.

WATERWORKS.

The inhabitants, long feeling the serious inconvenience of a defective water supply, determined in 1849 to call upon the the General Board of Health to apply the Public Health Act to this district, which request was complied with in the following year upon the report and recommendation of their inspector, Mr. B. H. Babbage. The corporation, however, preferred taking further advice as to the best means of doing this, and called to their aid the services of Mr. Park, of Preston, then engineer to the Preston waterworks, and subsequently those of Mr. McLandesborough, civil engineer, of Bradford. These steps were ultimately rendered nugatory by considerable opposition to the scheme.

In 1853 a company was formed for supplying the borough with water, and in the following Session of 1854 an Act of Parliament, to which there was some local opposition, was obtained for such purpose. Upon the Act being procured, the directors proceeded with the work of building a reservoir of 500,000 gallons capacity, with a 9-in. main and distributing pipes to the town.

In the year 1878 the waterworks was bought by the corporation and an Act of Parliament obtained for

further increasing the storage capacity and laying a new 9-in. water main in duplicate from the reservoir to the town. This reservoir was commenced in 1887, and has a storage capacity of 13,250 000 gallons.

Prior to the construction of the waterworks the supply of water for culinary purposes was procured principally from public and private wells, which sources yielded a supply of water abundant but unusually hard. The principal town's well (one of the softest) is 23 deg. of hardness, and the others range as high as 34 deg. The water supply from the waterworks is of exceptional quality, as the following report from the borough analyst will show:—

Borough Analyst's Report.

Borough Analyst's Laboratory,
166 Drake-street, Rochdale.

Dear Sir,

The sample of water received from you last week, which was collected just before entering the reservoir, is clear, bright, slightly alkaline, soft, and of great organic purity. Only traces of ammonia yielding compounds are present, nitrates are practically absent, chlorides are low, and oxygen absorption is negligible. Quantitative particulars are given below: —

	Grains per gallon.
Total solid matter	4·9
Loss on ignition of residue	0·5
Non-volatile mineral matter...	4·4
Combined chlorine	0·7
Chlorine calculated to common salt ...	1·15
	Parts per million.
"Free" or saline ammonia	0·02
Albuminoid ammonia	0·04
Oxygen absorbed in four hours	0·13
Total hardness (in Clark's degrees) ...	2·4 deg.
Temporary hardness (in Clark's degrees) ...	2·1 deg.
Permanent hardness (in Clark's degrees) ...	0·3 deg.

Nitrates and nitrites—absent. Lead and other poisonous metals—absent. It is difficult to imagine a more excellent town supply.

Yours faithfully,
E. STENHOUSE.

The water is procured from a number of copious springs that rise on the adjacent Grindleton Fells, the district being from 3 to 4 miles north of Clitheroe. The formation is of millstone grit, and from 560 to 1,300 ft. above ordnance datum. The minimum yield on any one day during the drought of last year was 450,000 gallons, and the maximum yield last January was 950,000 gallons. This supply is collected and conveyed from the springs to the reservoirs by means of earthenware conduits. The total length of water mains is 18 miles.

In order to ensure themselves that the purity of the water shall be maintained, the corporation determined to buy up all the land on which these springs were situated. During the last six years 632 acres of land have been purchased on the gathering grounds at a cost of £12,531 10s. 3d. The corporation supply several outside districts with water, including Grindleton, a portion of Sawley, West Bradford, and Mytton.

The water charges are 7½ per cent up to £20 rental, and 6 per cent over £20 rental. One bath and one water-closet for each house are free. The water for trade purposes is by meter at 1s. per 1000 gallons up to 100,000 gallons, and 3d. per 1,000 gallons over 100,000 gallons, paid quarterly.

The net water profits for the last ten years are:—

1902	£290
1903	311
1904	364
1905	210
1906	253
1907	262
1908	561
1909	659
1910	588
1911	630
	£4,128

HIGHWAYS.

The length of highways in the borough is 17 miles of which 11 miles are ordinary macadam, 2 miles wood and 4 miles tar-macadam. The whole of the ordinary macadam roads are now receiving a good coat of tar-macadam, or are gradually being converted to tar-macadam or pet-agitated roads.

Where the traffic is considerable I am of opinion that the best macadam road is the pitch-grouted. These are being formed in two coats, viz. The first coat is made of 2½-in. limestone, and within 1 in. of the finished surface and sprinkled over with boiling pitch. After being well rolled the top coat, consisting of 1 in. granite chippings, is put on which is well rolled and grouted flush with the boiling pitch and creosote, and afterwards covered with chippings.

PRIVATE STREETS.

All the private streets are being made up under the Private Street Works Act, 1892. Seventy have been made up during the last ten years. All the front private streets are made up with tarred limestone macadam, put on in two coats—*viz.*, a bottom coat of tarred stone, all sizes from 1 in. to 2 in.—4 in. thick laid is laid on a 8-in. foundation of limestone pitching, and, after being well rolled, is coated over with ½-in. tar chippings. The back private streets are all paved, the foundation being 8 in. of limestone pitching, and 6-in. setts from Wiswell quarries.

The footpaths in the centre of the town are all flagged with Yorkshire 3-in. flags. The footpaths on the outskirts of the town and several private streets are being formed of tarred-macadam, 2-in. thick, and have been very successful.

I have recently laid 1,700 super. yds. of granite-macadam with Rocmac as an experiment. This road cost 14·11d. per super. yd. Adjoining this length of road I also laid 3,800 super. yds. of water-bound granite-macadam road, costing 11·20d. per super. yd. The Rocmac has therefore cost 2·91d. per super. yd. extra. It is too early yet to give an opinion as to whether it has been worth the difference.

We are fortunate in Clitheroe in being able to obtain our tarred-macadam immediately on the doorstep, as it were, of the quarries; for this reason I can tar-macadamise our private streets at about 1s. 6d. per super. yd.

TAR-SPRAYING.

Clitheroe being on one of the main roads between Lancashire and the Lake District, the dust nuisance became unbearable. During last year we tar-sprayed 50,000 sq. yds. at an average cost of 1·12d. per yd. So satisfied have the corporation been with the result that we purchased a tar-spraying machine this year from Messrs. Llewellyn & James, Bristol, and we are now tar-spraying the whole of our macadamised roads in the borough where the gradient will permit.

STREET IMPROVEMENTS.

One of the disadvantages of an old town is narrow streets. Anyhow, during the last ten years there is no doubt the corporation have done some very good work in improving and widening several narrow streets, the most important being—

(1) Greenacre-street Improvement.—This street connects two main roads in the town, it was widened from 15 ft. to 36 ft. The widening necessitated taking down one house and building a concrete and girder bridge over the Mearley Brook, and cost £1,650.

(2) Wilkin-street Improvement.—This improvement was similar to Greenacre-street improvement. The roadway for a distance of 790 ft. was widened from 15 ft. to 36 ft. A concrete and girder bridge, with approach roads and retaining walls, was built over the Mearley Brook. This improvement cost £2,181.

(3) Waddington-road Improvement.—This roadway is one of the secondary main roads into Yorkshire, and for a distance of 1,020 ft. was widened from 20 ft. to 40 ft. wide, and cost £912.

(4) Roman Catholic cemetery improvement, £220.

(5) School-terrace improvement, £220.

(6) Taylor-street improvement, £315.

(7) King-street improvement, £308.

(8) Waterloo-road improvement, £351.

(9) Waddington-road improvement (near Crown Inn) £292.

(10) Railway-avenue improvement, £71.

(11) Victoria-street improvement, £108 14s.

(12) Wellgate improvement, £55.

(13) Wesley-lane improvement, £46.

GASWORKS.

The gasworks, like the waterworks, was originally formed by a company in 1836, and remained their property until 1878, when it was purchased by the corporation. Since that time the gasworks has made enormous strides, as the following figures will show: Amount of gas produced in 1894, 20,000,000 cub. ft. amount of gas produced in 1912, 74,000,000 cub. ft.

During the past four years the gasworks has practically been rebuilt. New retort-houses, containing nine sets of bed, eight retorts in each bed, new coal stores (with conveying and elevating plant), new purifying plant and super-structure, new station meter-house and meters have been built, and the capacity

almost doubled. The whole of these extensions at the gasworks were carried out and superintended by Mr. R. Barrett, gas engineer.

The price of gas is 2s. 6d. per 1,000 ft. nett, with an extra charge of only 1½d. per 1,000 ft. for penny-in-the-slot meters. The following are the nett profits at the gasworks for the last ten years:—

1902	£858
1903	1,496
1904	1,093
1905	1,141
1906	1,750
1907	1,992
1908	2,242
1909	2,021
1910	2,087
1911	1,783
	£16,733

PUBLIC ABATTOIRS.

In 1906 powers were obtained to erect seven new public abattoirs, and at present four have been erected, at a cost of £2,076. They consist of a lairage, slaughter-house and cooling-room, with the necessary boundary walls and paved yards. Each lairage is 17 ft. 6 in. by 14 ft.; slaughter-house, 17 ft. 6 in. by 13 ft. 6 in.; and cooling-room, 17 ft. 6 in. by 7 ft. 6 in. Each slaughter-house is provided with the necessary hoisting apparatus, and overhead runners for conveying the carcases from the slaughter-house to the cooling-room. The rent of the slaughter-houses are as follows:—

Private slaughter-houses for cattle and sheep, 10s. per week; but two, three or four butchers may join at one house on the understanding that each person is a direct tenant of the corporation on a quarterly tenancy.

Public slaughter-houses for cattle, sheep and pigs, 2s. per week for each butcher, each person to be a direct tenant of the corporation on a quarterly tenancy. All tenants to pay rates, gas and water charges. Occasional use of public slaughter-houses to be at the rate of 2s. per week or part of a week for each butcher.

PUBLIC LIBRARY.

A new free library and reading-room was erected in 1906 [illegible] wards when Mr. Carnegie gave £3,000 and [illegible] the old town hall. The free library was opened in 1870, and until 1906 [illegible] the corporation allowed the Free Library Committee the use of the [illegible] of the town hall.

The number of books is almost 9,000 volumes. The library is supported by a 1d. rate, producing £174. Last year 36,500 volumes were issued to the public. The librarian is Mr. J. W. Hayhurst, who has for thirty years taken a great interest in the work.

FIRE BRIGADE.

The fire brigade is a voluntary one, consisting of eighteen members, who are paid according to the following scale: [illegible] at the fire, 1s. per hour afterwards; 1s. for each drill.

The equipment consists of a steam fire engine, manual, fire-escape, hose cart, and all appliances necessary.

The corporation have been considering for some time the erection of a new fire station, and the efficiency of the brigade under their present circumstances reflects great [illegible] on the superintendent, Mr. J. Taylor.

SCHOOLS.

There are five elementary schools in the borough, of which one is a council school and the remaining four are voluntary schools. The council are contemplating erecting at least one, if not two, new schools, and a sub-committee are at present selecting the most suitable sites for these proposed new elementary schools, and I have been instructed to get out plans for them.

A new secondary school is also being erected by the Lancashire County Council to take the place of the old Grammar School, costing about £20,000, including the site.

PARKS.

The corporation were fortunate in being the owners of 6 acres of land adjoining the river Ribble. This has been made into a park, and is greatly appreciated by the public. It has been laid out with walks, and bathing facilities have been provided for both male and female.

Recently an extra strip of land adjoining has been leased to the corporation, and a new entrance is being formed into the park.

At the last council meeting the ex-mayor, Alderman J. T. Whipp, very generously offered to the corporation 4 acres of land for a park at the south-west end of the borough.

HOUSING AND TOWN PLANNING.

The corporation very recently took advantage of the powers under the Housing and Town Planning Act of 1909. During last year 222 houses were inspected and notices served on the owners to remedy any defects. A scheme is [illegible] for the erection of workmen's dwellings.

I think that I have given a fair outline of municipal progress in the borough of Clitheroe, and I feel confident that, although we may not have advanced at a very rapid pace, improvements have been made of a solid and substantial nature. We are very hopeful of the future, and with the introduction of a new industry, which undoubtedly will commence before long, we hope to make still further progress, comparing favourably with towns of similar size to Clitheroe.

Owing to the lack of time the business meeting in the council chamber was very brief. Mr. Platt took the chair and read a letter from Mr. Bowes, resigning the chairmanship of the district. Mr. Platt proposed the election of Mr. Bleazard to the vacant position, and this was heartily carried.

Mr. Bleazard then took the chair and briefly returned thanks. Mr. J. W. Gleave (Heywood) was elected honorary district secretary, and the retiring officers were thanked for their services.

New Open Space for Croydon.—An anonymous donor has given to Croydon land covering 3½ acres at Pollard's-hill, Norbury, to be preserved as an open space for the use of the inhabitants, together with a sum of £250 to meet the cost of fencing.

Coroner's Court and Mortuary for Southwark.—It is proposed by the London County Council to apply to Parliament for authority to enable Southwark Borough Council to erect a coroner's court and mortuary on a site in St. George's-churchyard, Southwark.

Crystal Palace School of Engineering.—Sir Maurice Fitzmaurice (chief engineer to the London County Council) on Monday awarded the certificates won during the summer term by the students at the Crystal Palace School of Practical Engineering. In the course of an address Sir Maurice stated that the school had maintained its reputation for many years. He said [illegible] the [illegible] staff, and their work [illegible] satisfactory.

Guildford's Old Cottages.—Arrangements have been made between Surrey County Council and the Corporation of Guildford by which the proposed widening of Farnham-road will not be proceeded with, and the county council will contribute £3,000 towards an improvement, estimated to cost £10,286, at the Ram Corner in High-street. Under the first proposal several picturesque old cottages were to be pulled down, when the National Trust and other societies protested against their destruction as an act of vandalism.

Problems in Engineering.*—This reprint from the popular students' section of our contemporary consists chiefly of questions that have been set at the examinations of the Institution of Civil Engineers and of the Institution of Municipal and County Engineers. There is no index to the work, but the matter is classified under the heads of Mechanics and Hydrostatics, Strength and Elasticity of Materials, Theory of Structures, Surveying and Levelling, Water Supply and Hydraulics, Sewerage, Sewage Disposal, Road Making and Tramways, Building Construction and Materials, Law, and Miscellaneous. This book is calculated to be of considerable use to students in these subjects, but it would have been an advantage if the source of the questions could have been stated. The answers have in general been given rather more fully than would be the case at an examination, with the object of explaining the principles to a student without his having to refer to a text-book for them. The price brings the work within the reach of all students, and there is so much useful matter compressed into a small space that even the best-prepared candidate cannot afford to be without it.—*Sanitary Record.*

* "Problems in Engineering, with Solutions." Being Questions and Answers reprinted from the Associate and Student Sections of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER. First Series, 1909-10. Edited by Sidney G. Lister, A.M.Inst.C.E. Price 5s. net. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

The premium for July has been awarded to

Mr. W. Duff.
Town Hall,
Dudley,

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

QUESTIONS.

This week answers are invited to the following questions:—

260. Refuse Disposal.—Where there is no system of sewers in a district, what are the best methods of collecting, removing and disposing of the fluid and solid refuse from the community?

262. Wood Paving.—What contour should be given to a wood-paved (soft wood) road 60 ft. in width? Describe the best method to adopt in fixing the screeds. (A. B.)

263. Floor Construction.—Give sections showing clearly the construction of a double floor and a framed floor respectively. ("Junior.")

264. Concrete Beam.—A concrete beam reinforced with steel rods is to be designed to carry a distributed load of 20 tons. The span is 15 ft. Show by calculations what size of beam you would use—the method and formulæ to be as simple and short as possible. ("Greenland Farm.")

265. Strength of Shafting.—A 10-in. shaft has a 4-in hole run through it; what fraction of its weight is removed? To what extent is its strength in resisting torsion affected?

REPLIES TO QUESTIONS.

261. Deflection of Beams.—If two precisely similar beams of rectangular section, one of cast iron and the other of wrought iron, were laid across the same span and loaded with the same load (within the elastic limit), what would be the relative deflections of the two beams?

The general form of the equation for the deflection of any beam loaded within the elastic limit is

$$D = C \frac{WL^3}{EI}$$

where D is the deflection,
W is the total load on the beam,
L is the clear span,
E is the modulus of elasticity of the material composing the beam,
I is the moment of inertia of the cross section of the beam,
and C is a fraction which is dependent for its value upon
(*a*) the manner in which the beam is supported, i.e., whether it has ends "free," "fixed" or "part fixed,"
and (*b*) the manner in which the beam is loaded, i.e., whether it be a concentrated or distributed weight.

The units employed must be consistent—*e.g.*, if E be in lbs./sq.-in., then W must be in lbs., and I and L in inch units.

Let D_1 and D_2 represent the deflections of two similar beams one of C.I. and one W.I. when similarly loaded and fixed.

Let E_1 and E_2 represent the respective values of the moduli of elasticity of these materials.

Then

$$D_1 = C \frac{WL^3}{E_1 I}$$

and

$$D_2 = C \frac{WL^3}{E_2 I}$$

$$\therefore \frac{D_1}{D_2} = \frac{C \frac{WL^3}{E_1 I}}{C \frac{WL^3}{E_2 I}} = \frac{E_2}{E_1}$$

Since other factors are equal—*i.e.*, the deflections of two similar and equal beams as regards shape, size, fixing and loading, but of different materials are inversely as the moduli of elasticity of those materials.

Taking E for C.I. as 14,000,000 lb./sq.-in.
and E for W.I. as 29,000,000 lb. sq-in.

We obtain from a direct application of the above the result that the

Deflection of the C.I. beam : Deflection of the W.I. beam.

:: 29 : 14

(A. J. S. P.)

Some Notes on Reinforced Concrete.

Concrete has been extensively used as a building material for ages, its use being common in ancient Rome, for instance, but its economic application was limited to purposes where it was subject only to compressive stresses, until forty or fifty years ago. Being practically ten times as strong in compression as in tension it is wasteful when used *alone* to make beams, &c., on account of the bulk needed on the tension side and the space occupied. Steel, however, is so much stronger in tension than concrete that a small proportion of it, suitably introduced into the parts of a beam or slab which are subject to tensile stresses, will balance the compressive forces exerted on the other side of the neutral axis. A construction which utilises the most important properties of each of the two materials steel and concrete is arrived at by suitable combination and disposition of the two across the sections of a structure or structural member. This principle has led to the several forms of "Reinforced Concrete Construction," many of which have met with considerable commercial success.

Many fine architectural and constructional feats have resulted in all parts of the world from applications of these systems, among which the "Kahn," the "Expanded Metal," and the "Indented Steel Bar" methods are as well known as any. It is sufficient to say that the durability of such structures, the economy with which they have been erected, and the ease of construction point to an almost unlimited field in the future for applications of Reinforced or Ferro Concrete Systems.

The *expansion and contraction* of steel and concrete under varying temperatures may be taken as equal for all practical purposes, this being an important fact from the engineer's point of view, as induced stresses are thereby eliminated. As a matter of fact the coefficient of expansion for steel is 0·00000676, and for good hard concrete 0·00000655, and high carbon steels (too brittle) are avoided in preference for high quality mild steel of ultimate tenacity not less than 60,000 lb. per square inch. Clearly the capacity of a reinforced concrete member for resisting tension is dependent entirely upon (1) the cross section of the combined metallic bars or pieces introduced and their quality: (2) the grip or adhesion of the concrete to the steel, which allows of the transmission of tension from the concrete to the steel, so preventing failure of the concrete.

The provision, then, of a sufficient mechanical bond between the two materials is of primary importance. Where plain rods or bars are used many devices have been employed by engineers, such as splitting or bending the bars at their ends to obtain *anchorage*, and in view of the fact that the adhesion may be easily destroyed by the mere small contraction of reinforcing bars when under stress, this is very necessary. The adhesion is purely mechanical friction, in other words, and if the bar is sufficiently pulled, it will slip in the concrete owing to its contraction in area. Again the shocks and vibrations inseparable from the average structure may cause this failure of bond. The use of smooth bars is thus risky, though cheaper than the forms of "expanded metal" or "indented" or otherwise deformed bars introduced with considerable success to secure a depend-

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
An Anomaly	155
An Interesting Calendar Competition	155
Appointments Vacant	194
Assistants' and Students' Section	174
Bacteria	183
Berlin Congress	154
Correspondence	183
Institution of Municipal and County Engineers	
Annual General Meeting in London	184
Notices	193
Institution of Municipal Engineers:	
North-Western District Meeting	169
Notices	193
Law Notes	176
Local Government Board Inquiries	177
Molesworth Formula for Masonry Dams	185
Municipal Competitions Open	194
Municipal Contracts Open	194
Municipal Engineering, Architecture and Town-planning	156
Municipal Progress in Clitheroe	171
Municipal Work in Progress and Projected	179
Notes on the Extension Seawards of the Gynn Outfall Sewer at Blackpool	182
One Solution of the Sludge Problem	165
Personal	184
Prevention of Smoke	154
Recent Publications	175
Royal Sanitary Institute:	
Annual Congress and Exhibition at York	159
Conference of Engineers and Surveyors	159
Health Exhibition	165
List of Awards	168
Presidential Addresses	159
Sanitary Progress and the Law	155
Sewage Disposal in Rural Districts	167
Sewage Disposal at the Sanitary Congress	153
Sewage Disposal at West Bridgford	158
Sewage Treatment. Advantages of Land over Artificial Schemes	162
Tenders for Municipal Works or Supplies	196
Town-planning in America	155
Town-planning in Sheffield	180
Town-planning: Laying out new Towns and Cities	184
Utilisation of Road Sweepings	154

able mechanical and cross bond. It must be stated that these more modern methods of reinforcing aim at and secure a much more *continuous* bond than can any bending or splitting of round bars (where the grip can be obtained only around the deformed parts). With smooth bars a maximum tensile stress in the steel of about 8 tons per square inch is advisable, and in some countries the use of bars designed to provide a continuous mechanical bond is enforced if a high tensile stress is allowed.

The Elastic Limit of the steel employed is the prime factor which determines its value for reinforcement, and *not* the ultimate stress. For when the elastic limit is exceeded considerable contraction of the bars will inevitably occur, causing moisture to creep in and cause failure by corrosion of the iron sooner or later.

A material of relatively high elastic limit is therefore most suitable, and a value of over 50,000 lbs./sq.-in. (about 23½ tons/sq.-in.) applies to the rolled "indented steel bars," with an ultimate strength of over 42 tons/sq.-in., as against an elastic limit of 15 tons sq.-in., and an ultimate strength of 30 tons sq.-in. for the ordinary plain bars employed.

It is also advantageous to employ a deformed bar of unvarying net cross section (though perhaps of varying form) throughout the length, so that no metal shall be wasted, since "*the strength of a chain is that of its weakest link*," *i.e.*, the useful strength of a bar is fixed by its minimum section.

There is a critical angle of friction between steel and concrete beyond which angle the projections on deformed or indented bars must not be set, as they then begin to exert a wedge-like bursting action. The faces of the projections must make with the centre line of the bar an angle *greater than* this critical or friction angle so that, no matter how great the tension on the bar, this bursting tendency shall be non-existent. In order to provide for the resistance of combined shear and tension it should be possible to bend the bars easily through a large angle, so that they can be set for part of their length in the direction enabling them best to take up and resist the shear existing.

A large ultimate elongation (15 per cent to 17 per cent on an 8-inch gauge length) and the ability to bend at a small radius *cold* without cracking is here necessary. Large bars may need heating before bending. In considering *shear* members, it is well to note that they are of short length usually, such as the full depth of a beam, and that the provision of a good mechanical bond in that short length is necessary to avoid the bar pulling out of the steel (due to imperfect adhesion) before the full strength of the metal has been developed. When we consider that a length of anchorage equal to not less than 150 times the diameter of the bar is reckoned necessary in a round bar, the advantages of deformed bars to secure complete adhesion within a short length become apparent.

SOME RECENT PUBLICATIONS.*

THE COMING OF PETROLEUM. Price 2s. 6d. nett. London: Curtis, Gardner & Co., Limited.

An idea of the vastness of the petroleum industry may be gained from figures in this interesting publication as to the present output of oil in the various producing countries. The total is no less than 43,000,000 metric tons, of which the United States contributes over 63 per cent and Russia nearly 22 per cent. The information in the book appears to have been carefully collected, and is presented in a form which will enable readers better to follow the reports and statements of those associated with the industry.

Part xxxvii. of the London County Council's series of booklets in which accounts are given of the work of indicating houses of historical interest in London has just been published. The price of the booklet is 1d. We have also to acknowledge copies of the "Statistical Abstract for London, 1911-12" (price 1s.), and "London Debt, 1910-11" (price 4d.), the latter being a return showing, in respect of the various London local authorities, the gross and nett debt outstanding at the end of the period which it covers, and the annual charge on the rates in that year, together with an analysis of the total nett debt of London.

The remarkable progress of the Royal Colonial Institute is indicated by the Year Book of that body for the present year. The institute has now nearly 6,000 Fellows, and its growing importance, the widening of its scope, and the increase of its membership have necessitated a great extension of its premises in Northumberland-avenue. Here is established a club house where persons from all parts of the Empire are able to exchange experiences, and have the advantage of an information bureau, the value of which may be gauged by the statement in the Year Book that its admirable library contains nearly 90,000 volumes and pamphlets, not one of which does not relate to the objects of the institute.

Change of Address.—The Fernden Fencing Company announce that in future their only address will be Bell Vale, Haslemere, Surrey.

India's New Capital.—It was announced in the House of Commons on Tuesday that the Government buildings of Delhi, the new Capital of India, are to be built in the Renaissance style, at a cost of £4,000,000.

London's Tramways.—In the proceedings before the Select Committee of the House of Lords considering a Bill of the London County Council for tramway extension, it was stated that of the 156 miles of tramways in the county of London 148½ were worked by the London County Council. Of that number 130 miles are worked electrically, and there still remain 10 miles which are worked by horse power.

Institution of Civil Engineers: A Legacy.—Under the will of the late Sir James Inglis, a former president of the Institution of Civil Engineers, the institution has just received a legacy of £5,000, to be applied to its new building which is now in course of erection in Great George-street, Westminster. This legacy testifies to the marked interest which Sir James Inglis took in the scheme for the rebuilding of the institution, towards the cost of which he had also during his lifetime, contributed liberally—regarding the occasion as an opportunity to promote the centralisation, and thereby the strength, of civil engineering interests throughout the British Empire.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

Law Notes.

Edited by J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, one side only) should be addressed to "The Law Editor," at the office of The Surveyor, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

In order to avoid confusion queriers are requested to use distinctive words as noms de plume. *The letter X, combinations such as* X.Y.Z., *and words such as* "engineer" *and* "surveyor," *should never be used.*

Laying Out a New Street.—"H." writes: "The owner of a house standing upon a large plot of ground is desirous of building another house on the same plot, at the rear of the present house, in the position shown on the enclosed block plan. Between the points A and B an occupation road 10 ft. wide has been reserved,

and forms the only means of approach. I shall be glad to have your opinion as to whether: (*a*) This proposal involves the creation of a new street between the points A and B, and, if so, (*b*) sec. 5 (sub-sections 1 to 3) of the enclosed by-laws is applicable; (*c*) can the intention to build where shown be vetoed on other grounds?"

[EXTRACT FROM BY-LAWS WITH RESPECT TO THE LEVEL, WIDTH, AND CONSTRUCTION OF NEW STREETS.]

Width of street.

5. (1) Every person who shall lay out or construct a new street which shall be intended for use as a carriage road shall so lay out such street that the width thereof shall be 36 ft. at the least.

Streets exceeding 100ft. in length.

(2) Every person who shall construct a new street which shall exceed 100 ft. in length shall construct such street for use as a carriage road, and shall as regards such street comply with the requirements of every by-law relating to a new street intended for use as a carriage road.

(3) Provided always that this by-law shall not apply in any case where a new street shall not be intended to form the principal approach or means of access to any building.

Width of street not intended for carriage traffic.

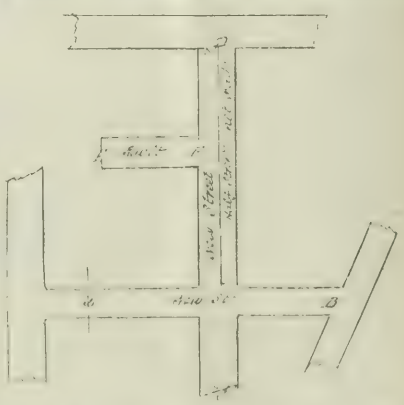
(4) Every person who shall lay out or construct a new street which shall be intended to form the principal approach or means of access to any building but shall be intended for use otherwise than as a carriage road, and shall not exceed in length 100 ft., shall so lay out such street that the width thereof shall be 24 ft. at the least.

Secondary means of access.

(7) Every person who shall lay out or construct a new street which shall not be intended to form the principal approach or means of access to any building, but shall be intended for use as a secondary means of access to any premises for the purpose of removal therefrom of house refuse and other matters, shall so lay out such street that the width thereof shall be 16 ft. at the least, provided that if such new street shall not exceed in length 120 ft., the width thereof shall be 10 ft. at the least. Provided that where such street shall be of a less width than 16 ft., and shall exceed 100 ft. in length, such person shall provide that each end of such street shall be open from the ground upwards to the full width of such street, and shall communicate with a street of not less width than such street, or shall so construct such street that at the end farthest from the entrance thereto there shall be a space forming part of such street free from any erection thereon above the level of the ground of an extent not less than 30 sq. yds., and of a width not less in any part than 16 ft.

(*a*) In my opinion the erection of the proposed house does not in itself constitute the laying out or construction of a new street. (*b*) These provisions apply only if proven a new street is being laid out or constructed. (*c*) Not unless the proposed building contravenes any of the by-laws.

Private Street Works: Work already done by Owners: Apportionment.—"L. Q." writes: I should be extremely obliged if you would give me your opinion as to whether I have apportioned in a correct manner the making up of three streets in this district (as sketch). I apportioned the work done according to frontage, and the total amount expended on each street. I made a survey and prepared plan, sections, specification and provisional estimates and quantities, and when these were completed notices were served on owners—twenty-one days. No objections were made by the owners during that period. A contract for the work was let, the contractor in this case being one of the private property owners. The work is completed and paid for, and there are no extras or deductions from the contract amount.



Notices of apportionment of expenses were served on the owners under Form 257. The notices stipulate that a period of three months is allowed, during which time objection to the apportionment may be made. At the time the plans, &c., were made I included only in the quantities and specification the work required to be done to complete the making up of the streets. In the specification a clause was inserted that "A copy of the bill of quantities, schedule of prices, and form of tender will be supplied to intending contractors. These quantities are taken out with great care, but the contractor must verify their accuracy for himself should he think it necessary." Two owners have objected to the apportionment the contractor and one of my council. One

owner objects because he says the whole of the half-roads and the footpaths belonging to him were formed and rough pitched, and the kerb and channelling all fixed in every case, before the notices to make up the streets were sent out. This is not quite correct; portions of these streets were made, but not completed, and only kerb or channel was specified in the quantities to be provided where there was no channel in the street, and where old channel was defective this was specified to be reinstated. In the street C to D kerb and channel were laid on the objecting owner's side, and the other half of the street, belonging to another owner, was not made at all or kerbed and channelled. The objecting owner thinks I ought to make him an allowance for the work he had done previous to the contract being let. This I cannot do in any case, because this owner receives the benefit of the entire street being completed as a whole, and all the owners are joint users of the street, and the street could not be taken over by the council until complete. On August 14th the time expires under the notice of apportionment of expenses for disputing the apportionments, and two other owners have time yet in which to dispute the apportionment. The point in dispute appears to be: An owner has made part of a street opposite his premises, the street being then left in an unfinished state for several years; the owner then did further work at different times on this private street. The council, after receiving complaints of the bad state of the street, decided to have plans, &c., made for this making up of the street under sec. 150 of the Public Health Act. Could this owner make any claim for allowance for work done in the street previously to the contract being let?

In my opinion an owner cannot object to an apportionment under sec. 150 of the Public Health Act, 1875, on the ground that no allowance has been made to him for work already done to the street. The council have no power under this Act to make any such allowance, even if they were willing to do so.

By-Laws: Air Space.—"Health Officer" writes: I should be glad if you would give your opinion of the correct interpretation of by-law 54 (copy of by-laws and sketch forwarded). The contention of a speculative builder in this district is that a wash-house for the joint use of two houses occupied by separate tenants can be erected a distance of 10 ft. from the rear of the dwelling-houses. The height of the houses in question is 25 ft. measured in the manner defined in the by-law, and I contend that there should be provided in the rear of such dwelling-houses an open space of a width of 20 ft., and this open space must belong exclusively to each separate house, and extend laterally throughout the entire width of each house, and to be free from any erection thereon above the level of the ground, except a water-closet, earth-closet or privy, and an ashpit. I further contend that the word "erection" applies to any wall or timber fence, and not merely to a building. An exception is made to a fence or wall intended solely to divide each yard or air space from the adjoining space. The reading of the by-law in this district in the past has been to the effect that "the height of such building" referred to the appurtenant building—*e.g.*, wash-house—and not to the dwelling-house. Personally, I feel confident my own interpretation of the by-law is the correct one, and the illustrations on p. 128 of Knight's "Annotated Model By-laws" support my view. No wonder houses are overcrowded into a small area, with this local reading of the by-law, which my predecessor has upheld for the past fifteen years.

The by-law is absolutely clear and definite. The height of the houses being 25 ft., the distance across the open space to the boundary of the opposite premises must be 20 ft., and that 20 ft. must be free from any erection (except a wall, &c., as specified). A wash-house is not one of the excepted erections and cannot therefore be erected within the 20 ft. The suggestion that "the height of such building" refers to the height of the washhouse or other outbuilding is in my opinion preposterous and astounding. Such a reading would make nonsense of the by-law. "Such building" of course means the "new domestic building" mentioned at the beginning of the by-law, and in the rear of which the open space is to be provided. "Erection," in my opinion, includes a wall and a timber fence.

By-Laws: Air Space.—"W. H. R." writes: Will you please say if it is lawful for a person to erect a large wooden shed on wheels, or otherwise, in the rear space provided in connection with a dwelling-house in such a manner that the shed lies within the lateral space referred to in the by-law No. 58 (copy of by-laws forwarded)?

The object of this by-law is to provide a sufficiency of space about buildings to secure a free circulation of air. Bearing this in mind, I think any structure (whether on wheels or not) which would interfere with or militate against that object would be held to be an "erection" within the meaning of the by-law. In my opinion, therefore, the erection of a large wooden shed (whether on wheels or otherwise) on the open space provided would be a contravention of the by-law.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Ashton-in-Makerfield U.D.C. (July 10th. Mr. A. W. Bergmore).—£2,350 for the purposes of sewerage and sewage disposal. Mr. J. Stephens (Messrs. Stephens, Banks & Fairclough, consulting engineers) stated that the method of treating the sewage at the existing works near Millingford Bridge was by means of first, second and third contact beds, which were insufficient and unsuitable for efficient treatment. It was proposed to abandon the use of those beds. The new works were designed with the object of reconstructing the subsided sewer in Princess-road, and providing for the existing and further subsidence by a pumping station and for the efficient treatment of the sewage from the Princess-road, Bryn-road and Golborne-road areas in detritus, storm stand-by, and precipitation tanks, and in percolating filters and humus tanks, and by the treatment of the sludge by Dr. Grossman's process.

Bournemouth T.C. (July 10th. Mr. H. R. Hooper).—£12,170 for the erection of law courts in Stafford-road.—The borough engineer, Mr. F. W. Lacey, stated that the corporation were doing the whole of the work, and the Home Office were paying a certain proportion. The loan did not include the cost of the furnishing of the courts, for which the Home Office were responsible. The inspector suggested that it would be better to leave out of the amount asked for, the cost of the furniture and fittings, amounting to £2,405, which could be the subject of a further application to the board upon the basis of amended estimates and provisionally accepted tenders.

Chorley T.C. (July 23rd. Mr. R. G. Hetherington).—This was a renewed application for sanction to borrow money for the purpose of providing a sewerage scheme and outfall works for the Bolton-road and Red-bank districts. The scheme was strongly opposed by landowners and property owners in the district.

Clones (Co. Monaghan) U.D.C. (July 24th. Mr. A. D. Peace). £2,500 for the carrying out of a supplementary sewerage scheme, and £1,750 for the erection of a new working gas lodging-houses on the Cattle Fair green, the site being the property of the council. The inspector stated that he had received no objection to either scheme.

Exeter T.C. (July 16th. Mr. W. H. Collin).—£8,847 under the housing order; for sanction to borrow £2,039 for the purchase of the Exeter Nursery, St. Thomas, for the erection of houses, and to be relieved from the purchase of certain other lands under the order.—The town clerk stated that the corporation desired to be relieved from the necessity of utilising the whole of the site involved by the Blackboy-road improvement in providing dwellings for those of the working classes who were displaced by the scheme proposed. The city was growing rapidly in the direction of Blackboy-road, and the site would be a most valuable one for business premises, and was more suitable for such premises than private cottages, especially having regard to the fact that the policy of the council now in regard to the erection of working-men's dwellings was to provide gardens to the houses. It found practicable, a number of cottages might be erected at the rear of a range of business premises, but the council had been unable to find a site in the vicinity which they could purchase at a reasonable price for the erection of houses to accommodate residents displaced. The council, however, had decided upon a site known as the Exeter Nursery, where workmen's cottages could be put up at a reasonable cost and gardens provided. Mr. T. Moulding, city surveyor, said that the site of the nursery was below the sewer of a neighbouring road but it would not be drained by this sewer. There had been trouble with the sewers in St. Thomas at time of flood. If a builder applied to the council for sanction to erect houses on this site he should not object.

Featherstone U.D.C. (July 25th. Mr. Courtenay Clifton). £3,740 for the purpose of erecting workmen's dwellings.—The clerk, Mr. J. A. Haigh, stated that the council proposed to erect 159 houses at a uniform weekly rental of 6s. each. After an allowance for "empties," the estimated income would be £2,433 12s. The loan would be at the rate of 3¼ per cent. interest, and the repayment in regard to land would be spread over a sixty years, and as to

years as to the buildings. The surveyor, Mr. S. Chesney, explained the scheme. Each house, he said, would have a living-room, scullery (with bath), accommodation for stores, three bed-rooms and a garden. No private builder had provided better houses for 6s. a week.

Ilford U.D.C. (July 17th. Major C. E. Norton).—£1,057 for the purchase of land adjoining Suffolk-road, Seven Kings, as a site for a dust destructor.—Mr. H. Shaw, surveyor and engineer to the council, expressed the opinion that the price which the council proposed to pay—*viz.*, £325 per acre—was reasonable. The proposed destructor was of Horsfall pattern, and the site was a ¼-mile radius from the nearest buildings.

Ipswich T.C. (July 11th. Mr. F. O. Stanford).—£1,300 for the widening and improvement of Bramford-lane, Greyfriars-road, and the Seven Arches Bridge, London-road.—Mr. Will Bantoft, town clerk, explained that the work had been done at Greyfriars-road, where Messrs. Burton's works, having been reconstructed after the fire, gave them the opportunity of making the improvement. At Bramford-lane, in the vicinity of which many houses had lately been built, they had so far only set the fences back. In London-road there were two bridges, of which Handford Bridge had been widened about twenty years ago, the cost having been defrayed by loan. Since the bridge was widened the Education Committee and the Government inspector had called attention to the necessity for widening the Seven Arches Bridge, near which there was a public school. As this was a main highway from London to Ipswich and Yarmouth, and a great deal of motor traffic passed through, it was obvious that the bridge was very dangerous to children. Mr. E. Buckham, borough surveyor, stated with regard to the Seven Arches Bridge, that two-thirds of the work was now done. The palisading and parapet was not yet in hand. There was an excellent foundation. When completed the bridge would be widened from 18 ft. 3 in. to 35 ft. between the parapets, the same width as Handford Bridge.

Ludlow T.C. (July 26th. Mr. W. O. E. Meade-King).—£4,300 for the purchase and laying out of land adjoining Clee Hill-road, in the parish of East Hamlet, as a burial ground.—Mr. J. A. Spreckley, borough surveyor, said it was proposed to lay out about half the ground for 2,890 graves.

Rhymney U.D.C. (July 25th. Mr. W. H. Collin).—£6,800 for the erection of thirty houses in the Lower Rhymney district.—The evidence showed that in consequence of the council's persistency in abolishing the back-to-back dwellings and cellar tenements and making each a through house, and the Rhymney Iron Company's consistent efforts to comply with the mandate, there was now a shortage of dwellings, notwithstanding the large number of houses that had been built by private enterprise, clubs, &c. Mr. W. Beddoe Rees, who appeared for the Welsh Garden City Syndicate, said his clients were prepared to erect thirty houses with an equal number for the council, and in consideration of the construction of sixty, the Rhymney Iron Company, who were the landowners, had given the council ½ acre of land adjacent to the dwellings proposed to be erected. It was stated that the houses would be self-supporting. The cost of erection would fall upon the tenants, and not the ratepayers. The average cost per house for buildings, road construction, sewers, &c., would be £215 per house.

Rotherham R.D.C. (July 16th. Mr. A. W. Brightmore). £14,027 for the purpose of providing a water supply for the parishes of Bramley, Brampton-en-le-Morthen, Hooton Levitt, Laughton-en-le-Morthen, Maltby, Ravenfield, Ulley, and Wickersley.—Mr. J. H. Pickford, from the office of Messrs. Oxley & Coward, clerks to the council, stated that the district, because of colliery developments, was becoming thickly populated, and the parishes were for the most part dependent upon shallow wells for their water supply, making it desirable that the scheme should go forward. The supply of water from Sheffield was well known to be pure and wholesome, and a provisional agreement had been entered into, the price to be paid to Sheffield being 9d. per 1,000 gallons. Mr. B. Hey, sanitary engineer, also gave evidence.

Scarborough T.C. (July 18th. Mr. F. H. Tulloch).—£325 for the widening of Somerset-terrace.—The borough engineer, Mr. H. W. Smith, stated that this improvement was the cheapest the corporation had carried out for some time.

Sunderland R.D.C. (July 24th. Dr. Farrar).—£6,000 for the purpose of extending their hospital.—Mr. J. C. Wilson, clerk to the council, said it was proposed to build a new block to contain twelve beds for the treatment of diphtheria, to provide accommodation for six new beds in the scarlet fever block, and to make additions and improvements to the existing building. There was no opposition.

APPLICATIONS FOR LOANS.

Bristol T.C.—£2,678 for road widenings.

Devonport T.C.—£400 for works of paving.

Hinckley U.D.C.—£1,100 for laying out a recreation ground and the construction of a new road.

Loughborough T.C.—£1,303 for street improvement works.

Mirfield U.D.C.—£3,800 for sewage disposal works.

Southampton T.C.—£300 for a motor fire escape van, and £475 for superheaters and steel mains.

West Sussex C.C.—£3,540 for the purchase of convertible tractors and steam rollers.

LOANS SANCTIONED.

Bedwellty U.D.C.—£12,682 for a housing scheme near Pengam.

Billericay R.D.C.—£2,280 for erecting workmen's dwellings at Great Bursted.

Burnley R.D.C.—£5,200 for works of sewerage and sewage disposal at Foulridge.

Coleraine R.D.C.—£8,520 for workmen's dwellings.

Evesham R.D.C.—£10,025 for building sixty cottages.

Hull T.C.—£7,822 for the provision of an infants' school.

Kettering U.D.C.—£2,600 for the erection of an art gallery.

Llanelly U.D.C.—£5,100 for laying out Park Howard.

Loughrea U.D.C.—£1,900 for an improvement scheme.

Luton T.C.—£4,615 for a new boys' department at Hitchen-road school.

Mansfield T.C.—£400 for electricity extensions, and £200 for a road improvement.

Oxfordshire C.C.—£2,300 for a new school at Sonning Common.

West Bromwich T.C.—£4,500 for removing the tramway poles from the centre to the side of the road.

West Sussex C.C.—£15,000 for main road reconstructions.

FORTHCOMING INQUIRIES.

AUGUST.

	£
6.—**Acton.** For works of paving (Mr. F. H. Tulloch)	8,315
6.—**Colchester.** For works of sewerage (Mr. A. W. Brightmore)	820
6.—**Mansfield.** For street widening purposes (Mr. Edgar Dudley)	5,450
6.—**Newcastle-under-Lyme.** For electricity purposes (Mr. H. R. Hooper)	6,600
6.—**Reading.** For works of sewerage (Mr. H. Shelford Bidwell)	1,093
7.—**Bushey.** For private street improvement (Mr. F. H. Tulloch)	2,400
7.—**Bridlington.** For works of water supply (Mr. W. O. E. Meade-King)	260
7.—**Cambridge.** For the provision of county offices (Mr. M. K. North)	16,000
7.—**Newark.** For the provision of pleasure grounds (Mr. Edgar Dudley)	2,365
7.—**Norwich.** For sewerage and sewage disposal purposes (Mr. A. W. Brightmore)...	4,811
7.—**Sutton Coldfield.** For electricity, baths, sewerage and drainage purposes (Mr. H. R. Hooper)	6,671
8.—**Bridlington.** For street improvement works (Mr. W. O. E. Meade-King) ...	1,600
8.—**Cambridge.** For street improvement works (Mr. M. K. North)	3,960
8.—**Peterborough.** For street widening works (Mr. Edgar Dudley)	475
9.—**East and West Molesey.** For road improvement purposes (Mr. W. O. E. Meade-King)	1,019
9.—**Lowestoft.** For street improvement purposes (Mr. M. K. North)	2,324
10.—**East Dereham.** For burial ground purposes (Mr. M. K. North)	400

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Aberdeen £5,800, Boston £7,370; housing and town planning—Rhondda; refuse collection and disposal—Melton Mowbray; roads and materials—Croydon £20,600, Lancashire £15,000; sewerage and sewage disposal—Camborne £25,000; Hinckley £5,000, Middleton £25,000; water, gas and electricity—Nottingham £17,000.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

BUILDINGS.

Aberdeen T.C.—The corporation are advised by the Finance Committee to extend the accommodation of the fish market, at an estimated cost of £5,800.

Belfast T.C.—The new slipper Lassar baths at Ligoniel were formally opened last week. Mr. J. G. Gamble, of the city surveyor's department, was the architect, and the contractor was Mr. Isaac Copeland, Belfast.

Birmingham T.C.—The new offices of the Health Committee in Broad-street are to be structurally altered, at a cost approximately of £4,000.

Blyth U.D.C.—The tender of Messrs. Robson & Waddell, of Blyth, at £10,414, has been accepted for the erection of a new elementary school.

Boston T.C.—The amended estimate of the engineer, Mr. Webster, at £7,370, has been accepted for the new town bridge.

Brighton T.C.—A hostel is to be provided in connection with the grammar school, at a cost of £8,000.

Bristol T.C.—A report by the Baths Committee has been accepted recommending the erection of a new swimming bath for the benefit of the inhabitants of Bishopston, Horfield, and Ashley Hill district.

Cork R.D.C.—A building scheme is to be carried out for the provision of ten cottages, at £120 each.

Devonport T.C.—The tender of Mr. E. R. Lester, at £879, has been accepted for the erection of a swimming bath.

Durham C.C.—Mr. J. W. White's tender, at £5,039, has been accepted for a new girls' school at West Boldon.—An iron school is to be provided at West Stanley, at a cost of £1,437.

East Riding C.C.—The tender of Mr. J. T. Levitt, of Hull, at £3,693, has been accepted for a new school at Cottingham.

East Suffolk C.C.—Mr. W. C. Reade, of Aldeburgh, has secured the contract for building a new elementary school at Pakefield, at a cost of £5,177.—The tender of Messrs. T. Parkington & Son, of Ipswich, at £5,144, has been accepted for a new elementary school at Stowmarket.

Essex C.C.—A new secondary school is to be built at Southend, at an estimated cost of £20,127.

Leeds T.C.—The city engineer, Mr. W. T. Lancashire, has prepared plans for altering the market hall for the purposes of the tramway department.

Leyton U.D.C.—The tender of Mr. W. J. Maddison, of Canning Town, at £13,629, has been accepted for a new girls' and infants' school, and alterations to the Church-road School.

Llandrindod Wells U.D.C.—A new pavilion in the recreation ground of Llandrindod Wells, erected by the council at a cost of £6,000, and a free library in the town hall grounds, costing £1,600, which was provided by Mr. Andrew Carnegie, were opened on Saturday.

Luton T.C.—The tender of Mr. A. Cole, at £565, has been accepted for the erection of a new block at the hospital.

Nuneaton T.C.—Twelve slipper baths are to be erected near the electricity station, at a cost of £210.

West Riding C.C.—A new school is to be provided at Airton, at a cost of £874.

HOUSING AND TOWN PLANNING.

Birmingham T.C.—The council on Tuesday last sanctioned a town-planning scheme for East Birmingham at a cost of £69,000. The district comprised in the scheme covers an area of 1,443 acres, and Mr. Neville Chamberlain explained that this area had been divided into three zones, in one of which eighteen houses to the acre would be allowed; in another, which was more or less agricultural, twelve houses to the acre, and in the third fifteen houses to the acre.

Edinburgh T.C.—The Town Planning Committee recommend that the necessary steps be taken in connection with a planning scheme for the area of Bellevue on ground belonging to the Heriot and Hope Trusts. They also recommended the preparation of a scheme for an area on the west side of the city and one for ground in the parish of Corstorphine. The county council are already moving in the Corstorphine area, and it is proposed that the two bodies should work in harmony.

Rhondda U.D.C.—As the result of the investigations of two special Local Government Board inspectors, steps are to be taken to provide housing accommodation by the erection of dwellings with a kitchen, scullery, two or three bedrooms, and a bath in the scullery, at from 20s. to 24s. per month.

Rosyth T.C.—The town planning expert (Mr. Wilkes) has submitted his first set of plans for the laying out of the new town of Rosyth. An endeavour is to be made to have the final plans approved by the Local Government Board within nine months in order that builders may get started to the construction of the new town next spring.

Ruislip-Northwood U.D.C.—Notice has been given by the council that they have prepared a draft town planning scheme in relation to certain lands in the district, and in the rural district of Watford, in the county of Herts. Notice is also given that the draft scheme and maps showing the area of land included in the proposed scheme, and also showing particulars and details in relation to the proposed scheme, have been deposited at the council offices. The draft scheme and maps may be seen at the council offices aforesaid, and explanations or information with reference thereto will be given without payment of any fee during the period up to and including the 17th day of August, 1912.

Shrewsbury T.C.—The Improvement Committee have recently been considering plans for the development for building purposes of certain lands lying between Copthorne-road and Porthill-road, and the council have now concluded to make application to the Local Government Board for authority to prepare a town planning scheme in respect to this area of approximately 132 acres. With the exception of a few houses and gardens, the area consists of meadow land, and is well adapted for town planning.

PARKS AND OPEN SPACES.

Campbeltown T.C.—It has been decided to lay out a golf course at a cost of £200.

Edinburgh T.C.—The Parks Committee have recommended approval of sketch plans showing additions and alterations on the Tynecastle bowling green pavilion at an estimated cost of £150.

REFUSE COLLECTION AND DISPOSAL.

Lowestoft T.C.—In view of the expiry of the refuse removal contract in October, the surveyor, Mr. G. H. Hamby, was requested to submit a report on the practicability of carrying out the work by direct labour, and as a result it has been decided by the council to collect the refuse by means of their own vans and men.

Melton Mowbray U.D.C.—A sub-committee has been appointed to consider the provision of a refuse destructor.

ROADS AND MATERIALS.

Argyll C.C.—The Cowal District Committee have had correspondence with the secretary of the Road Board in connection with the road development of the district. The board asked that further particulars of the scheme of improvement on the Glencoe-Inveraray road be submitted before further grants be made, and the surveyor submitted two alternative schemes of road widening and improvement at a cost of £10,547

and £6,577. The chairman, with Maclachlan of Maclachlan and the surveyor, have been appointed to draw up a modified scheme.

Bootle R.D.C.—The highways surveyor, Mr. D. R. Dawson, estimates the cost of the necessary repairs to Seascale Hall-road at £352. The particulars have been sent to the parish council.

Bristol T.C.—Several road widenings are to be carried out at an estimated cost of £2,678.

Croydon T.C.—The council agreed on Monday last to widen West Croydon Bridge, at an estimated expenditure of £20,600, and to seek Parliamentary powers for acquiring properties in High-street, South-end, and Cherry Orchard-road in connection with widening schemes.

Heaton Norris U.D.C.—Earl's-road and Derby-road are to be made up at a cost of £1,037.

Lancashire C.C.—The Main Road and Bridges Committee recommend the reconstruction of the main Preston-road from the Freckleton Marsh gate to the Lytham boundary, at an estimated cost of £15,000. It is also suggested that the county council support the Fylde Rural District Council in an application to the Road Board for a grant towards the cost of the improvement.

Loughborough T.C.—Bridge-street is to be widened to a minimum of 40 ft. and repaved.

Lynton U.D.C.—The question of forming a new road from Hill's Ford Bridge to join the main Barnstaple-road, at a cost of £1,200, is under consideration.

Middlesbrough T.C.—Linthorpe-avenue and Oxford-road are to be made up at a cost of £1,000.

Shrewsbury T.C.—A tender has been accepted at £311 for improving the river wall and footpath opposite the county secondary public bowling green now in course of preparation.

Southampton T.C.—The borough engineer, Mr. J. A. Crowther, has been directed to report upon what additional land was required by him at the western shore for the storage of an adequate quantity of granite and road material for the making up and repair of the roads of the borough.

Southport T.C.—The borough surveyor, Mr. R. P. Hirst, is engaged in carrying through the boulevards extension from Eastbank-street, opposite the picture [illegible] Market-street.

Uckfield U.D.C.—The surveyor, Mr. E. Johnson, has been instructed to prepare plan and specification for the making up of Mill-lane. The cost of the work is estimated at £250.

Westminster B.C.—The Improvements Committee have received a notification from the London County Council on behalf of the Grosvenor estate for a new building line at the corner of Oxford-street and Park-lane. It is proposed to give up to the public way some 300 sq. yds. in Oxford-street, 167 sq. yds. in Park-lane, and 96 sq. yds. in North-row. The city engineer, Mr. J. W. Bradley, estimates the cost of the paving in Oxford-street at £480, in Park-lane at £350, and in North-row at £100, a total cost of £930, exclusive of the cost of alterations to main, cables and boxes, which will probably not exceed £200. The committee approved the scheme, and advise the council to undertake the necessary paving works.

West Sussex C.C.—In view of the danger arising from heavy traction engines standing in the roadway for the purpose of taking water, and also in consequence of the damage which might be done by these heavy engines standing on bridges, it has been decided that a notice be posted on each of the county bridges warning drivers of locomotives that their engine must not remain stationary on any bridge, arch, or culvert, or within 10 ft. from the face of the abutment of any bridge, arch, or culvert. The county surveyor has reported that the question of the provision of water can be economically and satisfactorily dealt with by the [illegible] and has reported in detail regarding the tenders received from wide contractors, and requested permission to prepare and submit for consideration particulars of a scheme for putting this into effect next season. The council have agreed that this be carried out. The county surveyor has been authorised to purchase four convertible tractors and steam rollers from Messrs. Aveling & Porter, Limited, at a cost of £2,540.

SEWERAGE AND SEWAGE DISPOSAL.

Caerphilly U.D.C.—Messrs. Wilcox & Raikes, engineers, have been instructed to prepare plans and specifications for the sewering of Nelson, and steps are to be taken to acquire the necessary land for disposal works.

Camborne U.D.C.—The Local Government Board has given a general consent to the North Cliffe sewerage scheme, for which a loan for £25,000 has been obtained.

Hinckley U.D.C.—The Highways Committee are considering a proposal to construct a new main outfall sewer, at an estimated cost of £5,000.

Larne R.D.C.—The tender of Mr. W. Geddis, of Belfast, at £3,027, has been accepted for the sewerage of the parish of Groenisland.

Lymm U.D.C.—Messrs. Bennie & Thompson, of Warrington, have obtained the contract for sewerage works, at the price of £6,917.

Middleton T.C.—Messrs. J. Diggle & Son have prepared plans of the proposed extensions and alterations at the sewage works. The scheme has been based upon a dry-weather flow of 1,300,000 gallons per day, including subsoil and trade waters. To meet the latest requirements of the Local Government Board the scheme makes provision for the construction of two storm-water tanks for the treatment [illegible] storm water, 100 ft. long, 43 ft. wide and 7½ ft. deep, containing in the whole 400,000 gallons. An installation of electrically driven plant has been provided for to supplement the present gas-power plant. The total estimated cost of the complete scheme is £25,000.

Tenby T.C.—The dilapidated and unsafe condition of the culvert is fully reported upon by the surveyor, Mr. Bertie Morley, who proposes that the whole of the trunk be opened out, the present sides thrown down and a 4-ft. diameter cast-iron pipe outfall laid on the present trunk bed for a foundation and carried to the original length of the outfall, 600 ft. from the air-shaft, at a cost of about £1,300.

West Bridgford U.D.C.—The new bacterial sewage purification and pumping plant was inaugurated last week. The total cost of the installation was £4,031. A tribute was paid to the surveyor, Mr. William Pare, for the valuable assistance he rendered in connection with the scheme.

WATER, GAS, AND ELECTRICITY.

Aberystwyth R.D.C.—It is proposed to provide a water supply for Llanbadarn.

Chester T.C.—The electricity department earned a nett surplus last year of £4,251.

Glasgow T.C.—It is recommended by the Watching and Lighting Committee that the lampfitters' labourers employed in the lighting department whose wages at present are at the rate of 22s., rising to 23s. per week, be paid a minimum of 23s. per week, with increments rising to 25s. per week after five years' service.

Hinckley U.D.C.—The tender of Messrs. Bever, Dorling & Co., Limited, of Bradford, at £1,210, has been accepted for increasing the existing pumps at Snarestone Waterworks pumping station; that of Messrs. Gunson & Co., Limited, of Leicester, at £180, for a new steam winch and head gear to the well at Snarestone; that of Mr. W. Flavell, of Hinckley, at £35, for a new iron winch head; and that of Mr. E. Gr[illegible] of Hinckley, at £5, for a new [illegible] at the depot.

Kingston-upon-Thames T.C.—The debit balance on [illegible] working of the electricity undertaking for the year [illegible] against £1,192 the previous year.

Malton R.D.C.—A plot of land at Amotherby is to be purchased for a water supply for the street villages. A water diviner has reported that there is water in abundance in the locality.

Nottingham T.C.—Exhaust turbines and cooling towers are to be installed at the St. Ann's power station, at a cost of £17,000. It is expected that the consequent saving in the cost of producing current will be a little over £3,000 per annum. The cost of the installation is to be drawn from the reserve fund.

Nuneaton T.C.—The tender of Messrs. James Simp[illegible] & Co., of Leicester and Newark, at £1,897, has been accepted for the installation of pumping plant at the Gas & Oil pumping station. The council has also accepted the tender of the Stanton Ironworks Company, Limited, for about 200 tons of 9-in. pipes.

Southampton T.C.—Upon the recommendation of the water engineer, the council have decided to purchase superheaters and steel mains for the waterworks, at a cost of £475.

Twickenham U.D.C.—The tender of the Brentford Gas Company has been accepted for one year for street lighting. The terms are £1 11s. 2d. per annum for a burner of approximately 80-candle power, which, with the present average cost of maintenance, cleaning, lighting, extinguishing, repairs, and renewals (£1 3s. 6d.), gives a total cost of £2 14s. 8d. per lamp per annum. The tender of Messrs. Parkinson & W. & B. Cowan, Limited, for the supply of three dozen 15-in. square street lanterns, at 34s. each, has also been accepted.

MISCELLANEOUS.

Aberdeen T.C.—The profit accruing from the tramway undertaking last year was £11 158, the largest ever recorded, and an increase of £3,554 over the previous year.

Cardiff T.C.—The nett surplus on the working of the tramways last year is £18,522, an increase of £6,488 compared with the previous year.

Glasgow T.C.—By 30 votes to 17 the council last week rejected a proposal to establish a works department charged with the duty of co-ordinating the works of the various departments, and where practicable submitting tenders for the work of the various departments of the corporation to be carried out by its own workmen in the direct pay of the corporation.

Southampton T.C.—The offer of Messrs. Shand, Mason & Co., at £30, for two manual fire engines has been accepted, and it has also been decided to purchase from the London County Council a motor escape van for £300.

York T.C.—The city engineer, Mr. F. W. Spurr, has been instructed to obtain tenders for a steam wagon and trailer at an estimated cost of £650.

PERSONAL.

Mr. S. E. Burgess, M.INST.C.E., borough engineer and surveyor of Middlesbrough, has been elected a Licentiate of the Royal Institute of British Architects.

Mr. T. Henry, surveyor to the East Retford (Notts) Rural District Council, has been voted £25 a year (instead of 10s. 6d. for each case) for the inspection of petrol licences.

Mr. James S. Hurst, at present deputy borough surveyor of Bridlington, is recommended by a special committee for the appointment of borough surveyor and inspector of nuisances of Southwold.

Mr. Samuel Gladwin, quantity surveyor under the Derbyshire County Council, has been appointed quantity surveyor in the architect's department of the Essex County Council, at £200, rising to £250 a year.

Mr. Alfred Barlow, ASSOC.M.INST.C.E., chief assistant in the city engineer's office at York, has been appointed city engineer and surveyor of Ripon in succession to Mr. T. P. Frank, ASSOC.M.INST.C.E., who was recently appointed borough surveyor of Newark-on-Trent. The salary is £150, rising to £200.

Mr. Frank Chappell, the town engineer of Oshawa Ontario, is a native of Cardiff. After completing a five years' apprenticeship course in the workshop and offices of the Mercantile Pontoon Company, ship builders and repairers, of Cardiff, and winning a scholarship, he began a course of study in civil and municipal engineering at the University of South Wales, from which he graduated in 1907. Going to Canada, he entered the service of the Grand Trunk Railway Company at Montreal; and in 1908 he attended the Department of Surveying of McGill University, and later took up post-graduate work in municipal engineering there. After completing this course he engaged in private practice until 1909, when he was appointed town engineer and superintendent of waterworks at Oshawa.

FOR OTHER ADVERTISEMENTS

See End of Paper.

GOOD CLERK OF WORKS required by the Surrey County Council, for erection of a Ferro-Concrete Bridge. Engagement about four months. Previous experience in ferro-concrete bridge construction and pile driving essential. Application, stating age and experience, with testimonials or references, and salary required, to Mr. A. Dryland, M.INST.C.E., County Surveyor, County Hall, Kingston-on-Thames.

COUNTY OF SURREY.

COUNTY SURVEYOR'S DEPARTMENT.

Required, an Engineering Assistant. Commencing salary £120, rising by annual increments of £10 to £200.

Must be good and expeditious draughtsman, and capable in preparing specifications, quantities, and estimates, and calculations of stresses, &c.

Also an Office Clerk. Commencing salary £80, rising by annual increments of £5 to £130.

Must be good shorthand writer and typist, with a knowledge of accounts. Experience in a surveyor's office desirable.

Forms of application setting forth the conditions of the appointments may be obtained of the undersigned, and must be sent in duly filled up by Friday, the 16th August, 1912.

A. DRYLAND,
County Surveyor.

County Hall,
Kingston-on-Thames.
July 31, 1912.

SHANGHAI MUNICIPAL COUNCIL.

PUBLIC WORKS DEPARTMENT.

SECOND ASSISTANT ENGINEER.

Applications are invited for the post of Second Assistant Engineer in the Public Works Department.

Candidates should be about 24 years of age and unmarried. Salary Taels 250 per mensem, without allowances, under a three years' agreement. The value of the Tael at present rate of exchange is about 2s. 8d., but it is liable to fluctuation. Particulars of the appointment may be obtained of the Council's Agents, and applications in Candidate's own handwriting, stating qualifications, experience, &c., accompanied by copies of not more than three recent testimonials, and endorsed "Second Assistant Engineer," should be forwarded on or before August 16th, 1912, to

MESSRS. JOHN POOK & CO.,
Agents for the Shanghai Municipal Council.

63 Leadenhall-street,
London, E.C.
July 31, 1912.

ATHERSTONE RURAL DISTRICT COUNCIL.

WATER SUPPLY.

TO WELL BORERS AND OTHERS.

The above Council invite Tenders for Sinking a Borehole and Testing the yield of Water therefrom in the Parish of Polesworth, within their District.

Specification and Form of Tender may be obtained at my office upon payment of the sum of £1, which will be refunded upon the receipt of a *bona-fide* Tender and the return to me of all documents supplied.

Sealed Tenders, in the envelopes supplied, must reach Mr. W. A. Hatton, Clerk to the Council, Atherstone, not later than 9 a.m. on Tuesday, the 13th August, 1912.

The Council do not guarantee the acceptance of the lowest or any Tender.

H. J. COLEBY,
Engineer and Surveyor.

Council Offices,
102 Long-street,
Atherstone.
July 31, 1912.

BOROUGH OF SOUTHPORT.

The Corporation of Southport require immediately the services of a Surveying Assistant for a few months. Must be experienced in Surveying and Levelling, and be a good Draughtsman. Wages Two Pounds Ten Shillings per week. Applications, stating age, experience, when at liberty, and accompanied by not more than three testimonials, to be sent to the undersigned not later than 10 a.m. on Monday, August 12th. Canvassing will disqualify.

J. ERNEST JARRATT,
Town Clerk.

Southport.

Notes on the Extension Seawards of the Gynn Outfall Sewer at Blackpool.*

By JOHN S. BRODIE, M.Inst.C.E., Borough Engineer and Surveyor, Blackpool.

The following note may be of interest to the members of the congress, describing the method of extending seawards a main outfall sewer on the system adopted by the author at Blackpool in 1907, and which has since been adopted at other seaside towns.

The old outfall at Gynn, Blackpool, was 1,304 ft. in length, and consisted of cast-iron flanged pipes, 3 ft. internal diameter, in 6 ft. lengths, bolted together and supported on timber piles and cradles. This outfall was laid in 1898, at the cost of £6,755, or at the rate of £15 10s. 9d. per linear yard. The work in 1898 was carried out by a contractor, and was never really completed to its intended length, which was 1,400 lin. ft., on the ground that the difficulties in connection with stormy seas and deepening water were so great that further extension was impracticable. Since then, sand and silt have formed seaward of the old outlet, and it has been found necessary, in order to prevent the sewage from lodging on the foreshore, to extend the outfall across the recently formed sand banks into deep water seaward of the same.

The present extension has been made by means of a continuous steel tube, 3 ft. internal diameter, of solid welded pipes in 18-ft. lengths, formed of open hearth steel, ⅛ in. thick, riveted together with cover straps 10 in. wide, ⅛ in. of thickness, with a double row of ¾-in. rivets, spaced 3 in. centre to centre. The quality of the steel was such that the ultimate tensile breaking stress averaged 26 tons per square inch, with an ultimate elongation of 20 per cent in 8 in. The whole of the tube, both inside and outside, has been heavily coated with an improved bituminous preservative. In order that the new tube should fit properly on to the flanged end of the old outfall, 10-in. square Karri wood piles were driven on each side of the trench at intervals of 6 ft. centre to centre, and connected by half-timber walings, to which close timbering, 3 in. thick, was secured, for a distance of 86 ft.

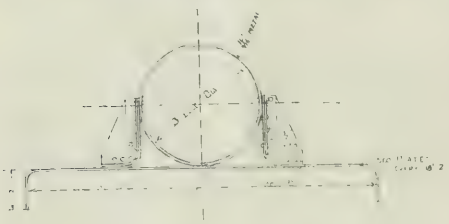


Fig. 1.

Cross vertical section of tube.

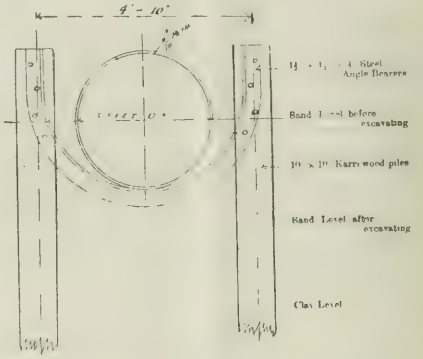


Fig. 2.

Cross section, showing piles and cradling to receive connecting end of tube.

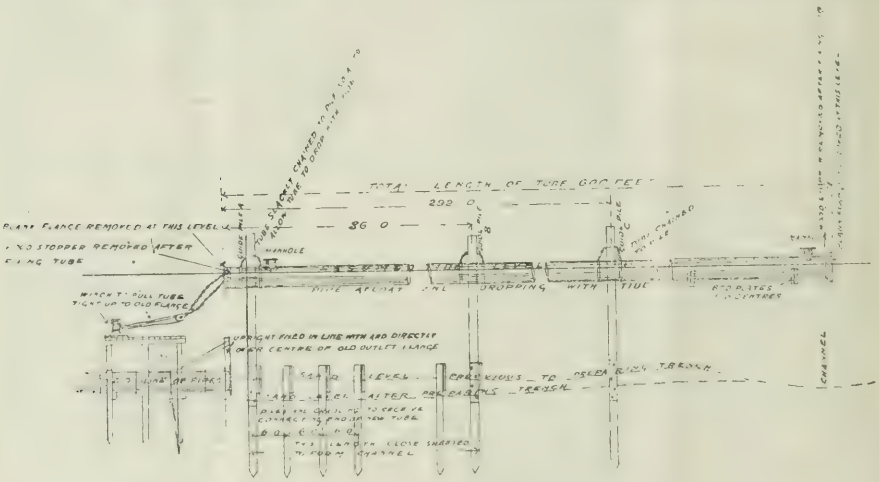

TOTAL LENGTH OF TUBE 600 FEET
292 0
86 0
PLATE FLANGE REMOVED AT THIS LEVEL
MANHOLE
DROPPING WITH TIDE
UPRIGHT FIXED IN LINE WITH AND DIRECTLY OVER CENTRE OF OLD OUTLET FLANGE
CROSSING TO OSBORNE ROAD TRENCH
CHANNEL

Fig. 3.

Longitudinal section, showing method of dropping tube in position.

Blackpool Outfall Extension Sewer.

* Paper read on Tuesday at the Conference of Engineers and Surveyors held in connection with the Annual Congress of the Royal Sanitary Institute at York.

The tube was built up, for a total length of 600 ft., on the foreshore above high-water mark, at a distance of 3 miles along the coast line from its ultimate destination. In order that, when laid, the tube should not be subject to a rolling or rocking action on the sea bottom, caused by heavy on-shore gales, transverse steel bed-plates, 9 ft. long by 12 in. wide, and ½ in. in thickness, turned down at the ends for a length of 12 in. as shown in Fig. 1, were riveted to the tubes at 18 ft. centres, except for the 86 ft. length referred to above, where the tube rests on the Karri wood and steel cradles.

After being completed the tube, which is provided with a 24-in. manhole and cover at each end, and also with blank flanges at the open ends, was filled with water and tested to a pressure of 50 lb. per square inch, at which pressure it was found to be

perfectly tight. Timber watertight stoppers, easily removable, were then inserted at each end of the tube, close to the manholes above referred to, and caulked up watertight. The blank flanges were then securely fastened to the ends of the tube, and the manhole covers on the two manholes, one at each end, were also secured and made perfectly watertight. The tube was then launched from above high-water down the foreshore, to such a level between high and low water marks as would enable it to float with a 24-ft. spring tide. It was then floated into the sea, and towed by means of a steam tug for a distance of 3 miles, and was adjusted at high water over the trench, by means of guide piles as shown in Fig. 3, where it was ultimately intended to lie. The blank flanges at both ends were then removed, the temporary stoppers maintaining the tube afloat. On the tide receding, the tube dropped down into its permanent position, the flow of sewage being held up temporarily by the shore penstock valves; the shoreward-end flange was then bolted up to the flange of the old cast-iron pipe, by means of 12 1⅛-in. steel bolts, and so secured in continuity of the old outfall. The manholes at both ends were then opened, the temporary timber stoppers were removed, the new outfall was then ready for the passage of the sewage.

The cost of the steel tube, which was constructed under contract by Messrs. Clayton, Son & Co., Limited, of Leeds, was £1,358, and the cost of launching, floating and laying was £592, a total cost of £1,950, or at the rate of £9 15s. per lineal yard.

Fig. 1 shows a plan and section of the new outfall tube sewer.

Fig. 2 shows the cross-section of the sewer as laid on the cradles for a length of 864 ft. seaward of the end of the old outlet.

Fig. 3 shows the tube afloat, dropping down into its position on the receding tide.

The tube was manufactured and delivered on the foreshore at Blackpool by Messrs. Clayton, Son & Co., Limited, of Leeds, and the launching, floating and laying has been carried out departmentally under the author's assistant, Mr. H. Banks.

CORRESPONDENCE.

"*Be calm in arguing; for fierceness makes*
Error a fault and truth discourtesie."
—Geo. Herbert, "*The Temple.*"

BACTERIA.

To the Editor of The Surveyor.

Sir,—Although a constant reader of your excellent paper, it is seldom I have troubled your correspondence columns. I think, however, this now seems necessary, as otherwise some misapprehension may arise over your leading article last week, and what I was reported to have said when proposing the vote of thanks to Mr. Ransom for his useful paper on "Bacteria" read at the annual meeting of the Institution of Municipal and County Engineers at Caxton Hall, Westminster.

The shorthand reporter has unfortunately missed out the two small words "do not," which materially alter the meaning of my observations. This may have been my fault for not speaking more clearly, as I notice one or two other small omissions from the verbatim report, a copy of which I have now obtained.

Referring to the sterilisation of milk, &c., the words I actually said were "as by so doing we *do not* only eliminate pathogenic organisms, &c." It would have been absurd to have made the statement as printed, which is manifestly incorrect; but my point was that in addition to the elimination of pathogenic or harmful bacteria from water, milk and other foodstuffs—which everyone desires—the process of sterilisation removed many other bacterial organisms which may be neutral or even beneficial to the human body, or probably advantageous in counteracting the influences and effects of other harmful bacteria.

It is, I think, recognised by medical men, and also by bacteriologists, that many sterilised articles are particularly susceptible to harmful influences if exposed for only a short time in a bad atmosphere, and it is probable they may then take up other bacterial organisms, which may be even more harmful than those originally dealt with.

Where material is known to be polluted with definite pathogenic bacteria, it would, of course, be wise to adopt the best-known method of dealing with same, which at present is sterilisation, but I am of opinion that the treatment of foodstuffs will not be the complete sterilisation of all bacterial life, but only the elimination of pathogenic organisms so soon as bacteriologists or scientists in the future have discovered the means for effecting such treatment.

You also add "How would Mr. Willis strengthen the phagocytes, &c.?" Surely this is a needless question, since it is ancient history that the white corpuscles of the blood are the fighting element against disease germs. The improved sanitary condition of homes, cleanliness of person, wholesomeness of solid and liquid foods, and obedience to the ordinary laws of health, are all helpful and even necessary to the attainment of this object, while I have no doubt medical science will even add to the above brief list of measures for improving the general health of the individual, as well as the community, and you will probably admit disease germs do not thrive as a rule in persons in perfect health.

Regretting to trouble you to insert this correction.—Yours, &c.,

Edward Willis.

Town Hall, Chiswick.
July 30, 1912.

[Our apologies are due to Mr. Willis for the error in the report of his speech, and under the circumstances our criticism was, to a large extent, out of place. We quite agree with all that Mr. Willis says in the last paragraph of his letter, but in his speech he seemed to deprecate the use of sterilisation, preferring rather to depend upon general methods of improving conditions of health. Until the white corpuscles or "phagocytes" of every single person, from infants upwards, are in such excellent fighting trim that they are capable of successfully resisting the attacks of any number of disease germs of any kind, we consider that sterilisation affords a valuable means of protection.—Ed. The Surveyor.]

MOLESWORTH'S FORMULA FOR MASONRY DAMS.

To the Editor of The Surveyor.

Sir,—I notice in your issue of July 19th a reference to an objection to my formula for masonry dams on the ground that it does not take into account the specific gravity of the masonry.

May I draw your attention to some remarks I made on this subject in the discussion of Prof. Kreuter's paper on masonry dams (p. 84, "Proceedings" of the Institution of Civil Engineers, Vol. cxv.), in which I said that in 1873 I had been asked to devise some simple formula which would give results approximate to the complicated formulæ of the French engineers. I stated in discussion that

> "at the outset I had discovered a circumstance which had much simplified my labours, namely, that the weight of masonry did not materially affect the profile of the dam, because, though heavier masonry generally involved increased pressures on the base of the dam, yet the resultant pressure was thrown further away from the outer face, and there was not a greater *maximum* pressure on the wall."

An inspection of the section (page 86, vol. cxv.) shows an extraordinary coincidence, under varying limits of pressure and density of masonry, between the results of my formula and those of the more complicated formula of M. Bouvier, which take into account the density of the masonry.

The sections given on page 87 also show an extraordinary coincidence between the results of my formula and actual practice.

My formula, as given on page 315, Molesworth's Pocket Book, is combined with a provision to allow for the weight of masonry (in the formula $y = \frac{x}{\sqrt{s}}$ as a minimum), to keep the resultant of pressure within the middle third, as recommended by Rankine, where s = the specific gravity of the masonry.

In practice, however, I have never found it necessary to use this correction as a minimum.—Yours, &c.,

Guilford L. Molesworth

The Manor House,
Bexley, Kent.
July 30, 1912.

Institution of Municipal and County Engineers.

ANNUAL GENERAL MEETING IN LONDON.

The first day's proceedings at the recent annual meeting of the Institution of Municipal and County Engineers included the consideration of the following papers: -

TOWN PLANNING: LAYING OUT NEW TOWNS AND CITIES.

By W. H. Price,
Sewerage Engineer's Office, Leeds.

Town Planning played so prominent a part at the last annual meeting, that it is only the well-known interest of the past-president and the members generally in the subject that induces the author to offer still another paper on town planning. The laying out of a new town or city rarely falls to the lot of anyone in these days, though Barrow and Eastbourne, and on a smaller scale, Port Sunlight, Letchworth, and other places, have been laid out and developed during the lifetime of the present generation. Speaking generally, it is to the newer countries, such as America, or our colonies and dependencies, that the town planner must look for the best opportunities for showing his skill in the designing and laying out of new towns and cities.

The laying out of Delhi as the capital of India, and of the Federal Capital of Australia, are two of the largest and most recent schemes offering scope for the present-day town planner, and it is a matter for congratulation to all members of the institution that one of their past-presidents should have been honoured by the Government as being the first man selected for the work of laying out Delhi. That the work of Mr. Brodie and the gentlemen associated with him in the laying out of Delhi will be of the greatest interest and be extremely useful to all members of our institution there can be little doubt, and it is sincerely to be hoped that at some future time Mr. Brodie will be able to give to his brother municipal engineers the benefit of his experience in the laying out of this historic city.

Although the conditions of the competition recently promoted by the Australian Government for laying out the Federal Capital were not sufficiently inviting to induce many Englishmen to submit schemes, the competition still offered one of the few opportunities for putting into practice on a large scale the teaching of the past few years on town planning. Though the Federal Capital will probably never equal the size and magnificence of Delhi, it is still of sufficient importance to afford great scope for the skill and imagination of the engineer and architect; while it presented an opportunity for a young man to try his "prentice hand" that may rarely fall to his lot in the future.

The author is not prepared to claim any great merit for the scheme, which is described in the latter portion of the paper, and for which he was jointly responsible; but he is hopeful that the experience gained in its design will be helpful to his fellow-students, if not to the older and more experienced members, of the institution. Experience is the best teacher, and it is only by actually sitting down to design such a scheme that one finds out his limitations and the difficulties with which the subject bristles, or learns how to apply the experience and teaching of past and present town planners to the requirements of to-day and the future.

It may be laid down as an axiom that each particular town or city will have some special characteristic or distinctive feature that will influence and dominate the whole design. The social, civic, and industrial character of the city, and its situation and general topographical character, have all to be carefully considered, and given their proper importance and place in the design. While some special feature is almost bound to predominate, there are still many features common to all cities; and it is possible to lay down something like general rules, while recognising that exceptions will have to be made in particular cases. Among the first essentials for all well-planned towns are:

(1) The provision of an adequate water supply.

(2) An efficient sewerage and drainage system.

(3) Proper sanitary arrangements, scavenging, and the removal and disposal of house refuse.

(4) The construction of main, secondary and residential roads, and streets and bridges.

(5) A railway system, tramways, or other means of communication.

(6) Gas and electricity for lighting or power, and hydraulic, pneumatic, or other forms of power.

(7) The provision of parks, recreation grounds, and open spaces.

(8) Public, industrial, and residential buildings, the necessity for architectural and artistic treatment of the public and private buildings, parks, &c.

In order to prepare a town plan for carrying out these works it is first necessary to define the area to be dealt with, estimate the probable growth and development for thirty or fifty years, and decide upon the character of the town. The site having been carefully selected with due regard to obtaining a good supply of water, disposing of the sewage, and the convenience and amenities of the population, the area should next be carefully surveyed and a plan made, preferably to a scale of not less than 1/2,500, showing all the natural features of the area, such as woods, trees, rivers and streams, or hills, and giving contour lines at every 5 ft. or 10 ft. Models of the site are unnecessary where a plan contoured to every 5 ft. is provided. If a river or stream runs through the site the flood level should be shown, and in the case of a seaside town or tidal river the H.W.M.O.S.T. must be given.

Having obtained our contour plan with the natural features of the site, we next proceed to locate the different areas, such as government, civic, commercial, residential and industrial areas. With the growth of imperial officialism it is probable that most large towns will in the near future require an area for Government offices; but, except in the case of a capital city, these can generally be combined with, or merged in, the civic area. In a capital city the Houses of Parliament with the Government offices will occupy the most important position, and these with the civic area embracing the city hall and municipal offices should have a central and dominating position. The commercial and shopping area will generally be best placed between the civic and residential areas, and the residential area will occupy the zone outside the central area and extend to the outskirts of the city.

The industrial area should be located so that the prevailing winds will carry away the smoke from factories without nuisance to the residential or other areas. Its convenience to railway, river, or canal is a matter of great economical importance to the industrial interests, as well as of convenience and comfort to the residents generally, by avoiding carting goods through busy streets. The planning of the principal streets and boulevards is perhaps the most important part of the laying out of a city. When the city is to be large and important its beauty depends very largely on the laying out of its streets, boulevards, bridges and parks. The direction, width, gradient, and the laying out of the streets so as to provide vistas of the principal buildings, and the provision of squares, circuses and crescents, are important points, and call for very careful consideration. The question of straight or curved streets is one very largely of convenience *versus* picturesqueness. Generally, it may be said that in the business areas the streets should be wide, direct, and have as easy gradients as the physical character of the site will permit; while in the residential areas curved, irregular and undulating streets will add to the beauty of the district, and will frequently prove more economical in construction.

The formal or informal systems of town planning, with the streets laid out rectangularly or radiating in the former case, and as rings or with irregular lines and gradients in the latter, each have their advocates. The wise course in this, as in other matters, is to avoid extremes and refuse to be bound to any one system. In practice it will generally be found that the rectangular and radiating systems are most suitable for the central and business areas, while the ring boulevard on the outskirts of the town is most convenient, and irregularity of planning in the residential portion of the town enhances the charm of the district, and adds to the amenities of the residents.

The widths of the streets, while mainly governed by the traffic requirements, must also be considered in connection with the size and architecture of the buildings. Tall or imposing buildings placed in narrow streets not only lose in architectural effect, but suffer from a sanitary point of view through want of light and air. On the other hand, too wide streets in working-class districts tend to the building of high tenement houses and flats, and overcrowding. The cost of the land, as well as the cost of construction of streets, must be borne in mind in deciding the width of streets, for where land is practically obtained for nothing and materials obtained on the spot, as in the case of the Federal Capital of Australia, a greater width can be provided than in the case of London or Berlin, where land is costly, and materials are only obtained from outside the city. The sale of great advantage to be able to transport coal or other necessaries by subway. In many towns, as at Chicago, underground railways or subways would allow the goods stations to be located some miles outside the city, and the goods conveyed to the doors of the users in various parts of the town without interfering with the traffic in the streets. It is not desirable to have underground railways for passengers, but this can only be avoided in large towns by having roads of ample width to allow tramcars or motor 'buses to run without interfering with other traffic.

The tramway, trackless tramcar, and the motor 'bus will probably all find a place in the design of an up-to-date city. The tramway is likely to be most economical and convenient in the central and busy parts of the town, while the greater flexibility and saving in track of the trackless trams or motor 'buses

Proposed Lay-out of Australian Federal Capital.

(Plate 1.)

the land for building purposes, again, places at the disposal of the Australian Government funds for laying out the streets, bridges and parks on more generous lines than the town or city where the land belongs to a number of private owners.

The majority of the bridges in London and throughout the country are too narrow for the traffic they carry, and in the case of a capital city it is desirable that the bridges should be of an imposing width, and of a monumental character.

The disturbance of the roadways of our principal streets through making connections for water, gas, electricity and other purposes is a source of great inconvenience to pedestrians, a danger to vehicular traffic, and an injury and loss to all engaged in business in such streets. That subways should be provided for pipes to avoid breaking up the roads is certainly desirable in the case of new cities, and in these days of coal and transport workers' strikes it will be a make them preferable for serving the outlying districts of the city.

A central railway station with suburban stations convenient to the residential areas are required. The goods station or marshalling yard should be placed at a spot where it taps the goods traffic coming into the city, and it should be convenient to the industrial area, with rails running into the chief factories or workshops, so as to save cost of transhipment, or carting through the city.

Parks and recreation grounds are needed in all cities, and as far as possible all natural features, such as trees, forests, watercourses, hills, or ravines, should be preserved, and incorporated in the design of the parks. Low-lying land near a river which is unsuitable for building purposes can generally be utilised for recreative purposes, and forests and hills form a natural belt of woodland and park, which not only present a

splendid outlook from the city, but tend to preserve the health and amenities of the inhabitants.

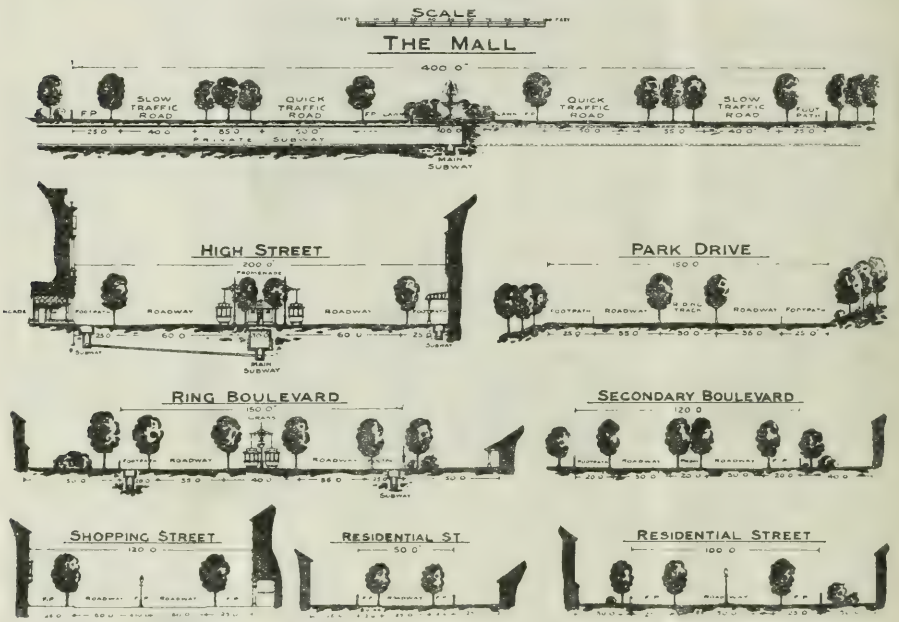
The chief religious and educational buildings should be grouped together, and the cathedrals and university should have dominating positions so as to form a good landmark from all parts of the city. Smaller churches and schools should be located in various areas suitable to the requirements of the district. The art gallery, museum, library, and places of entertainment should be centrally situated, with baths, drill hall, fire station, markets, hospitals and cemetery in convenient spots.

The water supply is of great importance, and whether this can be obtained from the hills or lakes as an upland surface supply, from wells or springs, or from a river, can only be decided by a careful study of the physical character of the locality, with full particulars of the rainfall over a number of years, and a thorough knowledge of the geological formation. The selection of the gathering grounds, river or wells, with sites for impounding and service reservoirs, filters or pumping stations, and the arrangements for the distribution of water, all call for the expert services of the engineer.

The question of separate supplies for potable, trade or sanitary purposes, will also have to be considered; dentally making possible the reclamation of low-lying lands for parks or recreation grounds; or for the provision of weirs for holding up the river waters for boating and other purposes during the dry season, all call for engineering skill and experience.

Scavenging and watering of streets play an important part in the well-being of any town, and the provision of suitable means for transporting and disposing of the scavenged materials, or for watering and washing the streets, has hardly yet received that close attention and study which it deserves.

The collection and disposal of refuse is another problem waiting fuller consideration. While the introduction of the refuse destructor has made a great improvement in the disposal both from the sanitary and economical point of view, the method of collection still leaves much to be desired. No method of house-to-house collection, with its vast amount of hand labour and untidy littering of the streets, can be considered satisfactory. It is not only desirable, but it also appears practicable and economical to provide for the removal of all dust and household refuse by pneumatic power, worked on the vacuum system. The vacuum cleaner has been in use for several years for removing dust from domestic articles. Sewage is now drawn to a



Street Sections.

(Plate 2.)

for unfiltered water can not only be used safely for many purposes where pure filtered water can now be badly spared, but it may also be possible to utilise many sources where the chemical or bacterial conditions make the water unsuitable for drinking purposes.

The sewerage system and the disposal of the sewage are important matters in the laying out and planning of a town. The engineer designing a scheme for a new city will, in the laying out of his roads and streets and the allocation of his different areas, constantly have to keep before him the lines and gradients of his sewers, and the position of the outfall or sewage disposal works. The obtaining of a purely gravitation scheme and avoidance of pumping if possible, are points which will require his careful consideration.

Storm water is frequently more difficult to deal with than sewage, though, where a river or good watercourses are available for discharging into, they simplify the difficulty to a great extent. On the other hand, the river or watercourse is frequently an additional source of trouble, owing to the necessity for prevention of flooding in the districts adjoining the river or watercourse. The impounding of the flood waters by reservoirs or lakes, or controlling the floods by raising the embankments of the river, and incicentral station by vacuum pumps at several places; and as we have pneumatic tubes for the conveyance of letters and parcels, there is no reason why the system should not be adopted for refuse collection in preference to the unsightly and insanitary method of loading by hand into carts or vans. The refuse would be simply tipped into a bin or hopper at each house or shop, connected to the pneumatic tube and controlled by valves, and be drawn to the refuse destructor, where it could be fed directly into the furnaces without handling. The steam generated from the destruction of the refuse would be sufficient to provide the greater part of the power required for the vacuum pumps, and it would therefore prove to be a very desirable, sanitary and economical method of collection.

The paper up to the present has dealt chiefly with the engineering and purely practical portion of town planning; and while it can certainly be claimed that these are not the least important, it can readily be admitted that the architect, sculptor and landscape gardener have an important part to play in the development of the town.

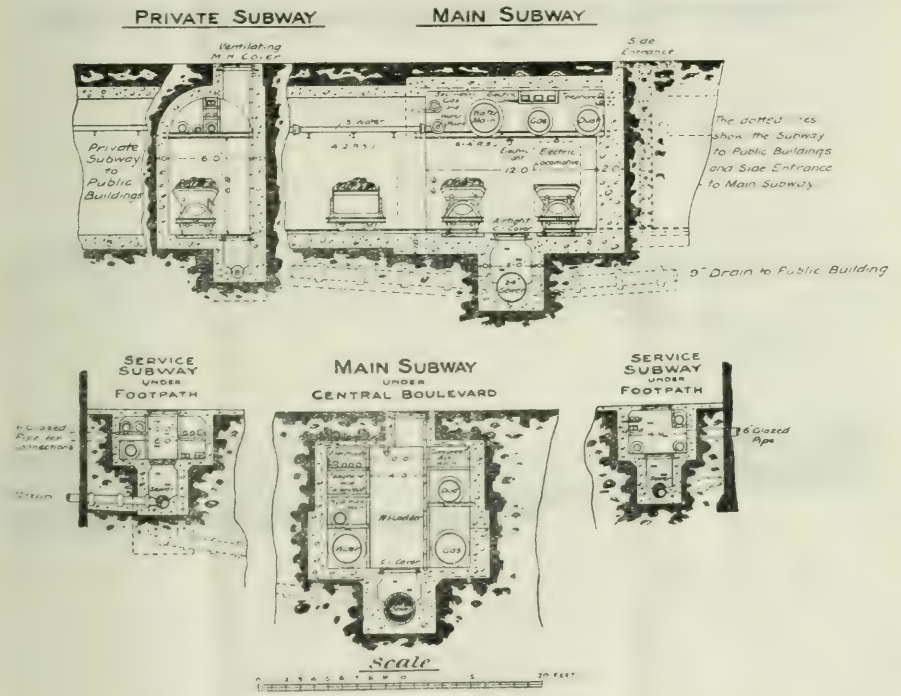
The engineer is mainly responsible for the laying out and utilitarian portion of the town planning, but for the completion and ornamentation of the

town we turn to the architect, artist and sculptor. The engineer and surveyor must provide opportunities for the exercise of the skill and taste of the architect by laying out wide streets, leafy boulevards, and stately squares on which he can erect his buildings. Buildings for national, municipal, ecclesiastical, educational and entertainment purposes offer full scope for the architect to exercise his powers of design and artistic leanings without encroaching on the domain of the engineer and surveyor; while the domestic buildings give him an opportunity for displaying the common sense and good taste which has placed English domestic architecture in a class by itself. The battle of the styles may be left to the architects to fight out, but it may be said that a due regard must be paid to climatic conditions, the development and use of local materials, and historical associations or local usage. The use of statuary or monumental work in the adornment of the public, ecclesiastical or other buildings, in the public parks, gardens, squares and bridges, must be on generous as well as artistic lines, though unfortunately economical rather than artistic considerations too frequently prevent the sculptor being given the full and proper opportunity his art demands. The landscape gardener also cannot be ignored in laying out large parks or gardens, for a knowledge of plants, trees, shrubs and flowers must be combined with artistic feeling and the power of planning, while the natural beauties of the site must be carefully preserved.

principal plan presented for the guidance of the competitors was a contour plan to a scale of 400 ft. to an inch, which showed the Molonglo River flowing practically through the centre of the city, the flood levels, the chief watercourses, woods, and hills, the suggested position and levels of the railway, the geological formation, and the contours of the site at every 5 ft.

Several other plans were given showing the position of the Commonwealth territory; a topographical map of the territory to a scale of 1 mile to 1 in.; a contour map of 20 chains to 1 in., and maps showing the rainfall and temperature statistics, and a geological survey of the site. A very full description of the requirements of the city was given with the conditions of the competition, and reports on the geology and rainfall of the district were also supplied.

Models of the site of the city were exhibited in Australia, London, New York, and several Colonial and Continental cities. The model exhibited in London afforded very little additional information beyond what could be obtained from the large contour plan, and although the principal features of the scheme were settled on the contour plan before the model was inspected, there was no necessity to alter any of these as the result of the inspection. The scale of the model was a natural one, and on the small scale to which the model, representing some 9 or 10 square miles, was necessarily plotted, 50 ft. rise or fall was scarcely noticeable. The contour plan to a scale of 400 ft. to 1 in. was issued in duplicate, on one of which the laying out of the city was to be shown, and this was practically the only plan necessary with the full information given in the instructions to competitors. The capital city is to be the seat of Government, with Houses of Parliament, Government Offices, and Courts of Justice; and except for the manufacture of Government stores is hardly likely to have any large industries within its borders. It will be essentially a residential city.


PRIVATE SUBWAY
MAIN SUBWAY
Ventilating
Side Entrance
Private Subway to Public Buildings
The dotted lines show the Subway to Public Buildings and Side Entrance to Main Subway.
9" Drain to Public Building
SERVICE SUBWAY UNDER FOOTPATH
MAIN SUBWAY UNDER CENTRAL BOULEVARD
SERVICE SUBWAY UNDER FOOTPATH
Scale

Details of Subways.

(Plate 3.)

Description of Scheme for Laying out the Federal Capital of Australia.

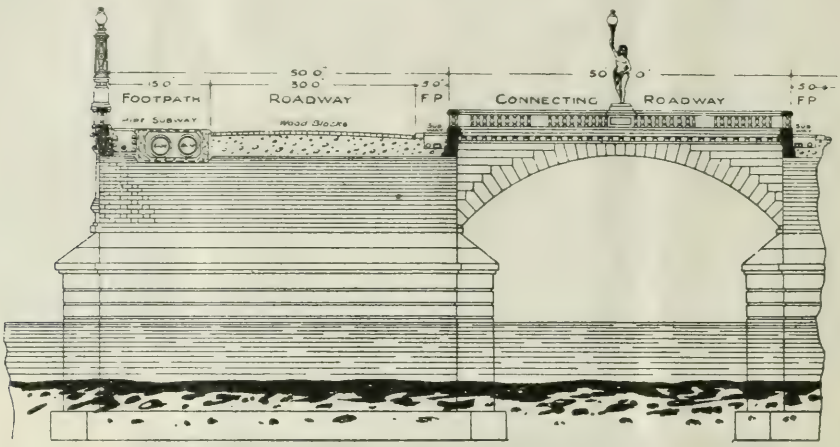
The Federal Capital City of the Commonwealth of Australia is to occupy an area of about 16 square miles, of which about 9 square miles is dealt with in the scheme shown on Plate No. 1. An area of about 900 square miles, lying about 70 miles from the sea and 150 miles south-east of Sydney in the Yess Canberra country, has been reserved as Commonwealth territory, and it is in the northern portion of this country that the capital city is to be laid out.

The population to be provided for is 25,000, and in the scheme now described it was estimated that this population would be reached in some fifteen years, 50,000 in thirty years, and 100,000 in fifty years. The

The Molonglo River runs through the middle of the site, which is surrounded with well-wooded hills, rising from 800 to 1,000 ft. above the level of the river. The prevailing winds are westerly and south-westerly, and are very cold and biting in winter, and these had to be fully taken into consideration in allocating the different areas, and fixing the sites of the main buildings.

The Houses of Parliament were located on Camp

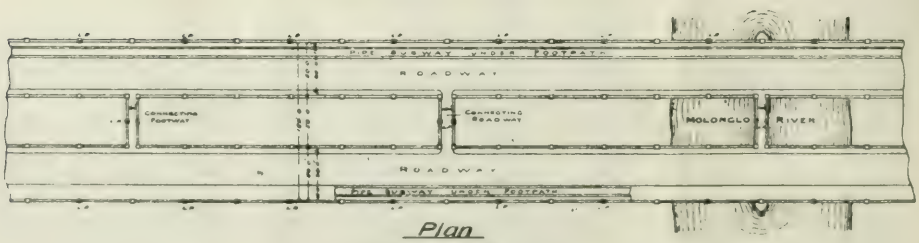
Hill, south of the Molonglo River, the position being central and dominant, well sheltered by a natural belt of trees from the cold westerly and south-westerly winds in winter, and open to the cooling north winds in summer. It is approached by easy gradients from, and within easy reach of, the central station, and commands fine views of the Molonglo River and the distant wooded slopes of the Black Mountain and other hills on the north. The Government offices are grouped together convenient to the Houses of Parliament, facing the Parliament Square and The Mall. The Post Office and Courts of Justice are near the central station, and the State House, Art Gallery, Museum, and Reference Library lie between the Houses of Parliament and the Church of England Cathedral and the University. A Roman Catholic



Cross Section

Longtdl Section & Elevation

Scale of Feet



Plan

Scale of Feet

Details of Bridges.

(Plate 4.)

cathedral is situated to the south of the Houses of Parliament, and the road devoted to clubland, shown as Pall Mall.

The Government and civic areas are kept distinct, though both are fairly central, one on the south and the other on the north side of the river. The city hall is placed on rising ground north of the river, a few feet lower than the Houses of Parliament, and presenting from them a fine vista through The Mall and High-street. All the city officials would be housed here, and a large public hall would be provided in the centre of the building. In the City-square the police courts, free library, technical school, banks, and offices would present a fine opportunity for architectural effect.

The commercial and shopping area lies between the city hall and Molonglo River, arcades running between the main streets. The markets are near the centre of the city and on the tram route. Small shopping centres are provided on the outskirts of the city. Sites for offices, banks, and hotels are provided, the chief hotels and pensions being near the central station and facing the lake and gardens near the centre of the city.

The chief residential area is south of the Molonglo River, and west of the railway. The Governor-General's house is placed in grounds of about 100 acres in area to the south of the park and Houses of Parliament, and the Prime Minister's and other Ministers' houses face the west side of the park. The plots are laid out for detached or semi-detached houses, and the size of the plots varied from some 700 ft. square to the labourer's cottage or bungalow with 30 ft. frontage and 140 ft. depth. The building lines vary from 25 ft. to 120 ft., according to the size of the house and depth of building plots. As all houses are detached or semi-detached, no back streets are required save in the shopping areas.

The industrial area is located near the south-eastern entrance to the city between the railway and Jerrabomberra Creek. The chief goods yard or railway marshalling yard is near this point, and as the bulk of the coal and materials coming into the city will be required for industrial purposes, it is a matter of great convenience and economy, and avoids carting through the city. The prevailing winds will take away the smoke without nuisance to the residential area. The gas, electricity, and refuse destructor works, tramway depot and car shed, and Government factories are located in the industrial area, and connected with rails to the goods yard. The cattle market, abattoirs, ice factory, and cold stores are also placed near the goods yard.

The main streets in the Government and commercial areas are generally straight and direct from one important point to another, The Mall, connecting bridge, and High-street, form a continuous straight line between the Houses of Parliament and the city hall; though the view would to some extent be broken by clock towers in the Station-place and at the north end of the bridge. Two boulevards, east and west of The Mall, radiate from Parliament-square, while the city hall is the radiating point for eight streets. The two cathedrals form the focal points of important streets or avenues, and in the smaller squares, crescents, and circuses, the vista is formed by churches or other important buildings. The chief buildings being built on elevated sites are visible from various parts of the city, while good views of the parks and river are commanded from large portions of the district.

The contours of the site are such as to make the gradients of many of the roads somewhat steeper than desirable; but, except in one or two cases, it is possible to get gradients not steeper than 1 in 25; and in the business area the steepest gradient would be one in 40. The main streets and boulevards are laid out of a sufficient width to meet the requirements of the larger population which it is expected the city will ultimately reach, and the sections on Plate No. 2 show that they will be largely laid out as tree-planted boulevards or avenues with grass or gravel margins, or central plots.

In a hot climate such as Australia shelter from the trees is very desirable, while the tree-planted space costs little to lay out, and is always available for throwing into the roadway should the traffic in the future require the widening of the road. The roads have been given a width which may seem somewhat excessive to English ideas; but it must be borne in mind that the land costs nothing, that the city is the capital of a country which is a continent, that suitable road materials may be obtained on the spot, that the revenue from the sale of the land is available for the road making, and that the roads are largely planted with trees, or laid out as lawns. There is, therefore, no reason to adopt the cheeseparing ideas of many of the promoters of Garden City competitions, either with regard to widths or materials for road making.

The principal road, "The Mall," is a fine open boulevard 400 ft. wide. The main feature of this road is the central lawn, 100 ft. wide, laid out with flower beds, fountains, and statuary. Footpaths 25 ft. wide are planted with one row of trees on each side of the 40-ft. roads for slow traffic and service to the Government buildings. Two further strips, each 35 ft. wide, laid out with three rows of trees as avenues or promenades, adjoin the 50-ft. roads on each side of the central lawn. These roads provide space for quick traffic, half of the road being macadam for horses and the other half tar-macadam for motor traffic. The High-street, which is the chief shopping centre, is 200 ft. wide, has 25-ft. footpaths, two 50-ft. roads, and a central tree-planted plot 50 ft. wide, on to which passengers will alight from the tramways. Other shopping streets are 120 ft., 100 ft., and 80 ft. wide, according to the importance of the position and the traffic. In each case a large portion of the streets is taken up by grass and trees, which lend beauty to the streets, provide shade, and save expense in street making. The arcades, which are 30 ft. wide between the shops, would have rolling stairways to transport customers or clients to the shops or offices above the shops on the ground floor. The main ring boulevards are 150 ft. wide with 20-ft. footpaths, two 30-ft. roads, and a central plot 50 ft. wide with 10-ft. gravelled footpaths and 30-ft. grass plot in which the tramways are laid. Trees on the footpaths and on the sides of the tram track make a pleasant avenue. Other roads are 100 ft., 80 ft., 60 ft., and 50 ft. wide, according to requirements and importance. The Park Drive is laid out 150 ft. wide with 25-ft. footpaths, two roads each 30 ft. wide, and a central riding track 40 ft. wide.

Subways, as shown on Plate No. 3, are provided for the Government and main business roadways. Under The Mall and the road east of Pall Mall the main subway is made wide enough for coal trucks drawn by a small electric locomotive, and the pipes are carried above on rolled steel joists. Pipes for water, gas, electricity, and hydraulic power, pneumatic tubes for house refuse, or postal purposes, telegraph and telephone wires, and in the near future, petrol and liquid air, may all be provided for. On the north side of the river the main subway under the High-street is simply a pipe subway, and both main subways give access to the main sewers. Secondary or shallow service subways are provided for pipes on each footway adjoining the shops, and private subways are shown to the Government buildings and clubs.

The main bridge over the Molonglo River and across the lake, shown on Plate No. 4, is 150 ft. wide on plan, though it is actually only 100 ft. wide, as it consists of two 50-ft. wide bridges with an open space 50 ft. wide between them. The roads are connected at intervals of 100 yds. alternately with footways and carriageways carried by arches harmonising with the bridge arches. This arrangement allows the traffic to continue over the bridge in a straight line instead of being diverted by the contraction of the road from 150 to 100 ft., where the bridge and road meet. It gives more light and air to the roads, river, lake, or gardens under the bridge, and lessens the tunnel-like character of the arches of the bridge. It allows a bridge of a somewhat novel and unique type to be constructed at a cost of little more than the 100-ft. wide bridge, while presenting the appearance of a 150-ft. wide bridge. It also affords opportunities for artistic treatment of balustrades, piers, and lamp standards. Pipe subways are placed under the footpaths. Other bridges are 80 ft. and 50 ft. wide, and footbridges are provided at several points over the railway and river.

Tramways are provided to reach the suburbs, and on the ring boulevards they are laid in the grass plot, which not only makes easier running and gives a pleasanter outlook, but saves enormously in the construction and maintenance of the track. The line and levels of the railway were suggested on the plan issued to competitors, and it was only necessary to alter the levels to provide headroom for the roads running under the railway bridges, or the railway under the road bridges. The Central Station is practically in the centre of the city, and suburban passenger stations are placed 1¼ miles north and 1¾ miles south of the Central Station.

The railway marshalling yard or chief goods yard is located at the south-eastern entrance to the city in the midst of the industrial area, and large warehouses are erected there. Small goods yards are placed at the central and northern stations.

Ample provision is made for parks and recreation grounds, and the natural belt of woodland and park on the outskirts of the city will assist in the future development of the city. The chief park is located at the rear of the Houses of Parliament enclosing the hill called Kurrajong, and has an area of about 200 acres. It is well timbered and watered. The trees would be preserved as far as possible, and the watercourses would be made a picturesque feature with waterfalls, ferns, &c., as well as being used for stormwater purposes. A botanic garden, aviary, observatory, shelters, and bridges, with fountains, conservatories, and shrubberies add to the attractiveness of the park. The roads are laid out as avenues for pedestrians, riders, and vehicular traffic. Smaller parks and gardens are provided in various parts of the city, and in the squares, crescents, and circuses, small enclosed gardens are shown. Large ornamental gardens with boating lake, bandstand, fountain, and terrace, are formed near the centre of the city adjoining the river. This land is below the flood-level, and is protected by a broad, tree-planted embankment and roadway. The land below flood-level has practically all been reclaimed and reserved for recreation purposes; the stadium, cricket, football, and golf grounds, military exercising ground, racecourse, and show ground all being located in this area.

The Church of England cathedral has a church house and bishop's residence near to it. The Roman Catholic cathedral has a presbytery and convent school adjoining, and there are churches in suitable situations for the other denominations. A university, high school, technical school, and four elementary schools are provided.

A national theatre and a music hall are situated near the Central Station, and sites for other places of entertainment are provided in other districts. The barracks, gaol and mint are placed near the eastern boundary, and drill halls are located convenient to the military exercise grounds and rifle range. A sanatorium, infectious diseases hospital, general hospital or infirmary, and cottage hospital are provided in suitable situations. Central baths and three open-air bathing places, a cemetery containing three chapels and a crematorium, and a fire station, are also shown.

The Molonglo river is converted into a series of large lakes by impounding the river water by weirs. These hold the water up to such a level that it will make the river suitable for boating and bathing for about 3 miles, though at the same time the levels of the weir are kept sufficiently low to prevent flooding.

There is a considerable fall from the east to the west of the city, and no difficulty should be experienced in providing good falls for the main and other sewers, and avoiding pumping. The northern sewer would have to be carried across the river near the western weir, either by means of an inverted syphon, or by steel pipes supported on cast-iron piles and columns. The sewage disposal works are to be located some 6 miles west of the city. Storm water should be treated separately, and, as far as possible, the natural watercourses should be used for the purpose of storm-water drainage. They all empty into the Molonglo River, and where they run under the roads they will be culverted, or in some cases bridged over.

The collection of refuse from the Government and shopping areas would be by a suction pipe worked from the destructor works by a vacuum pump as described at page 7. The system might be extended to the residential areas, but, if not, carts, vans or motor wagons may be employed. For street watering and garden[illegible] purposes special pipes should be laid in the principal streets, boulevards and gardens.

A longitudinal section to a natural scale of 100 ft. to an inch, which though not reproduced in this paper, it is hoped may be published in the "Proceedings," was given from the Houses of Parliament to the city hall. This drawing showed in section the Houses of Parliament as a domed building in the Classic style, with terraces, gardens and fountains in the Parliament-square and facing the park; elevations of the Government offices; the colonnaded Station-square, with clock tower and Station Hotel; the main bridge over the gardens, lake and river; the banks and shops in the [illegible]-street, and a section through the city hall. The style of architecture suggested for the public buildings was Classic, or the adaptation of it known as Renaissance, and the banks, hotels and business premises were a somewhat freer type of the same style.

In conclusion, the author hopes that the consideration of town planning in the wider and general view which he has attempted to place before the institution, may prove to be of service even to those who are called upon to deal with only a small or partial scheme. The principles which underlie all sound planning are of wide application, and it is the study of these principles, combined with common sense and experience, which can alone produce the ideal town plan.

TOWN PLANNING IN SHEFFIELD.

By C. F. Wike, M.Inst.C.E.,
City Engineer and Surveyor, Sheffield.

Town planning is a subject which has received a considerable amount of attention in Sheffield, both before and since the passing of the Housing and Town Planning Act, 1909. In several instances small areas were dealt with, but owing to the lack of any legislative powers and the unwillingness of the majority of the landowners to co-operate, matters progressed very slowly, until the Act referred to was put into operation, when the Sheffield City Council immediately commenced to take advantage of the provisions contained in the Act. The matter was one which required very careful consideration, and the exercise of the powers of Part II. of the Act was relegated to the Improvement Committee, who appointed a special Town Planning Sub-Committee to deal with the question.

The first step was to decide as to which portion or portions of the city were suitable for town planning schemes. The area of the city is 24,347 acres, and of this about 5,000 acres may be taken as being densely populated, and 2,500 acres sparsely built upon, or, about 7,500 acres which cannot be dealt with under the Town Planning Act. The area not available for building purposes, such as moorland, reservoirs, parks, recreation grounds, precipitous ground, &c., is about 5,000 acres, leaving approximately 12,000 acres of land available for further development, and for inclusion in a town planning scheme.

A key plan was prepared showing this land divided into sections, to enable the committee to decide whether they would forthwith include the whole of the undeveloped land available for building purposes in a town planning scheme, or whether they would deal with it in sections. The latter course was considered the most advisable, and three areas were selected as the most suitable to be dealt with first, the committee's intention being, as the work in connection with these areas progressed, to take in hand other sections from time to time, until the whole of the undeveloped land in the city is included in a town planning scheme.

The three areas in question are: (1) An area in the south-western portion of the city, containing 488¼ acres; (2) an area in the western portion of the city, containing 97 acres; (3) an area in the north-western portion of the city, containing 624¼ acres. A total area of 1,209¾ acres.

As no revision of the 25 in. to the mile scale maps has taken place for the last eight or ten years, during which period the development of the city has been very considerable, it became necessary, in order to comply with the Local Government Board's regulations with regard to the preparation of the various maps, to bring the ordnance maps of these areas up to date. The work was at once put in hand, and the new streets constructed, and buildings erected or in course of erection, were posted on the maps, which undertaking involved a great amount of labour. It was also necessary in some instances to spot level and contour the areas, owing to the hilly nature of the land, for the purpose of showing the feasibility and practicability of suggested new main and secondary roads.

The points to which the committee thought it desirable to give their immediate attention in the earlier stages were: The widths of the existing main roads; the lines and widths of new main and secondary roads; the "set-back" of the main building line; the provision of a satisfactory number of open spaces; the limitation of the number of houses to be built to the acre.

The surveyors to the owners of the large Sheffield estates were invited to inspect the plans, and the owners asked to co-operate with the committee in making the town planning schemes a success. Negotiations were opened, and, except in one or two cases, arrangements have been made satisfactory to both parties, the corporation agreeing to slightly modify their requirements with regard to the number of houses to the acre, set-back, &c., the owners throwing out the necessary land for widening the roads to the widths agreed upon, and the corporation paying for the street works over the width required by the by-

laws—*i.e.*, 40 ft. The widths of roads which the committee consider reasonable and which they have decided upon are, for existing main roads, 80 ft.; secondary roads, 55 ft. and 60 ft.; and subsidiary streets, 40 ft.

NUMBER OF HOUSES PER ACRE.

With regard to the limitation of the number of houses to be built to the acre, it was found impracticable to fix a definite "limit" which would be applicable to all the areas, or even to fix a "limit" for the whole of one area, it being considered advisable to vary the number of houses to the acre in different portions of the areas, according to the class of houses in the district, and the density or otherwise of the buildings adjoining, and as to whether it would develop into a working class or residential district.

In portions of some areas the number of houses to be erected to the acre is to be limited to twelve, these being residential neighbourhoods containing houses of a good class. The houses or cottages already built immediately abutting upon a portion of another area, however, average as many as thirty-five (gross) to the acre, and it would scarcely seem fair or reasonable to fix a "limit" of twelve to the acre for the area adjoining. The committee, therefore, in order to meet the landowners, have decided to accept a "limit" of twenty-four to the acre for this portion of the area, reducing this number as the area withdraws from the overcrowded district; but this is the extent to which they will be prepared to go in any case, and then only when the owners show a disposition to meet them satisfactorily in other ways.

Speaking generally, it may be taken that for residential and good class districts the number of houses to the acre will be limited to twelve, and in areas adjoining working-class districts twenty to twenty-four.

With respect to the set-backs, the following have been agreed upon: Existing main roads, 15 ft.; proposed new main roads, 15 ft.; secondary main roads, 15 ft.; subsidiary streets, 10 ft.; and these set-backs will probably form the basis of agreement when subsequent schemes are taken in hand.

Estimates in connection with these three areas were prepared, these being based on the assumption that the land required for the widenings will be transferred to the corporation without charge, as has already been arranged in several cases.

The areas were referenced, and the requisite notices to the number of about 300 served upon the owners, lessees, and occupiers of the land to be included in the schemes. In this connection it may be stated that the Town Planning Department of the Local Government Board was approached, and agreed that the notices need not be served on occupiers with tenancies of three months or less.

The statutory meeting of owners and others interested in town planning was held on September 6th last, the Local Government Board inquiry being held on January 17, 1912. At this inquiry there were present, in addition to the owners and others interested, a number of prominent officials and corporation members from various towns.

There was comparatively little opposition, and this was not to a town planning scheme in itself, but to some details of the draft scheme which the corporation have submitted to the landowners. The inspector pointed out, however, that the inquiry was only an initial one to consider whether the preparation of a scheme was desirable, and not to consider the methods by which it should be carried out. The Local Government Board have now given the corporation permission to proceed with the preparation of their schemes, the details of which will be gone into at a subsequent inquiry. They insisted, however, on built-up portions of districts within and adjoining the boundaries being ringed out on the deposited plans, so as not to be included in the scheduled areas.

Whilst the preliminary plans had been prepared and the necessary notices served, and pending application to the Local Government Board, the committee decided to proceed with two further areas, one in the north-western portion of the city, containing about 1,300 acres, and another in the south-west containing about 1,750 acres adjoining one of the areas already scheduled.

The total area of the Sheffield town planning scheme therefore is 4,260 acres, which is more than the combined areas of the adjacent towns of Barnsley and Doncaster, and greater than the areas of some towns with populations of approximately a quarter of a million.

The work of posting up the ordnance sheets and contouring the two additional areas is at present in hand, and it is probable that the arrangements as to widths of roads, number of houses to the acre, set-backs, &c., will be on the same lines as in the case of the first three areas.

An attempt has been made by the author of a certain paper on town planning to form a basis of the cost of preparing town planning schemes, worked out at so much per acre. It is scarcely possible, however, to adopt a principle of this kind, as so much depends upon the contour of the district. For instance, it is a very different matter to town plan in a flat city or town than in a place like Sheffield, which is of an exceptionally hilly nature with an altitude varying from 100 ft. to 1,500 ft. above sea level, containing five valleys, and where building development gradually extends up the valleys into the country.

In some towns the populated portions are fairly well concentrated, and the town planner has a free hand, but in cases like Sheffield, where the town and country are intermixed, it is very difficult to get good leading lines of communication. The position and construction of main arterial roads must depend upon the levels and contour of the town itself, and at the same time the natural beauties of the suburbs must be preserved as far as possible.

The cost involved in the posting up of ordnance sheets will also vary in different places according to the growth of the town and the date of the last ordnance survey. Sheffield has grown very rapidly since the ordnance sheets were last revised, the population having increased from 376,160 in 1900 to 459,923 in 1912, and, as previously mentioned, the work of posting up has been very considerable.

DISCUSSION OF MESSRS. PRICE'S AND WIKE'S PAPERS.

Mr. J. W. Cockrill (Great Yarmouth) said Mr. Wike's paper gave them a lot of information on the subject of town planning. In Sheffield they to deal with many problems which in a more level town they would not have. There was much land with which it was impossible to do anything but leave it open. The work done by Mr. Wike was of a very good character, and at West Bromwich a year ago they had the pleasure of seeing the original plans. He moved a vote of thanks to Mr. Wike for his paper.

Mr. W. H. Grieves (Sutton, Surrey), who seconded, remarked that Mr. Wike suggested negotiations with the owners of large estates. Mr. Wike went on to say that, except in one or two cases, arrangements had been made satisfactory to both parties, the corporation agreeing slightly to modify their requirements with regard to the number of houses to the acre, set back, &c., the owners throwing out the necessary land for widening the roads to the widths agreed upon, and the corporation paying for the street works over the width required by the by-laws—*i.e.*, 40 ft. What he would like to ask Mr. Wike was whether the Sheffield Corporation induced everyone concerned to give up the land without paying compensation, because if that was so they had done extremely well. That was going to be one of the great problems with regard to the widening of streets. In a scheme in his district, which was in course of preparation, they wanted the owners to give up a certain width of land on a main road to make it at least 60 ft. wide, but the amount they named was excessive, and they could not possibly consider it. They did not want to use the arbitration part of the Act if they could get the land without. It would be interesting to know if there had been any difficulty of that kind in Sheffield, or whether the owners were persuaded by conciliatory methods to give up the land without paying anything. Their by-laws would not allow a road to be made of less width than 50 ft., but it had been suggested that they might allow owners who were prepared to give up land for the widening of the road to make streets from 30 ft. to 40 ft. wide. He would like to know if any member had had experience of an agreement of that kind. Mr. Wike said it scarcely seemed fair or reasonable to fix a limit of twelve houses to the acre for the area adjoining another area where there were as many as thirty-five houses to the acre, and the corporation had therefore fixed a limit of twenty-four to the acre for that part, which, under the circumstances, seemed a fair thing to do. With respect to the set back of 15 ft. mentioned, he thought it should be 20 ft. or 25 ft.

Mr. E. R. Matthews (Bridlington) said that, according to the paper, a Special Town Planning Sub-Committee of the Sheffield Corporation was appointed to deal with this question. He would like to ask whether

any portion of the town planning area was outside the area of the city, and, if so, whether the rural district council or the council, or both, were asked to appoint delegates to serve on that sub-committee? His own council, who had a town planning scheme before them, were making proposals designed to get rid of the opposition of the rural districts at the outset. They intended to seek the co-operation of three rural district councils, and they would be asked to appoint representatives to serve on the Town Planning Sub-Committee. They also proposed to write to the county council asking them likewise to appoint representatives. In this way they hoped to avoid the opposition of both the rural districts and the county council. Mr. Wike suggested that it was well to divide the portion of the town intended for town planning into sections, taking two or three in hand at first and others from time to time. He would ask Mr. Wike if he still thought that the best plan to adopt. They had a discussion on that point in his own council, and the decision came to was that the whole should be done at once, although fifty years might elapse before part of the area was built upon.

Mr. A. H. Campbell (Edinburgh) moved that Mr. Wike's and Mr. Price's papers be considered together. This was agreed to.

Mr. Campbell, with reference to the question as to how to get owners to surrender their land, thought he was correct in stating that no compensation was payable under the Act. The whole area dealt with in the scheme described by Mr. Wike was within the city of Sheffield.

Mr. T. S. Picton (Eccles) said he would have liked to ask why the new road shown by Mr. Wike was curved, and if the authority considered that the limit of twenty-four houses per acre would have any effect on building operations in the city. In the outskirts of Manchester it was a common practice with owners and builders to erect forty houses per acre, giving 110 sq. yds. to each building, and he did not see how that could be prevented unless each municipality adopted the Town Planning Act. He thought that should be done, for it was not at all desirable to have as many as forty houses to the acre, it was much better to have only twenty-four. He had pleasure in moving a vote of thanks to Mr. Price. It showed how carefully Mr. Price, senr., had trained his son when they saw the remarkable ability displayed by young Mr. Price in connection with the scheme for laying out the federal capital of the Australian Commonwealth. When they had juniors who showed such ability as this municipalities need not fear to appoint them to succeed older men. He could not say, however, that he saw eye to eye with Mr. Price in putting down a tramway track on grass plots. In Lancashire towns that certainly would not do at all; it would mean such an awful expense.

Mr. A. H. Campbell (Edinburgh) seconded the vote of thanks, remarking that it was well they had such a junior member capable of taking so admirable a discussion of town planning. He had not heard whether this plan was premiated or not, but it certainly deserved a premium if it did not get one. It was gratifying that town planning had been given such prominence at the last four annual meetings of the institution, culminating in the successful conference at West Bromwich last year. He hoped the question would for many years continue to form an important part of their programme at the annual meetings. They were only on the threshold of it, and the more they went into it the greater would be found the possibilities of the Act in the direction of furthering the good government and improved administration of the large cities and towns. The Act of 1909 formed a renaissance in public health legislation. It comprehended not merely public health in the narrower interpretation of the phrase, but public health as involved in the whole question of governing an urban community. It dealt not only with city improvements, but with the widening of city main roads, the construction of new intercommunicating ways between distant parts of cities, with the distribution of population, and the relieving of that congestion which was found in all big urban communities by spreading the people over the less-built-up areas. It also enabled them to create open spaces and conserve the amenities of their towns. Consider what it meant with regard to everything affecting the good government of their cities. Formerly, if they went to Parliament, they were faced with [illegible] and how little that was new they could get into local legislation, because, usually, said there was "no precedent" for it. Then, if there was a precedent of ten, twelve or fourteen years back, they would say, "We are not granting this to-day, because we are so advised by the central authority." He was glad to see that now the central authority had surrendered to the pressure of local opinion, as voiced by the municipality. The Association of Municipal and County Engineers, about the year 1907, had as one of the subjects for discussion that of "Town Planning." That brought the question to the front, and induced Mr. Burns to go forward with this new birthright for the municipalities of the country. The point mentioned by Mr. Matthews about overlapping authorities was an important one. They in Edinburgh were experiencing that. It was a pity that there should be such rivalry and unneighbourliness between authorities as to prevent the carrying out of what would be for the benefit of all the authorities concerned; and he deprecated the setting up of rival plans and schemes to the detriment of the common good. He hoped the prevailing tendency in the future would be to refuse to countenance rival schemes and to institute joint authorities, so that coalition would take the place of rivalry, and co-operation of hostility. Mr. Price dealt with the case of an entirely new town, and he congratulated him on his work. That brought him to another aspect of the question. They who hailed from Scotland had the satisfaction of knowing she was going to lead in town planning in the United Kingdom. There were 7,000 acres ready for planning in connection with the development of Rosyth, and the Admiralty was pushing the authorities along with all possible speed. In the course of a few years a stretch of country which was now green fields would have a population resident upon it of from 40,000 to 50,000, who would be—he would not say aliens—but from the Midlands and the South. He was glad to say that the gentleman who was carrying out that scheme was English—from Mr. Stilgoe's office. Mr. Wike was applying himself with all the energy and knowledge derived from his experience to his task, and he was going to lay out there an absolutely new area to receive these guests from the South. Well, all of them had not these 7,000 acres or federal capitals to deal with, but they all had their plots to till, and therefore let them not be discouraged. Each of their small towns presented opportunities for the consideration of the same developments, and the same problems as if the area were ten or twenty times as large.

Sir James Lemon (Southampton) said the objects of town planning were twofold—to prevent slums in the future and to provide better housing in the suburbs, and to get direct communication with the main roads in the surrounding districts. He happened to know three estates with a good road running round the three of them, and the owner of the centre block proposed to lay out his land and wanted the other two owners to join with him so as to get through roads. The other two said, "We are not in a hurry. You develop your land first, and then we will have a go." Under the Town Planning Act that would be prevented, and all three estates would be developed. As regarded the width of roads, Mr. Wike got over the difficulty pretty well. It was a great step in advance to have a road 80 ft. wide; they never thought of such a thing some years ago. He knew he had great difficulty in getting roads 40 ft. wide. After most of the owners had been induced to go beyond 40 ft., there would be one obstinate owner who would not budge, but the difficulty in his case was got over by an agreement to put a good forecourt to the houses. He got one gentleman to make a road 50 ft. wide, and as there was a forecourt in that case of 10 ft. or 12 ft., they got a total width of practically 70 ft. What they wanted was really not so much a great width of road as a great width between house and house. He had laid out an estate on which the owner wished to put as many houses as possible, and he persuaded him to give a road which, with the forecourts on each side, brought the total space between the houses up to 100 ft. When they met with landowners who would not increase the width of the road so much as they thought they ought to do, the difficulty might be got over in that way. The suggestion was a good one that, when local authorities wanted a greater width dedicated to the use of the public, they should pay for making up the increased width above what the owner wanted to give. By all means come to an agreement if it were possible to do so, for if they had to go to arbitration it would be a very expensive matter. He believed if they negotiated with the owners in a reasonable spirit they would not have much difficulty in increasing the width of roads as much as they wished. With regard to the number of houses, he

considered twenty per acre the maximum under any conditions whatever; indeed, he went further than that, and said that twelve would be much better. They wanted to spread their towns out, not to have a lot of houses crowded on a small area.

Mr. W. Stubbs (Blackburn) considered the scheme described by Mr. Wike as suitable for a large manufacturing town. The limit of twenty houses per acre was a very reasonable one. In Blackburn the present by-laws would not permit more than twenty-six per acre. As to the width of roads, he thought it was a mistake to make the roads too wide, as they could get a forecourt as suggested by Sir James Lemon. He did not agree with the suggestion to spread the laying out of the area over fifty years. He thought it was a mistake to do that, especially in parts of the country where there were many owners, as in Lancashire. Another suggestion he did not agree with was for keeping works separate from houses. How was a working man who was in receipt of 25s. a week to get to work? Was he to pay 5s. or 6s. a week in tram fares? If they were going to have healthy working classes they must provide in town planning schemes for the working man, but so far as it had gone it did not provide for the working man. A man must have 35s. or 40s. per week to live in the houses provided under town planning schemes.

Mr. W. L. Carr (Ruislip-Northwood) said, with reference to the Ruislip scheme, which had aroused some interest, he might say that at the last meeting of his council the draft scheme was approved. It was proposed to deal with the widening of roads, also with the question raised by Mr. Matthews, of Bridlington. They had a road outside their district, and he was pleased to say though they had an objection from the rural district council, the Local Government Board overruled that objection, and they had now come to an agreement without any committee of the two councils being formed. The question of factory areas, shop areas, and open spaces were all dealt with. He would also be able to show them the several agreements entered into with the landowners, which dealt with the width of the roads. With regard to Mr. Wike's paper, he would like to ask whether it was proposed to frame general provisions with regard to the area mapped out. In his opinion it was not necessary to do that. He would also like to know how it was proposed to deal with the limitation of the number of houses per acre. The question of setting back they dealt with in a slightly different manner at Ruislip to that described by Mr. Wike, and he thought their method was preferable.

Mr. T. Adams (Town Planning Inspector of the Local Government Board) said the discussion had helped him to understand some of the difficulties which the surveyors of local authorities had to contend with. He hoped every member of the institution who had a town planning scheme on the stocks would take the opportunity offered of seeing Mr. Carr's plans. There were in connection with town planning schemes a great many difficulties to be encountered. The question of outside areas had been alluded to by Mr. Matthews, and in connection with that he might point out it was possible under the Act; indeed, it was of the very nature of town planning to provide in their scheme for getting control over an adjoining rural area. Regarding the width of roads, a surprising statement was made to him in the course of an inquiry which tended to show the existence of certain injustices in regard to the standard width. It was that 75 per cent of the area concerned could do with a less width than was asked for, but that a width of 45 ft. was insisted on in order to get something in return. He hoped that surveyors, in preparing town planning schemes, would always draw a skeleton plan showing the arterial roads and other main roads required. Mr. Wike showed in his scheme he was not only prepared to deal on practical lines with the needs of the moment, but had considered how Sheffield was going to grow in the future. That was a natural scheme, for they desired to town plan not only for those who migrated to the South, but also for those in the crowded cities of the North. It was hardly fair to say that the Town Planning Act was encouraging the building of houses suitable for others than members of the working classes. There was a great deal of misapprehension on the point. Town planning was one thing; schemes like Letchworth were another thing altogether. Town planning dealt with undeveloped areas of towns and cities, and naturally the housing of the working classes was an important part of this. They could not deal with any large area in a city like Sheffield unless they made provision for housing the working classes as well as others. That was a point which it was necessary to remember—that the housing of the working classes was an important element in all town planning schemes, and particularly in schemes where the width of the roads was a consideration. Wide arterial roads were not roads in which they could economically house the working man; therefore, it was a serious matter to be providing these arterial roads which had to be paid for very largely out of public funds. This question of working-class accommodation should be taken into very serious consideration.

The President said they had had a most interesting discussion on two admirable papers, one from a veteran, and one from a coming municipal engineer.

The vote of thanks having been unanimously accorded,

Mr. Price thanked Mr. Picton and the other speakers for their kind words about the paper. Mr. Picton said something about the grass plots for the tramways. The cost of upkeep would not be very much, and the picturesqueness would make up for any expense that would be incurred.

(To be continued.)

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. Thomas, M.Inst.C.E., County Surveyor, Buckinghamshire.

EXAMINATION.

The October, 1912, examination will be held in Birmingham on the 10th, 11th and 12th of that month.

Thomas Cole,
Secretary.

11 Victoria-street, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

SOUTH-EASTERN DISTRICT.

The third annual district meeting will be held at 39 Victoria-street, Westminster, on Wednesday, August 7th, at 7.30 p.m.

The business to be transacted at the meeting is as follows: To consider annual report; to elect district chairman; to elect honorary district secretary; to receive offers of papers for discussion.

J. W. Brook,
Hon. District Secretary.

352 Central Park-road,
East Ham.

SOUTHERN DISTRICT.

The third annual district meeting will be held at 39 Victoria-street, Westminster, on Wednesday, August 7th, at 7.30 p.m.

The business to be transacted at the meeting is as follows: To consider annual report; to elect district chairman and honorary district secretary; to receive offers of papers for discussion.

E. W. Veale,
Hon. District Secretary.

Frensham,
Surrey.

COUNCIL MEETING.

At a meeting of the council held on July 24th the following applicants were recommended for admission.

To Membership: Messrs. John Morley, surveyor and Engineer, Ardsley Urban District Council; H. W. Lockton, deputy borough surveyor, Newark; W. H. Scott, assistant surveyor, Ruislip-Northwood Urban District Council; and W. W. Earwaker, sanitary surveyor, St. Columb Rural District Council.

To Associate Membership: Messrs. W. A. Walker, surveyor's office, Stourbridge; J. C. Stevenson, assistant surveyor, Ulverston Urban District Council; S. Grisdale, district main road surveyor, Cumberland County Council; S. L. Kumar, Public Works Department, Punjab, India; and R. U. Harper, assistant

highway surveyor, Chester-le-Street Rural District Council.

Transfer to Membership: Mr. W. H. Butler, assistant county surveyor, Cumberland.

Transfer to Associate Membership: Messrs. J. H. Marsh, surveyor's office, Worsley Urban District Council, and A. R. Chicas, assistant city engineer, North Vancouver, B.C.

(Under the new by-laws these elections will be ratified at the next council meeting if no written objections are lodged within fourteen days.)

New Members, &c.—From the applicants recommended for admission at the last meeting two members and four associate members were elected, and one transfer was made to the membership class. One student was elected.

Premiums for Papers.—The consideration of papers presented by members of the institution will take place at the September council meeting, with a view to awarding the premiums already announced.

Nominations.—Forms for the nomination of members for the council, 1912-13, are now ready and may be obtained on application. These forms must be returned to me, duly filled in, not later than August 20th.

Town Planning.—Mr. W. Louis Carr has kindly extended invitations to members to view his Town Plan—Maps No. 4 and 4a, with General Provisions. They may be seen at his offices, Northwood, Middlesex.

Nominations.—Mr. Frank Latham was nominated president and Mr. Thos. Mundy honorary treasurer for the year 1912-13. The nominations for vice-presidents will be announced later.

B. Wyand,
Secretary.

39 Victoria-street, S.W.
July 25, 1912.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* **The Surveyor** *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

CLERK OF WORKS.—August 3rd. Corporation of Hyde. £3 per week.—Mr. T. Brownson, town clerk.

ROAD FOREMAN.—August 3rd.—Kirkcaldy Town Council. 35s. per week.—Burgh Surveyor.

TEMPORARY ASSISTANT.—August 3rd.—Corporation of Richmond (Surrey). £3 per week.—Mr. J. H. Brierley, borough surveyor.

TEMPORARY ASSISTANT.—August 5th.—Easington Rural District Council. £3 per week.—Mr. G. Waterhouse, Easington, Durham.

CLERK OF WORKS.—August 5th.—Chesham Urban District Council. £2 10s. weekly.—Mr. P. C. Dormer, engineer and surveyor.

CLERK OF WORKS.—August 6th.—Breconshire Education Committee. £2 10s. per week.—Mr. C. W. Best, County Hall, Brecon.

CLERK OF WORKS.—August 7th.—Matlock Urban District Council. £4 4s. per week.—Mr. R. Taylor, clerk. Prescribed application forms can be obtained on application to Messrs. James Diggle & Son, engineers, 14 Victoria-street, London, S.W., and Hindhill-street, Heywood, Lancs.

CLERK OF WORKS.—August 8th.—Abersychan Urban District Council. £2 10s. per week.—Mr. W. H. V. Bythway, clerk.

CLERK OF WORKS.—August 9th.—Newport Pagnell Rural District Council.—Mr. Charles W. Powell, clerk.

SURVEYING ASSISTANT.—August 10th.—Borough engineer's office of a large Midland town. £130.—Box 1,174, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

TEMPORARY TRAMWAY ASSISTANT.—August 10th.—Engineer's office of large Midland town. £140.—Box 1,175, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

ASSISTANT SURVEYOR.—August 10th. Rothwell Urban District Council. £65 per annum.—Mr. W. Dodgson, clerk.

CLERK OF WORKS.—August 10th.—Corporation of Northampton. £1 per week.—Mr. A. Fidler, borough engineer.

ASSISTANT IN SURVEYOR'S OFFICE.—August 20th. Hemsworth Urban District Council. £78 per annum.—Mr. Thomas Robey, clerk.

ASSISTANT ENGINEER.—August 31st.—Darjeeling Municipality, India. 150 rupees monthly.—The Chairman.

CHIEF ENGINEER AND COUNTY SURVEYOR.—October 7th.—London County Council. £2,000.—Sir Laurence Gomme, clerk.

CLERK OF WORKS.—Surrey County Council.—Mr. A. Dryland, county surveyor, County Hall, Kingston-on-Thames.

MUNICIPAL COMPETITIONS OPEN.

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CARDIFF.—August 6th.—Designs and estimates for fire station.—The Town Clerk.

GOOLE.—September 1st.—Competitive designs and estimates for municipal offices, for the urban district council. Two premiums (£30 and £15).—Mr. R. Tyson, clerk.

CHORLEY.—September 9th.—Designs for a school, for the corporation.—Mr. J. Mills, town clerk.

GLASGOW.—October 29th.—Preliminary sketch designs are invited by the corporation for the extension of the municipal buildings. Honorariums of 100 guineas to five selected designs.—Mr. John J. Burnet, A.R.S.A., 239 St. Vincent-street, Glasgow, is assessor.—Applications to the clerk, Mr. J. Lindsay, town clerk.

HUDDERSFIELD.—October 31st.—Designs for laying out certain areas as a town planning scheme, for the corporation. Premiums of 100, 50, and 25 guineas.—Mr. J. Henry Field, town clerk.

RANGOON.—Designs for the new municipal buildings. Honorariums of £300, £200 and £100 are offered.—Messrs. Ogilvy, Gillanders & Co., Sun-court, 67 Cornhill, E.C.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* **The Surveyor** *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

Buildings.

HAMILTON.—August 5th.—For the erection of new municipal offices, for the corporation.—Mr. P. M. Kirkpatrick, town clerk.

SOMERSET.—August 6th.—For the erection of an infants' school, for the county council.—Mr. C. H. Bothamley, secretary, Weston-super-Mare.

HUNGERFORD.—August 6th.—For the erection of workmen's dwellings, for the rural district council.—Mr. W. S. Raine, surveyor.

DUNGANNON.—August 6th.—For the erection of twenty-four houses, for the urban district council.—The Clerk.

CHESHAM.—August 7th.—For the construction of an open-air swimming bath, for the urban district council.—Mr. P. C. Dormer, engineer and surveyor.

STAMFORD.—August 8th.—For the erection of a swimming bath, for the corporation.—Mr. F. R. Ryman, engineer.

BARNSLEY.—August 8th.—For building new waterworks offices, for the corporation.—Mr. J. H. Taylor, borough surveyor.

WEST RIDING.—August 9th.—For the erection of a school at Silsden, for the Education Committee.—Education Architect, County Hall, Wakefield.

WARRINGTON.—August 9th.—For the supply of tubed dadoes, heating installation, ventilation, sanitary goods, and electric lighting at school, for the corporation.—Mr. J. Moore Murray, clerk to the Education Committee.

HANTS.—August 9th. Alterations at St. Mary Bourne School, for the county council. Mr. A. L. Roberts, architect to the Education Committee, The Castle, Winchester.

SHEFFIELD.—August 9th.—For the erection of fifty-five cottages, for the corporation. City architect.

ABERDARE.—August 10th.—For the erection of thirty-two tenement dwellings, for the urban district council.—Mr. T. Phillips, clerk.

HUNTS.—August 10th.—For the enlargement of a secondary school, for the Education Committee.—Mr. S. G. Cook, clerk, County Education Offices, Huntingdon.

WOMBWELL.—August 10th.—For the erection of public baths, for the urban district council.—Mr. P. M. Walker, clerk.

KINGSTOWN.—August 10th.—For the erection of baths and wash-houses and caretaker's house, for the urban district council.—Mr. J. Sherlock Vaughan, town clerk.

MERTHYR.—August 12th.—For the erection of forty-eight dwellings, for the corporation.—Borough Architect, Town Hall.

TAVISTOCK.—August 13th.—For the construction of works of water supply, for the rural district council. —Mr. A. Kenneth G. Johnstone, clerk.

BARNSTAPLE.—August 15th.—For works at Knowle Braunton, including reinforced reservoir, and water main, for the rural district council.—Mr. R. E. C. Balsdon, clerk.

SOUTHEND.—August 17th.—For the erection of a lodge and refreshment-room, for the corporation. Mr. E. J. Elford, borough engineer and surveyor.

HANTS.—August 19th.—For the erection of a classroom, for the county council.—Mr. A. L. Roberts, architect to the Education Committee, The Castle, Winchester.

CHELMSFORD.—August 28th.—For the extension of the fire engine station, for the corporation.—Mr. W. Smith, town clerk.

WEYBRIDGE.—For the erection of new head post office and telephone exchange, for H.M. Works and Public Buildings.—Secretary, H.M. Office of Works, Storey's-gate, London, S.W., endorsed "Tender for Weybridge New Head Post Office."

Iron and Steel.

LANARK.—August 3rd.—For the supply of 1,700 tons of 15 in. diameter cast-iron pipes and special castings, for the Middle Ward District Committee.—Mr. J. McMillan, water engineer, District Offices, Hamilton.

LYMM.—August 7th.—For the supply of 1,100 yds. of 6-in. socket and spigot pipes, and 6-in. specials, for the urban district council.—Mr. W. Ward, clerk.

SOUTHAMPTON.—August 10th.—For the supply of straight steel pipes and specials, for the corporation.—Town Clerk.

BOMBAY.—For the supply of 20 miles of steel pipes of about 48 in. diameter, for the municipality.—Mr. H. J. Trivess Smith, hydraulic engineer, Municipal Offices, Bombay.

Roads.

BOLLINGTON.—August 5th.—For the supply of 300 tons of granite macadam, for the urban district council.—Mr. S. Knight, clerk.

SKIPTON.—August 5th.—For kerbing, channelling, paving and making up, for the urban district council. —Mr. Richard Wilson, clerk.

LANCHESTER.—August 6th.—For tar-grouting work, for the rural district council.—Mr. W. Cumming, highway surveyor.

CHINGFORD.—August 6th.—For making-up work, for the urban district council.—Mr. L. C. Bowen, clerk.

SUNBURY-ON-THAMES.—August 6th.—For the supply of granite, for the urban district council.—Mr. H. F. Coales, surveyor.

BARNSLEY.—August 7th.—For draining, levelling, metalling and flagging, for the corporation.—Mr. J. Henry Taylor, borough surveyor.

CORK.—August 7th.—For surfacing a cobble-paved street, for the corporation.—Mr. D. F. Giltman, clerk of committees.

KESTEVEN (Lincs).—August 7th.—For steam rolling and scarifying, for the county council.—Mr. W. B. Purser, county surveyor, Grantham.

BUNGAY.—August 8th.—For the supply of Mountsorrel or Quenast granite, for the urban district council.—Mr. P. J. Sprake, clerk.

BARKING.—August 8th.—For the supply of 500 tons of Norway granite setts, for the urban district council.—Mr. H. Hargreaves, clerk.

KINGSTOWN.—August 10th.—For the construction of a new road, for the urban district council.—Mr. J. Sherlock Vaughan, town clerk.

WEST SUSSEX.—August 10th.—For the supply of six or more tar-spraying machines of 250 gallons capacity, for the county council.—Mr. H. W. Bowen, county surveyor, 23 North-street, Horsham.

DONCASTER.—August 12th.—For work of road widening, for the rural district council.—Mr. W. R. Crabtree, surveyor.

ISLE OF WIGHT.—August 21st.—For the supply of 2,300 tons of quartzites, basalts, syenites or granites, for the rural district council.—Mr. H. Eldridge Stratton, clerk.

DROYLSDEN.—August 21st.—For private street works, for the urban district council.—Mr. Charles Hall, surveyor.

HERNE BAY.—August 21st.—For making up and paving, for the urban district council.—Mr. F. W. J. Palmer, surveyor.

BURNLEY.—August 24th.—For paving and making up, for the rural district council.—Mr. H. Prichard, surveyor.

CHICHESTER.—August 29th.—For making up with granite macadam about 10,000 super. yds. of London-Portsmouth road, for the corporation.—Mr. J. W. Loader Cooper, town clerk.

CASABLANCA.—August 29th.—For the improvement of several roads, for the Special Committee of Public Works.—The President, Comité Special des Travaux Publics, Dar En Niaba.

EAST BARNET.—August 29th.—For the supply of broken granite, gravel, hoggin, Portland cement, stoneware pipes, tar-paving materials, oats, hay, straw, horse hire and cartage, for the urban district council.—Mr. T. A. Buckley, clerk.

CASABLANCA.—August 31st.—For the construction of public roads, for the Moroccan Adjudications Commission.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

LOUGHTON.—August 31st.—For the supply of granite, gravel and hire of steam roller, for the urban district council.—Mr. H. White, surveyor.

Sanitary.

GLASGOW.—August 3rd.—For work of sewerage, for the corporation.—Mr. J. Lindsay, town clerk.

COCKERMOUTH.—August 3rd.—For laying a surface drain, for the rural district council.—Mr. J. H. Musgrave, clerk.

ASHINGTON.—August 6th.—For scavenging work, for the urban district council.—Mr. C. Alderson, clerk.

CARLISLE.—August 6th.—For the construction of a 6-in. sewer, for the rural district council.—Mr. F. Barker, surveyor.

BEDLINGTON.—August 6th.—For the construction of sewers and manholes, for the urban district council. —Mr. J. E. Johnston, surveyor.

TINTWISTLE.—August 7th.—For the construction of sewage disposal works, for the rural district council.—Mr. D. Pennington, clerk.

OLDHAM.—August 7th.—For the supply of 200 wash-down water-closets, cisterns and fittings, for the corporation.—Borough Engineer.

OLDHAM.—August 7th.—For the construction of six percolating filters, ejector chamber, excavation and contingent works, for the corporation.—Borough Surveyor.

TONBRIDGE.—August 7th.—For the construction of a stoneware pipe sewer and manholes, for the rural district council.—Mr. F. Harris, engineer.

ROCHDALE.—August 7th.—For sewering work, for the corporation.—Borough Surveyor.

TAMWORTH.—August 8th.—For the construction of pipe sewers, manholes, septic tanks, and circular percolating bed, for the rural district council.—The Clerk.

ATCHAM.—August 8th.—For the construction of 5,400 yds. of sewer, for the rural district council.— Mr. H. Asher, surveyor, 24 St. John's-hill, Shrewsbury.

DONCASTER.—August 9th.—For the construction of surface-water drains, for the rural district council.— Mr. W. R. Crabtree, surveyor.

EAST ASHFORD.—August 12th.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. Julius Kingsford, clerk.

DARTFORD.—August 12th.—For supplying and laying about 6 miles of stoneware pipes, manholes and appurtenant works, for the rural district council.— Mr. Eustace J. Hobbs, clerk.

DONCASTER.—August 12th.—For laying storm-water earthenware pipe drain, for the rural district council.—Mr. W. R. Crabtree, surveyor.

CHAPEL-EN-LE-FRITH.—August 13th.—For the construction of sewage disposal works, for the Whaley Bridge Joint Sewerage Board.—Mr. J. B. Boycott, clerk.

BUDLEIGH SALTERTON.—August 13th.—For the construction of 800 lin. yds. of 9 in. diameter stoneware-pipe sewers, manholes, and flushing chambers, for the urban district council.—Mr. Chas. T. K. Roberts, clerk.

ETON.—August 14th.—For scavenging at Iver, for the rural district council.—Mr. H. L. C. Barrett, clerk, Slough.

RAMSBOTTOM.—August 15th.—For works of sewerage and the construction of sewage disposal works, for the urban district council.—Mr. John W. Barlow, clerk.

GATEHOUSE-OF-FLEAT.—August 15th.—For the execution of a drainage scheme, for the corporation.—Mr. W. F. Crombie, 122 Irish-street, Dumfries.

COCKERMOUTH.—August 15th.—For the construction of 4,300 yds. of twenty 4-in., 9-in., 6-in. and 4-in. sewers, manholes, flush tanks, ventilators, tanks and filters, for the rural district council.—Mr. J. H. Musgrave, clerk.

LINTHWAITE.—August 16th.—For the construction of sewers and manholes, for the urban district council.—Mr. D. J. Bailey, clerk.

DISLEY.—August 17th.—For the construction of sewers, for the rural district council.—Mr. E. N. Davenport, clerk, Park Chambers, Vernon-street, Stockport.

YEARDSLEY-CUM-WHALEY.—August 17th.—For the construction of sewers, for the urban district council.—Mr. S. Taylor, clerk, 9 Terrace-road, Buxton.

MACCLESFIELD.—August 17th.—For the construction of sewers, for the rural district council.—Mr. F. May, clerk.

HALIFAX.—August 17th.—For the construction of cast-iron pipe sewer and appurtenances, for the Highways Committee.—Mr. J. Lord, borough engineer.

CHAPEL-EN-LE-FRITH.—August 20th.—For the construction of new sewers, for the rural district council.—The Clerk.

CHELTENHAM.—August 31st.—For the construction of nine combined circular sewage tanks in three sets, and eight percolating filters 101 ft. in diameter, with roads, drains, and conduits, for the corporation.—Mr. J. S. Pickering, borough engineer.

BRADFORD.—September 3rd.—For the erection of twenty-eight sludge filter presses at Esholt, for the corporation.—Mr. Frederick Stevens, town clerk.

WALMER.—September 4th.—For the construction of concrete tube and stoneware sewers and surface-water drains, for the urban district council.—Mr. F. W. Hardman, clerk.

Stores.

ABERCARN.—August 3rd.—For the supply of various gas stores, for the urban district council.—Mr. J. A. Brentnall, engineer and manager.

Miscellaneous.

HEYWOOD.—August 12th.—For the supply of tubes and fittings, sulphuric acid, and tinned ware, for the Gas Committee.—Mr. Geo. G. Boucher, town clerk.

SOUTHWELL.—For the supply of non-poisonous dust preventives, for the rural district council.—Mr. H. Blewitt, district surveyor, Ollerton, Notts.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BATTERSEA.—For erecting a handicraft workshop at premises in Latchmere-road, Battersea, temporarily occupied by the Battersea Polytechnic Secondary Day School, for the London County Council:—

Maxwell Brothers, Limited, Brixton-road	£995
J. Marsland & Son, Walworth	871
J. Appleby & Sons, Southwark Park	822
J. Ford & Sons, Fitzalan street	808
H. H. Hollingsworth, Peckham	789
Rice & Son, Stockwell-road	727
Trigge & Co., Clapham	698
Lole & Co., Chelsea	684
J. & C. Bowyer, Limited, Upper Norwood †	682

Architect's estimate, £694

BETHNAL-GREEN.—For improving the means of exit at the Globe-terrace School, Bethnal-green, for the London County Council:—

W. Bailey, Pelton-road	£340
Parrott & Isom, Fore-street	629
G. Munday & Sons, Eastcheap	628
A. E. Symes, Stratford	620
Vigor & Co., Poplar	587
H. C. Horswill, Forest-gate†	583

Architect's estimate, £560.

EARSDON.—For laying earthenware sewer, for the urban district council.—Mr. J. R. MacMillen, surveyor:—
G. Armstrong, Whitby Bay.

ELLESMERE PORT.—For making-up certain streets, for the urban district council:—
Private Street Works.—J. Shelton, Ellesmere Port, £1,548.
Cemetery Chapel, &c.—J. Jones, Ellesmere Port, £1,719.
Sewer. J. W. Flather, Ellesmere Port, £857.

HENDON.—For the Golder's Green and other road improvements, for the urban district council.—Mr. S. S. Grimley, engineer:—

Patent Impervious Stone Company, Hammersmith	£10,209
T. Adams, Wood-green	10,179
W. Muirhead & Co., Limited, Queen Victoria-street	10,088
J. Mowlem, Westminster	9,606
R. Ballard, Child's-hill	9,638
W. Griffiths, Bishopsgate	9,546
F. G. Brummell, Willesden	9,543
H. Farrow, Brixton *	9,318
H. Woodham & Sons, Catford (withdrawn)	8,887

HENDON.—For the erection of a public mortuary and other buildings, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor:—

Mortuary.

W. Tout, Hendon	£929
W. Moss & Sons, Loughborough	850
F. Gough & Co., Hendon	832
E. W. Hall, Finchley*	696

Other Buildings.

F. Gough & Co., Hendon	£323
W. Tout, Hendon†	313
F. King, Hendon*	294

* Accepted for shedding at depot and bicycle store, £233.
† " " shed at Child's Hill Recreation Ground, £55.

HUNSLET.—For making up private streets, for the rural district council:—

H. C. Pullar, Wakefield	£235
G. L. Briggs & Son, Leeds *	197

KINGSTON.—For the widening of Kingston Bridge, for the Joint Committee representing the Surrey and Middlesex County Councils:—

	Tender A‡.	Tender B§.
W. Scott & Middleton, Limited †	£59,730	£64,230
Mowlem & Co., Limited	63,000	67,500
Mitchell Brothers, Limited	64,544	67,806
Head, Wrightson & Co., Limited	68,000	71,950
Sir W. Arrol & Co., Limited	69,987	73,413
Perry & Co.	83,390	83,000

‡ The tender A provides for foundations being constructed partly by caisson and partly by cofferdam.
§ The alternative tender B provides for foundations being constructed wholly by caisson.
In each instance £5,000 is allowed for contingencies.
Mr. Basil Mott's estimate, with an allowance of £9,300 for contingencies, was £71,300.

KINGSTON-UPON-THAMES.—For the supply of granite kerb, channelling, setts, and cubes and quadrants, for the corporation.—Mr. R. H. Cincas, borough surveyor:—
Devon Basalt and Granite Company, Exeter.
Fry Brothers, Greenwich.
Enderby and Stoney Stanton Granite Company, Limited, Leicester.
W. Griffiths & Co., Limited, Bishopsgate.
A. & F. Manuelle, Gracechurch-street.
Brookes, Limited, Westminster.
G. Dixon, Dublin.
Wettern Brothers, London*
Separate prices quoted for each class of material.

LONDON.—For the provision of pumping machinery at the southern outfall works, for the London County Council:—

Rees Roturbo Manufacturing Company, Wolverhampton	£6,050
Fullerton, Hodgart and Barclay, Paisley	6,000
Drysdale & Co., Limited, Glasgow	5,350
(alternative tender)	6,250
(alternative tender)	5,850
J. Cochrane, Glasgow†	4,835
(alternative tender)	4,915

NEWPORT PAGNELL.—Accepted for laying cast-iron and stoneware sewers, and the construction of sewage disposal works, for the rural district council:—
A. H. Price & Co., Nottingham, £11,515.

NORTH DARLEY.—For the supply of granite, for the urban district council.—Mr. E. F. Lowe, surveyor:—
T. Wright, Matlock.
F. Hodson & Son, Nottingham.
United British Basalt Company, Buxton.
Mountsorrel Granite Company, Leicester.
Penmaenmawr Granite Company, Penmaenmawr.
Cliffe Hill Granite Company, Leicester.
United Stone Firms Limited, Bristol.
Whitwick Granite Company, Leicester.
Croft Granite Company, Leicester.
Enderby and Stoney Stanton Company, Leicester.
Ellis & Everard, Leicester,* £497.

NORTHUMBERLAND.—For the erection of a secondary school, for the Education Committee:—
J. F. Newbold, North Shields, £11,047.

ROMSEY.—For building a bridge at Plaitford, for the rural district council:—

C. Rogers & Co., King's Somborne	£180
F. Hurst, Awbridge *	144

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

Herefordshire Roads.

The annual report on the roads of Herefordshire, prepared by Mr. G. H. Jack, the county surveyor, presents in forcible and eloquent language a somewhat grim array of facts relating to the difficulties of highway administration and engineering in that county. The extracts which will be found on another page relate partly to administrative matters, and these passages suggest very strongly some of the chief weaknesses of the present system of organisation and control of highways. Of even greater immediate interest are the passages relating to engineering difficulties, with regard to which the natural conditions of the county must be taken into consideration before the reader living in a different part of the country indulges in mental comment. The position which Mr. Jack takes up on the subject of surface tarring, for instance, is due partly to the climate of Herefordshire, partly to the nature of the soils on which many of the roads run, and is no doubt to some extent the result of the fact that the crusts of the roads are at present, to a very large extent, in such a condition and of such small thickness that surface tarring is far less effective than it is on roads of greater strength and on firmer subsoils. Conditions tending to surface tarring, and opinions as to the extent to which it preserves the road, will be found to alter steadily as we pass from the south-eastern and eastern counties in a westerly or north-westerly direction, and the county surveyors of Surrey and Kent, for instance, are warranted in taking up an attitude in this matter which is very different from that taken up by county surveyors of Staffordshire and Herefordshire.

Looking at the conditions broadly, we find a number of differences each of which tends to the same result, and all of which, taken together, have a very marked influence. Comparing, for instance, Hereford with Kent, we find that the rainfall over the greater part of the former county exceeds 30 in. a year, and in parts the fall approaches or exceeds 35 in. Over the greater part of Kent the rainfall is less than 30 in., and in some parts it is less than 25 in., per annum. During January, February and March the difference is small, but perhaps considerable. It is greater from April to June, and in the specially important month of May it is very marked. Add to this that the temperature of Herefordshire is somewhat lower, the amount of sunshine considerably less, and the influence of these factors in the matter of road tarring will be realised. Geologically the circumstances are in favour of the south-eastern county, which is mostly on the Cretaceous system with some Eocene strata, while the greater part of Herefordshire is on the Old Red Sandstone system. The opinion may be hazarded that the Weald clay is, from the present point of view, a far less troublesome subsoil than the red marl of Herefordshire. A stiff clay—especially when the road between fences is wide enough to permit of its proper management—is probably a much better soil than a somewhat retentive marl which holds a larger proportion of the rain falling upon it or water flowing over it. It is not always realised by the "duck's back" school of armchair engineers that a waterproof film which prevents water from entering a road crust from above may also prevent water from drying off through the crust and may actually imprison that which enters from the side or from below. On a retentive marl the difficulties of drainage may be considerably increased by the use of waterproof surfacings or waterproof crusts. Apart from all this, a strong crust, true to shape, is especially necessary in the case of surface tarring, which, when a weak crust begins to form undulations, prevents adjustment by surface attrition and effectually checks the self-grouting on steep slopes which is an element of considerable importance on many by-roads and secondary roads.

The cumulative effects of surface-tarring cannot, of course, be attained on roads which churn up during the winter, and it is safe to say that it is now recognised, even in the south-east of England, that a very considerable expenditure on crust reform is usually necessary, at least as an accompaniment, and preferably as an antecedent, to systematic surface tarring; while up to the present hardly any evidence that tarring reduces the cost of maintenance seems to be forthcoming—at any rate with respect to rural and semi-urban roads. As regards the traction engine, which is by far the worst enemy of tarred roads, any general comment is somewhat feeble in face of the unfortunate fact that the authorities responsible for the framing of regulations persistently ignore the enormous annual expense due to their failure to issue suitable regulations with regard to the wheels of traction engines.

* * * *

Standardisation.

The question of standardisation is of special interest to municipal engineers in view of the excellent work that has been accomplished by the committee of the Institution of Municipal and County Engineers appointed to deal with the subject. It was specially appropriate that Mr. Ernest J. Elford should have chosen standardisation as the subject for his paper before the recent annual meeting of the Institution, inasmuch as he has presided over the Institution's committee for the past two years, and has displayed great ability and energy in forwarding the proposals for the standardisation of those materials which are largely used by municipal engineers. It has been said in more than one quarter that a possible result

of standardisation will be to put a brake upon progress, but it must be remembered that standardisation itself may be progressive, the minimum standard of to-day being raised in course of time with the onward march of scientific progress.

This flexibility of standardisation is secured by the permanent establishment of the Engineering Standards Committee. The direct advantages of standardisation are so well known as not to need recapitulation. They may to some extent be gauged by the fact that since the adoption, at the instance of Sir Joseph Whitworth, of standard screw threads, and the establishment, at the suggestion of Sir John Wolfe Barry, of the Engineering Standards Committee, a sum of over £30,000 has been expended on the work. In regard to individual materials, an excellent example of the practical benefits which may accrue from standardisation is afforded by the case of tramway rails. Before the publication of the standard specification, there were more than seventy different sections of tramway rails in use in this country, whereas the committee have found that five sections are sufficient to meet practically all cases.

The greater part of Mr. Elford's paper was devoted to a discussion of the standard specification for vitrified ware pipes. A draft specification was prepared by the Standardisation Committee of the Institution of Municipal and County Engineers, and sent by them to the Engineering Standards Committee. A conference was thereupon summoned, at which it was unanimously decided that it was desirable that a standard specification should be prepared, and a sectional committee was accordingly appointed. Unfortunately, the suggestion of the municipal committee for a chemical test was vetoed by the expert chemists as impracticable, and an absorption test had perforce to be adopted. The specification also deals with strength, soundness, thickness, length, shape, permissible deviations, glazing and marking. Some difference of opinion exists as to the possibility of specifying a standard form of joint, but many experts appear to favour something like the Stanford joint, as giving initial concentricity. It may be safely said in any case that municipal engineers will welcome a standard specification for pipes and for other materials, such as road metal and artificial stone, which they largely use, as cordially as they received the specification for Portland cement, which has proved of such great value.

* * *

Mersey and Irwell Joint Committee Annual Report.

Among the annual reports issued by the many authorities in this country some are filed away without being read, and only a few are ever taken out for reference at some future period. Others are read with interest and kept at hand for frequent reference. Among the latter are the annual reports of the Mersey and Irwell Joint Committee, and the reason these are read is that Mr. Hugh Stowell, the chief inspector, has the faculty of making them interesting and, as a rule, he contrives to make some pertinent and useful observations. The present report, which we print on another page, is an example of this kind, and it would be a good thing if it could be read by the members of many local authorities. One of the observations has been made before, but it cannot be repeated too often. Mr. Stowell states from his own experience that a very important factor with regard to efficiency is that of management. "There are instances in the watershed where works, although not up to modern requirements, are nevertheless dealing satisfactorily with their sewage, owing to careful and good management. On the other hand, there are instances of sufficiently designed works proving inefficient owing to unsatisfactory or insufficient attention, but these are chiefly at the smaller works, where continuous supervision by a skilled manager cannot be afforded . . . . Sewage treatment on modern scientific lines must be recognised as an operation needing skilled management, which should be provided by the appointment of experienced and sufficiently-paid managers, an expenditure which will undoubtedly prove economical rather than otherwise." We would emphasise the accuracy and importance of this statement. The Association of Managers of Sewage Disposal Works is doing much to provide skilled managers, and it only remains for the owners of works, both public and private, to offer suitable remuneration in order to secure experienced men.

An interesting feature of the report is the statement that the percentage of efficient works, with the total number of works in operation, has risen from 66 to 77 per cent, and that this has been brought about in most cases without resort to legal proceedings. This is excellent testimony to the energy and, better still, to the tact and diplomacy of Mr. Stowell and his staff. Most of the works which are not efficient at present are either being improved or new works are being constructed to take their place. In several places storm-water tanks have now been in operation for some time, and this modern method of treating storm water has been found to effect a great improvement. The reference to the regulation of natural water-courses, in which direction much useful experience has been gained in the Emscher district of Germany, is timely and should be acted upon, and the advice as to the cleaning of mill dams should be followed. Indeed, the whole report is very interesting, and demonstrates once more the necessity for the establishment of rivers boards for all the watersheds in the country, as recommended by the Royal Commission, but not yet brought into being.

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Factors Affecting Cost of Road Maintenance.

We especially draw the attention of our readers to the article appearing elsewhere in this issue, suggesting the importance of utilising costs accounts of road maintenance in such a way that the effects of various factors may be traced and their importance estimated. In every other branch of engineering work, or almost every other branch, it is recognised that detailed costs accounts are of great value in enabling work to be carried on with efficiency and economy. If it is not worth while to maintain the most rigid and detailed system of account-keeping throughout the whole range of the work, and at all times, we believe that, especially to road engineering, it is nevertheless worth while to make an elaborate analysis of costs here and there, and from time to time, in order that information may be gained as to the most important of the factors affecting the total cost of maintenance and repair. The great variety of conditions in highway engineering, and their sudden changes, make it desirable to carry out special investigations on certain lengths of road with greater thoroughness and in more detail than can be attained in the case of the system as a whole. It is suggested that much valuable information might be gained by comparing the costs of maintenance of short lengths of road, each of which exhibits one marked feature of divergence from the average, or from an otherwise similar length.

Our correspondence columns are open for the purpose of recording any facts, figures or opinions which our readers may be able to send us during the next few weeks; and the fact that surveyors have not at present at their disposal the funds and staffs needed for this purpose need not deter them from making practical suggestions as to the manner in which such accounts should be kept, assuming that the need for a regular organised system will be recognised in official quarters. A few definite comparisons of the kind suggested, dug out from data already recorded, would, we believe, suggest the consideration that the work of the local surveyors in recording the prime elements of cost is quite as important statistically as the marshalling of the facts with a view to the organisation of a system of keeping accounts and of distributing the burden of maintenance amongst the various persons concerned.

A very strong committee is engaged in the preparation of a report upon statistics for next year's Road Congress. It includes two county surveyors, Mr. James Moncur, M.INST.C.E., county surveyor of Staffordshire, Mr. R. J. Thomas, M.INST.C.E., county surveyor of Buckinghamshire and president of the Institution of Municipal and County Engineers; Mr. A. E. Nichols, M.INST.C.E., borough engineer of Folkestone; Mr. W. D. Harding, clerk to the Wood Green Urban District Council; Mr. E. J. Gowen, clerk to the Rural District Council of Croydon; and Mr. Reginald Ryves, ASSOC.M.INST.C.E., chairman.

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Pollution of Streams.

Two valuable papers were contributed to the Industrial Hygiene Section of the recent Congress of the Royal Sanitary Institute at York by Dr. H. Maclean Wilson, chief inspector of the West Riding Rivers Board. The first, dealing with the pollution of streams by coal-washing water, is of interest only in colliery districts, but is none the less important. The most interesting and most hopeful result of the work which has been done so far in preventing this kind of pollution is that the measures of purification adopted by colliery proprietors have resulted in a great saving to them. "When the dirty water from the washers was discharged untreated to the streams a much larger quantity of water was needed for washing the coal, and it carried with it a large amount of good coal in suspension, amounting in some cases to 200 tons per week. This coal is now almost always recovered and mixed with the washed coal," or utilised in some other way. It is curious how, in a number of cases where it has become necessary to prevent a public nuisance from some industry, the means adopted to that end have also prevented waste of good material, and have thus been a source of profit to the owner. Naturally, when this has been demonstrated, there is little difficulty in securing regular and careful attention to the treatment in question.

Among other cases of this kind are pollution by wastes from paper mills, and nuisance from factory smoke, and the pollution of streams by spent gas liquor from gasworks. These latter are in such general use that the second paper by Dr. Maclean Wilson dealing with the methods now in use for prevention of such pollution and the recovery of ammonia is of general interest, and should be valuable to all who are confronted with the difficulty of dealing with the wastes from gasworks. Dr. Wilson's experience in matters of this kind, and the opportunities he has had of observing the results obtained by the various processes which have been tried from time to time, render his paper extremely interesting. Among the economies effected by the new processes we notice that less plant is required, and at the same time not only is the yield of sulphate of ammonia increased, but it is of better quality, and less acid is needed for the absorption of the ammonia. Further, the quantity of water required is very greatly reduced. Thus there are savings all round: lower initial outlay for plant, and less cost for operation and maintenance. The fact that the annual congresses of the Royal Sanitary Institute afford opportunities for the publication and discussion of papers of this character fully justify the interest taken in such meetings and their continuance in the future.

* * *

Consulting Engineers.

We have already set before our readers the aims and objects of the newly-formed Association of Consulting Engineers, and we now have to record the first meeting of the members held for the purpose of receiving the rules and the report, and proposals of the provisional committee, and electing the first committee of the association. The chief idea which underlies, and in our view justifies, the formation of the new body is to enable the public in employing consultants to identify engineers who are not directly or indirectly concerned or interested in commercial or manufacturing interests, such as would tend to influence the exercise of independent professional judgment. It is not in Great Britain alone that the necessity for the establishment of such an association has been felt, as similar bodies are already in existence both in Germany and the United States. It should be carefully observed that the formation of the new body is in no way intended to imply that *any* duly qualified engineer should not be consulted on any engineering matter in regard to which he is an expert; but it does mean that the public are entitled, in employing a consultant, to distinguish the independent consulting engineer from the expert who is closely identified with commercial or manufacturing interests. There has hitherto been no source from which reliable information of this kind could be obtained, and the new association thus fills a definite gap in the already-existing professional societies. There are at present eighty members, and a strong committee has been formed. A full report of the first meeting of the members will be found elsewhere in this issue.

* * *

Contractors' Retention Money.

Although the term "retention money" is one which has a definite technical meaning when used in connection with building and engineering contracts, it appears from a case decided in the High Court on the last day of the Trinity sittings that, according to the strict legal interpretation of a contract, the phrase may have a different meaning from that in which it is ordinarily used. In the case referred to the clause of the contract relating to payments was drawn in the usual form—*viz.*, a monthly payment of 80 per cent of the certified value of the work executed, and a payment of 15 per cent on completion, the remaining 5 per cent being paid six months after completion. There can be no question that in ordinary engineering language the 5 per cent was "retention money" and not the 20 per cent, and expert evidence to this effect was given. Nevertheless it was held that the contractor, in granting a charge on the retention money to a third party, had mortgaged the full 20 per cent. It must not be assumed, however, from this decision that the full 20 per cent would have been held to be "retention money" as between the two parties to the original contract. The *ratio decidendi* appears to have been that in granting the charge the contractor intended to include the larger sum as retention money, and was understood by the assignees as doing so. In other words, the decision was based on the special meaning attached to the phrase "retention money" by the contract of assignment, and not on the ordinary interpretation of that phrase as applied to the original contract for the execution of the works.

* * *

Mr. John Burns and Housing.

The President of the Local Government Board has this week been drawing upon the reserves of his inexhaustible optimism in the matter of land and housing in a speech which he delivered at Wimborne. Into the political aspect of his remarks it is not our intention to trespass. We would confine ourselves to the facts which he cited with respect to the housing question, and these are sufficiently striking to be worthy of repetition. As an illustration of how the Housing and Town Planning Act is operating, Mr. Burns stated that he had sanctioned more loans for rural housing in the last nineteen months than had been sanctioned by his department in the previous twenty years. This would tend to prove, if anything could, that the need for the Act was pressing, and that public opinion is ripening very rapidly upon the most important of all social and sanitary problems that we have to deal with. It is a happy omen that politicians are engaged in a healthy competition to accelerate the pace of housing reform. There is little fear, apparently, of our going too fast, and there is no denying that hitherto we have gone much too slow for the public weal.

Road Construction and Maintenance in Herefordshire.*

By G. H. JACK, F.G.S., M.S.A., M.R.SAN.I., County Surveyor.

The provisions of the Local Government Act of 1888 render it impossible for the county council to make any payment to a district council unless the county surveyor issues a certificate to the effect that the roads in each particular district have been "properly maintained and repaired." At the time of the passing of the Act what was considered the proper maintenance of main roads would now be considered improper maintenance, owing to the altered conditions brought about by motor traffic. Proper maintenance of roads subject to heavy engine and swift motor traffic would be difficult to define at the present time. The whole matter is still in the transition stage.

It has not yet been decided how best to deal with the roads supporting the ever-increasing mechanical traffic. It is practically certain that general rules applicable to the whole country cannot be laid down. The methods suitable in one county are not suitable in its neighbour. Each road must be considered separately, and due regard must be had to the subsoil, lie of the road, drainage, and so forth. It is absolutely impossible to deal with engine traffic on foundationless roads.

I find the task of preparing my annual report under the Act an increasing difficulty, if only for the reason that the fears I expressed in my first annual report have, in many instances, become realised—namely, that it is now a question of remaking rather than maintenance.

The district councils are under contract to "properly maintain" roads in condition to support engines and motors, when the crust is only 4 in. thick, and the subsoil soft red clay. In my opinion, such a contract is impossible of fulfilment, roads so conditioned cannot be properly maintained. It is distasteful to me to be obliged to penalise the contracting district councils when I know that the cause of my complaints is largely beyond their control. The Act nevertheless insists that they "must" undertake the maintenance if the county council requires them to do so.

It has always struck me as being rather unfair in cases where my certificate is withheld to deduct the whole estimated cost of roads, parts only of which may be in an improper state of maintenance. I should have thought it more reasonable to withhold payment in respect of lengths failing to comply with the standard of repair demanded. The county clerk, however, rules that the whole, and not a part, must be disallowed. . . .

Sec. 11, 5, refers to improvement, enlargement, or "other dealing" with the main roads. This rather vague clause embraces the necessary reconstruction of weak roads, which the county council may also require the districts to undertake—a very large order. . . .

TRAFFIC.

To successfully cope with the many new difficulties which the great increase in weight and speed of traffic involves is now an exacting and difficult business. At the time of the passing of the Act there was little, if any, "through" traffic. The coaches had long disappeared and the motors were not dreamt of. It was for many years easy to deal with the roads as divided up among the various districts. Nowadays the aspect is changed. A motor entering the county on the western border leaves it on the east in about the space of two hours, and during that time the car has traversed main roads controlled by no fewer than seven separate highway authorities. Herefordshire is now feeling the strain of the altered traffic conditions, which was felt much earlier in those counties where the change came more rapidly.

THE IDEAL ROAD.

Another year has passed and road surveyors are still in quest of the ideal road. I will not weary the council with any description of the many methods which have been put forward as ideal, but will content myself with saying that there does not exist any particular method suitable to all conditions, and further, that the best methods are all expensive and fall short of the ideal. A few years ago it was thought that a thin skin of tar on the surface had solved the whole problem. It is now difficult to understand that such a proposition should have had so large a following.

TAR PAINTING.

Tar painting is now relegated to the position of a temporary measure, successful in keeping down the dust for a single season, and, where applied to roads with good natural or artificial foundations, beneficial to some undetermined degree to the life of the road. It does not, however, take a place at all in the great problem of sound road construction, and it is a doubtful, if expensive, factor in maintenance. I have always persistently objected to painting surfaces with untreated gasworks tar even on good roads, and have considered it a waste of money on weak roads. In January, 1909, the council decided not to carry out any such work on our foundationless roads, and I may venture to say that the wisdom of this decision is now generally endorsed. Until very recently the full force of inventive genius has been directed to "surface treatment." It is becoming recognised that strong construction must be the first consideration, and indeed all surface treatment, however good, must fail on roads resting on subsoil which becomes soft during the winter months. Strong construction on roads subject to heavy engine traffic is such a palpably necessary consideration that one is rather surprised that it is still very often given second instead of first place in the anxiety to obtain what has the superficial appearance only of a good road, even if its life is short and out of all proportion to the cost.

EXPENDITURE.

In spite of the great increase in expenditure during the last ten years it is difficult to maintain the roads in good condition. This cannot be understood by many. The initial difficulty is to be found in the fact of the roads not being constructed to meet modern traffic demands. It is an expensive and at the same time ineffective proceeding to put on thin surface coats upon such roads. Given continued wet weather the passage of the first heavy engine is sufficient to destroy the contour of the road; when this is done the deterioration is rapid, owing to the retention of water upon the weakened surface. On such roads as that through St. Weonards, for instance, one of three things must happen: (1) Traction engines must be prohibited; (2) the road must be reconstructed; (3) users of engines must pay for the damage done. In my view the first suggestion is most in accord with common sense. The road is 6½ miles long, and to reconstruct it for engines would cost £10,000. The suggestion is absurd; the locality does not warrant any such outlay.

So far as this county in particular is concerned, my conclusions are as follows:—

(*a*) Reconstruction and drainage must be resorted to on all stretches of road which are liable to give way during the winter owing to subsoil weakness, especially those places where the underlying clay is softened by subsoil water.

(*b*) Waterproof coatings, such as Tarmac, tarred Clee Hill stone, or tar-grouted macadam, should be laid down on lengths which give way owing to the percolation of water through the surface.

(*c*) On the strong roads, and roads not subject to engine traffic, the existing system of water-bound metalling with Clee Hill binding material will suffice for a long time to come.

I am now carrying out experiments mostly under Road Board grants in order to ascertain the wearing qualities of stone quarried in the county and bound with asphalt, distilled tar, Tarvia, and glutrin. I am hopeful of obtaining a surface crust as good and at the same time cheaper than the Clee Hill stone for roads in the southern parts of Herefordshire.

HEAVY ENGINES.

There is very urgent need for an alteration in the law in respect of heavy engines on highways. The majority of our roads simply cannot support engine traffic, and its continuance in wet weather results in a ruinous expense.

I have some hope of converting the roads for fast motor service at reasonable cost, but I have no hope of successfully combating the engine difficulty short of reconstruction, the cost of which is out of all proper-

* Extracts from Annual Report.

tion to the value of the engines or the work they accomplish.

The least that should be done is to prevent the passage of engines during continued wet weather. Such traffic is inimical to the interests of the general body of persons called upon to pay for the roads and ought not to be allowed to continue. . . .

THE CONTRACT SYSTEM.

The council having recently confirmed the preference for the contract system of management, it remains for me to continue as hitherto to endeavour to work that policy in a manner least calculated to cause trouble and inconvenience. It is impossible to work the Act quite smoothly unless the roads are maintained in a fairly high state of efficiency. If they are not so maintained, the Act gives me no option but to withhold my certificate. There is no mention in the Act of extenuating circumstances, which, to my mind, should be taken into account. The roads must be presented at March 31st in a passable condition. A difficulty this year is to be found in the fact that in most of the districts the contract work was incomplete at March 31st, and if some allowance is not made for the exceptional weather and the coal strike, I should be bound to disallow many miles of roads. Such a course does not commend itself to me. I feel that regard must be had to all the circumstances. In all contracts, extension of time is granted in respect of inclement weather and in case of strikes, and I fail to see why these road contracts should be an exception. There are cases where I think the stone could have been applied earlier if every effort had been made.

THE FUTURE.

The present is necessarily a time of progress in road construction and maintenance, and progress, generally speaking, is inseparable from change of method, and in no sphere more than road maintenance does this apply with greater force. On our much-used roads, the old method of thinly coating the worst stretches each year will have to give way to the permanent strengthening of all the weak places before the metalling is applied, otherwise the council will lose during the winter months the value of the hard Clee Hill metalling, which is simply churned up with the soft clay subsoil. The water binding will have to give way to something more adhesive and waterproof. All the sharp bends on the roads must be specially treated in some way, in order to withstand the much heavier wear due to the fast traffic. It is clear to anyone using the roads that the surface on these sharp bends is for the most part loose during summer and holds the water during winter.

Of late I have given serious consideration to the necessity of using to the utmost the natural resources of the county as regards the work of strengthening and, for the less important roads, for surfacing also. I have prepared a map showing the position of all quarries in the county from which sound stone can be obtained, and am now preparing a geological section of each of these quarries and am locating thereon the particular beds which I consider suitable for our purposes, both as regards foundation and surface material. This will take some time to complete, but when it is completed it will supply valuable information.

Clee Hill stone, preferably graded and tarred at the works, will always be found hard to beat for surfacing the trunk roads. I am very hopeful that some of our best local limestones, tar-grouted and topped with Clee Hill chips, will be found to supply all the needs of the less important roads for some time to come, and, in addition to being cheaper than untarred Clee Hill stone in some parts of the county, will be the means of employing much local labour in quarrying, breaking and carting the material. For strengthening the sides and foundation work the limestone cannot be beaten, except in situations where slag comes cheaper.

ALTERATION OF "SURVEYOR" TELEGRAPHIC ADDRESS.

In order to expedite the delivery of telegrams and cablegrams sent to this journal, we have, at the suggestion of the Post Office authorities, added to our registered telegraphic address, "Municipium, London," the indicator word "Fleet," representing the office of delivery. Telegrams should therefore now be addressed to us as follows: "Municipium, Fleet, London." No charge is made for the additional word, the full address being reckoned as two words.

POLLUTION OF STREAMS BY SPENT GAS LIQUOR.*

By H. Maclean Wilson, M.D., B.Sc.,
Chief Inspector, West Riding Rivers Board.

In the manufacture of gas large quantities of gas liquor are produced. It was at first looked upon entirely as trade refuse, but its treatment for the recovery of the ammonia it contains was soon undertaken, and this ammonia now yields a very considerable profit. The works at which ammoniacal liquor is produced or dealt with are either ordinary gasworks or the premises of chemical manufacturers, patent coke ovens, blast furnaces, shale oil works, or in works where gas producers have been installed.

The purification of this kind of refuse has been a problem difficult to solve. It is easy, by the use of simple settling tanks, to get rid of suspended solids, but these, although objectionable, are innocuous compared with the matters in solution. It has been shown by Gilbert J. Fowler, D.Sc., F.I.C.,† that the liquid when diluted is amenable to treatment on biological filters. He has constructed a percolating filter of somewhat coarse material, 9 ft. deep, and prepared it either by using material which had previously formed part of a sewage filter, or by ripening the filter by the application of a weak sewage until nitrification was induced. To such a filter he has applied the spent liquor from gasworks, clarified by settlement and diluted to ten times its original volume, either with clean water or with the filter effluent, at the rate of 100 gallons of the dilute liquid per square yard per day. This treatment effects a very marked reduction in the oxygen-absorbed figure, while the sulphocyanides and phenols are also greatly reduced. Mr. Radcliffe, of Barnet, has introduced two methods, one of which is in operation at Sutton and another at Enfield, for the partial purification of spent gas liquor, so that it can be received into the public sewers without upsetting the treatment of the sewage. He claims that by his latest method he can remove all solids in suspension, all free lime, all hydrocyanic acid, 70 per cent of the sulphocyanides, 60 per cent of the solids in solution, and can reduce the oxygen-absorbed figure by 75 per cent. Fortunately, although methods of purifying this kind of refuse are few and somewhat expensive, there are various ways, especially at collieries, in which it may be disposed of so that it does not reach a stream. Direct evaporation of the chemical refuse in furnaces of special construction has been adopted in several instances, but the latest developments in coke oven chemical works seem likely to render superfluous all the foregoing methods of dealing with the gas liquor. At the least, they will reduce the volume and alter the character of the refuse to be dealt with, making the problem much easier.

The economies effected by the new processes are many. The chemical plant is simplified by leaving out the water scrubbers and the coolers and ammonia stills; the yield of sulphate is said to have increased by 5 to 10 per cent, and this is easily explained by the simplification of the plant and the consequent fewer opportunities for loss of ammonia. In the old process there is some loss by leakage, but more especially because the ammonia in the gas is not completely absorbed by the water in the scrubbers, and because that in the gas liquor is not completely yielded up in the process of distillation. The quality of the sulphate is also improved, and less acid is required for the absorption of the ammonia, inasmuch as the fixed ammonia salts distilled from the coal do not require to be decomposed with lime and again fixed with acid. Further, the quantity of water required is very greatly reduced, the steam and lime necessary for the ammonia stills in the old system are not required, and there is a considerable saving in the initial cost of the work as well as in the upkeep.

The Institution of Water Engineers. — We are informed by the secretary, Mr. Percy Griffith, M.Inst.C.E., that the offices of this body have been removed to 20 Victoria-street, Westminster, S.W. The telephone number of the institution will continue to be Victoria 5913, and the telegraphic address is "Colenga, London."

* Extracts from paper read at the Industrial Hygiene Section of the Royal Sanitary Institute Congress at York.

† "Journ. Soc. Chem. Ind.," Vol. xxx., 1911, pp. 174, 180, 181.

Institution of Municipal and County Engineers.

ANNUAL GENERAL MEETING IN LONDON.

Following the proceedings reported in last week's issue in connection with the recent annual meeting of the Institution of Municipal and County Engineers, the following paper was submitted for discussion:—

STANDARDISATION.

By Ernest J. Elford, M.Inst.C.E., M.I.Mech.E.,
Borough Engineer, Southend-on-Sea.

Before referring more particularly to the subjects in regard to the standardisation in which this institution has taken an active part, the author would like to refer briefly to the subject of engineering standards generally. The principle of standardisation has long been acknowledged and practised, probably the earliest example being standard measure of time, and as early as the reign of Henry III. efforts were made to enforce the use of standard weights and measures. In other respects, however, the principle of standardisation made little progress until comparatively recent times. In regard to engineering matters, the efforts of Sir Joseph Whitworth appear to have been the first of a serious character. By securing the adoption of standard screw threads and gauges, and by his efforts to secure greater accuracy and uniformity, he did much to facilitate the progress of engineering in this country, and indeed to lay the foundations of the vast engineering industry now possessed by this country.

Valuable and important, however, as were the results of his work, it was found that progress was being seriously impeded by difficulties and confusion arising from great divergence in the manufacture, dimensions, and use of various materials required for engineering work. This was particularly felt in connection with the rolling of iron and steel sections of various kinds, the use of which in every branch of engineering was increasing by leaps and bounds. Every engineer appeared to think it incumbent upon him to design his own particular sections, with the result that an enormous amount of unnecessary expense was involved and serious delays occasioned.

Before the days of rolling mills, when all this class of work was forged, variations in design were comparatively unimportant, but with the introduction of mechanical means involving heavy initial cost, and depending for economy upon the production of large quantities of material to one pattern, the practice referred to could no longer be justified. Many of the sets of rolls cost £200 and upwards, and most of the manufacturers held hundreds of rolls which could not be used for more than one order. Special rolls had often to be cut for supplying orders for 100 and 200 tons and then scrapped. The effect, therefore, was to enormously increase the cost of production and to cause a great waste of time.

To Sir John Wolfe Barry belongs the credit of initiating a movement of reform. In 1901 he brought the matter before the Council of the Institution of Civil Engineers, and, being convinced of the importance of the subject, the council took steps to form a special committee to deal with the question. This committee includes representatives of the Institutions of Civil Engineers, Mechanical Engineers, Naval Architects, Electrical Engineers, and of the Iron and Steel Institute. The scope of the work has become very much enlarged, and there are now about forty sectional and sub committees with over three hundred members, comprising representatives of Government departments, engineers, manufacturers, and other interested parties working under the main committee upon various branches of the undertaking. Upwards of £30,000 has already been expended on the work of the committee.

The field covered includes the standardisation of tested sections, the preparation of standard specifications for other materials, the formation of standard tests, and in one case the preparation of standard specifications for complete machines. Many of the matters dealt with are of considerable interest to the members of this institution, notably Portland cement, tramway rails, rolled sections, cast-iron pipes, and vitrified sewer and drain pipes. Standard specifications relating to some of these subjects have now been issued several years, and there is overwhelming evidence as to their value. The specification for Portland cement is now very generally adopted, and has had the effect of causing a general improvement in the quality of material placed upon the market.

Sir John Wolfe Barry has quoted* the statement of a leading cement manufacturer as indicating the advantages following the publication of the standard specifications for this material, and in the author's opinion it will well bear repetition. He said—

"The result of the introduction of the standard specification has, no doubt, been to save a great deal of inconvenience to the individual cement manufacturer in reducing to a minimum the variety of odd specifications, some of them of the most peculiar and difficult character, with which he formerly had to deal, and from that point of view it is much more plain sailing for him in the production of the article which he supplies.

"Speaking for ourselves, we have welcomed the introduction of the British standard specification which is now being so largely adopted by the engineer and the consumer of cement, as, in these hard times of competition, it has equalised up the conditions under which the various manufacturers of cement have had to quote, and in specifying cement to the British standard specification, the consumer, in dealing with the tenders that he may receive for the supplies of same, knows that all the people tendering are doing so on even terms."

About 70 per cent of the tramway rails used in this country,† and the great majority of beams, angles, tie-bars, and channels, are now rolled to British standard sections.

The author has obtained from the manager of one of the largest rolling mills in the country the following statement of the advantages of standardisation:—

STANDARD SECTIONS.

(*a*) A very great reduction in the number of sections inquired for by buyers.

(*b*) As a result of the fewer number of sections, the amount of capital locked up in rolls (some of which are only used at very infrequent intervals) is materially reduced, depreciation and other charges being reduced accordingly.

(*c*) The smaller number of sections means less frequent roll-changing, with its attendant expense.

(*d*) Owing to the constant demand for standard sections, it is often possible to oblige customers for comparatively small quantities, as standard sections rolled and stocked usually find an early market.

SPECIFICATIONS.

There is a great saving in working standard specifications, as these facilitate chemical control, mixtures, and similar details.

The president of the Iron and Steel Institute, in his presidential address, delivered in May last, referred to this subject in the following terms:—

"The effect has been to reduce enormously the number of sections called for, as, owing to the very representative and influential character of the committees, British standard sections and specifications have been very extensively adopted, notably by the Admiralty, the Board of Trade, and Lloyd's Register. The British Corporation for the Survey and Registry of Shipping and the Bureau Veritas have likewise given effect to the committee's recommendations in their rules, with the result that the cost of roll stocks is being greatly reduced, and the manufacturer may now be content to roll into stock when it suits his convenience to do so, with the certainty that he will not have the material left on his hands, as was formerly frequently the case when almost every buyer had his own particular section and specification, which no other buyer could be prevailed upon to take, the advantage to the consumer of the adoption of the standard sections being quicker delivery (small lots frequently from stock) and reduced cost, practically no special rolls being now required."

The significance of these opinions is enhanced when it is known that, before the publication of the standard specification, there were more than seventy

* Lecture on Standardisation and its Relation to the Trade of the Country, delivered before the Institution of Engineers and Shipbuilders of Scotland.

† Seventh Report of Engineering Standards Committee.

different sections of tramway rails in use in this country, whereas the committee have found that five sections are sufficient to meet practically all cases. The fear has been expressed that standardisation would have the effect of so discouraging individuality of design as to seriously impede progress. As, however, except in rare cases where such a course is proved to be specially advantageous, the committee deals only with materials which are used in construction, the individual mind is allowed full scope in the use and assembling of the materials to form completed structures.

In addition, a safeguard is provided by the permanent constitution of the committee, which it is intended shall, from time to time, revise the specication in the light of later experience and development.

Having dealt so far with the general question of standardisation, the author will refer to that aspect of the subject which is of more particular interest to the members of this institution.

It will be remembered that at the annual meeting held at Plymouth two years ago Mr. Paton, in his presidential address, referred at some length to the adulteration and inferior quality of various materials in general use by municipal engineers, and suggested that the council should take up the question of standard specifications.

During the previous year a committee of the institution had been engaged in preparing, at the instigation of the British Engineering Standards Committee, a draft specification for sewer and drain pipes, and when at the first meeting of the new council the reconstitution of the committee was under consideration, the author suggested that the scope of the committee should be extended to enable it to deal generally with the subject of standardisation. This suggestion was adopted, and the committee has, during the past two years, devoted a large amount of time to the consideration of this subject.

The draft specification relating to sewer and drain pipes was completed and sent to the Engineering Standards Committee, who summoned a conference of representatives of various Government departments, engineers, manufacturers and others interested in the subject. This institution was invited to send three representatives, and on their motion the conference unanimously decided that it was desirable that a standard specification for vitrified ware sewer and drain pipes be prepared. A sectional committee was therefore appointed for this purpose.

The main committee selected as chairman of the sectional committee Sir Maurice FitzMaurice, chief engineer to the London County Council, and a number of meetings have been held under his able and sympathetic presidency.

In the course of their investigations the committee of this institution (which the author will refer to as the Municipal Committee) had accumulated a very large amount of evidence as to the inferior and unreliable quality of many of the pipes manufactured in various parts of the country, and they had been urged to do something to drive out of the market materials of this description. For this reason, in addition to various suggested tests for the finished article, they put forward the suggestion that if found practicable some chemical standard for the materials of which the pipes were to be made should be included in the standard specification. The committee felt that the practicability or otherwise of this suggestion was a matter upon which the opinion of the chemist and manufacturers should be obtained, and the suggestion was put forward with this view.

It is undeniable that a large number of pipes are supplied which to the eye appear to be quite satisfactory, but which in time deteriorate to such an extent as to give rise to serious trouble. Not long ago the author had to relay a 27-in. pipe sewer, about 500 ft. in length, which had collapsed, every pipe of which was found to be fractured. The pipes bore the name of a well-known maker, and had been laid about sixteen years. Probably at that time they appeared to be quite satisfactory, but when removed the material was found to have become most defective.

It was thought by the Municipal Committee that it might be found that the elimination of certain constituents from, and the inclusion of others in, the material of which the pipes were manufactured is essential for the production of thoroughly vitrified pipes; but unfortunately the chemists are of opinion that a chemical standard of this kind is not practicable. A few years ago the best pipes, in fact it might almost be said the only pipes of high quality, were those manufactured from the Devon and Dorset clays; but since then many of the Midland and other makers have, as the result of experimental work, and the exercise of great care in the selection and blending of clays and improvements in manufacture, been able to produce pipes of the highest quality.

The terms stoneware, fireclay, and earthenware as applied to sewer and drain pipes were always more or less ambiguous; but pipes made from Devon and Dorset or similar clays were generally included under the term stoneware, while pipes of Midland and other clays were usually designated fireclay or earthenware. Since, however, the latter were so much improved in quality these descriptions have practically lost all value. The aim of the Municipal Committee was to prepare a specification in such terms that all first-class pipes might be admitted and all inferior pipes rejected, and to ensure that all standard pipes should be made of dense, highly vitrified material. The old names have therefore been discarded, and standard pipes are to be designated vitrified ware sewer and drain pipes.

The suggested chemical standard for the material having proved impracticable, the committee had to fall back upon an absorption test, and it is hoped that this may be found both convenient and effective. One fact which has been brought to light while experimenting in regard to absorption, and which to most engineers will no doubt appear somewhat surprising, is that the salt glazing has very little, if any, effect upon the absorption, particularly in the case of better class pipes. It was thought at first that the glazing would interfere with the proper application of an absorption test; but it has been found that, for practical purposes, the effect of the glazing can be ignored in ascertaining the absorption figure. When applying a test of this kind it is, of course, essential that the samples should first be dried to constant weight, and with pieces of the size proposed this can be done under a temperature of 150 deg. C. in less than an hour. By subsequently boiling the samples as proposed, the maximum absorption is reached in forty minutes, so that the testing can be completed in a very short time.

The manufacturers on the Sectional Committee were not unanimous on the question of an absorption test, but a majority was in favour of the inclusion of a test of this kind.

The specification prohibits "slip" glazing, as this is generally applied to pipes of an inferior quality.

The interval water pressure test is to be adopted as a test for strength and soundness of the finished pipe, and the scale of pressures has been so calculated that the material will be required to sustain without damage a tensile stress of from 100 lb. to 125 lb. per square inch of sectional area. The general opinion is that for important work it is desirable to apply this test to each individual pipe, but having regard to the cost of so doing, the specification will contain alternative conditions which will enable engineers to call for pipes which have passed individually the hydraulic test and been stamped with the word "tested," or for pipes which have been made to the standard specification and are supplied as being capable of withstanding this test. The engineer will himself be entitled to select and test samples from each consignment of the latter class, but the makers will be under no obligation to apply the water-pressure test.

The specification also deals with such matters as thickness, length, shape, permissible deviations, glazing, and the marking of all pipes sold as complying with the standard specification, and the marking before sale of all inferior or defective pipes, and with the question of joints. The draft specification put forward by the Municipal Committee contained stipulations as to the dimensions and shape of sockets, but it was felt that in standardising a joint an effort should be made to improve the old form of socket and spigot, which, at any rate in the hands of the ordinary builder and estate contractor, is open to serious objection. Every engineer will agree that under proper supervision and by the exercise of care and skill in jointing, thoroughly good results can be obtained with this joint, but unfortunately hundreds of miles of house drains and considerable lengths of estate sewers are laid without care, skill, or effective supervision, and, notwithstanding this, the local authority is saddled with the whole responsibility for the subsequent maintenance and efficiency of the latter.

Fig. 1 is from a photograph of the section of a joint

typical of many which the author has from time to time removed, and the defects in which are directly attributable to the large annular clearance in ordinary spigot and socket joints. That this form of joint is by no means perfect is evidenced by the large number of patent joints placed upon the market during the past fifteen or twenty years, some of which have been very largely used. Unfortunately, however, these improved joints are seldom if ever used by the ordinary builder and estate contractor, but are adopted generally by those who could best ensure good work with the old joint. What is wanted is a pipe with a simple, inexpensive form of joint which, even when laid by comparatively unskilled and careless workmen, will give reasonably satisfactory results.

Fig. 1.

A modified form of socket was suggested by the municipal committee and was approved by a large majority of the members of the institution, who expressed their opinion in response to an invitation to do so, but on being placed before the makers it was stated by them to present difficulties in manufacture, and it had therefore to be abandoned for the time being.

For obvious reasons it is impracticable to adopt as a standard joint one which is covered by existing patent rights, and it is probable that the sectional committee will recommend a simple form of Stanford joint, the manufacture of which is now quite unrestricted. The cost of these pipes must necessarily be somewhat higher than that of ordinary socket and spigot pipes, but the labour of laying and cost of jointing material will be less, and it is hoped that in course of time local authorities may be able to obtain power to enforce the use for house drains, &c., of pipes which will give a concentric joint and true invert and that the standard Stanford joint may take the place of the old form of joint for all ordinary work. It cannot be disputed that municipal engineers are the largest users of vitrified ware pipes, and the author would express the hope that the members of this institution will do all in their power to support the efforts of their own committee to improve the quality of these important materials.

In addition to the work of the sectional committee on sewer and drain pipes, this institution has representatives on the sectional committees of tramway rails and cast-iron pipes for water, gas, and sewage, and representatives have also recently been appointed to attend a conference to consider the standardisation of road macadam. In addition, representatives of the institution's standardisation committee have taken an active part in the preparation of a standard specification for street lighting, by a committee called together by the Institution of Electrical Engineers, and composed also of members of the Institution of Gas Engineers, and of the Institution of Illuminating Engineers.

The draft specification which contains provisions standardising the unit and method of measurement, classification of streets, tests, and testings, &c., has now been completed and will be considered by the councils of the respective institutions represented on the committee. Probably, however, the most important work upon which the standardisation committee of this institution has been engaged—apart from the specification for vitrified ware pipes—is the specification for artificial stone paving. This was first issued about a year ago, and has had a good circulation; in fact, the first edition is now almost exhausted. It deals with materials, moulds, moulding, sizes, samples, tests and testing, maturity, marking, &c. The specification was prepared in consultation with, and received the approval of, the leading makers, and has already been found of considerable value. The author is aware that the work of the committee has been somewhat freely criticised, apparently in the belief that the matters dealt with have absorbed time and attention of the council which might have been expended with greater advantage to the members of the institution upon such subjects as security of tenure and superannuation. He is able to assure members that this impression is quite incorrect. The members of the standardisation committee who have been most devoted to the work of that committee have been not less devoted to the other work of the institution, and they submit that the work accomplished by them will prove the value to the members generally and increase the influence of the institution. Security of tenure and superannuation are undoubtedly matters of vital importance, but they can only be attained by special legislation, and in view of the present congested state of Parliamentary business and to the fact that practically the whole time of the Legislature is allocated to Government measures, it is almost hopeless to expect facilities for the introduction and passing of such a measure, even if the Government could be induced to preserve an attitude of benevolent neutrality, which is by no means assured.

In the meantime the author suggests that anything that can be done for the advancement of municipal engineering and in extending the influence of the institution must be of advantage to the members, and may in some measure hasten the accomplishment of the other objects to which reference has been made. In conclusion, he would urge the members of the institution to support and assist the standardisation committee in their efforts on behalf of the institution, both by adopting as far as possible the standard specifications, and by forwarding from time to time suggestions and information likely to be of value to them.

DISCUSSION OF MR. ELFORD'S PAPER.

Mr. J. S. Brodie (Blackpool), who proposed a vote of thanks, said he knew something of the work which Mr. Elford had put into this question. He had presided for two years over the committee of the institution which had had it in hand. He had been a member of that committee himself, and he spoke feelingly when he said they had been made to work. Information bearing on the subject had been obtained in various localities, and a specification for concrete had been out for some months. He took up the matter in his own district, with the result that the makers were working to the specification, and if the committee had done nothing more than that they would have done very good work. Many other materials appertaining to the work of municipalities they had had under consideration—from vitrified drain pipes to shovels and hammers. He hoped the committee would some day standardise all the things that they had occasion to use. It was urged sometimes that standardisation would not be altogether a blessing, that it would lead to lack of enterprise, lack of originality, and all sorts of evils. That was not so. Their standards were not like the laws of the Medes and Persians; if they fixed on a standard form for anything, and anyone came along with an improved form of it they would be quite willing to adopt it and cast their form aside.

Mr. E. J. Silcock (Westminster and Leeds), who seconded the vote of thanks, agreed with the suggestion that the members of the committee should from time to time give them some record of the work they had done. He wished to bear testimony to the advantages of standardisation with regard to Portland cement. They had undoubtedly made great advances in the quality of the cement which was supplied now compared with what they used to have some years ago. With so many specifications it was not worth the manufacturers' while to alter the make unless he had a very large order, and the consequence was that sometimes they got cement which was not so good as it should be since the standard specification had come into force; however, he had never had a consignment that had not passed all tests. He thought that said a great deal for the success of the manufacturers in complying with their requirements. The committee had not yet issued the standard specification for stoneware pipes, but that, he hoped, would soon be in force. The suggestion with regard to the modified form of socket was one which it did not seem to be possible to carry out successfully. It appeared to him that all the committee could do in the matter of the socket was to get some form of standard width and depth of joint. Materials should be of uniform quality and of a certain standard, but it seemed to him that a particular method of jointing should not be standardised, because that would interfere with the enterprise of private individuals in trying to improve the joints on the market. The Stanford joint mentioned by the author was a useful thing as a self-centring device for making a watertight joint; but personally, he

did not think it was of great value. A standard joint with a deep socket, allowing sufficient space for a cement joint to be made was more likely to be satisfactory, but in cases where water pressure was exceptionally severe no doubt some other form would be more applicable.

Mr. A. J. Price (Lytham) thought they were all agreed that they wanted standardisation for rails and cement, and the cement specification issued by the committee had been of great assistance. With regard to pipes, he thought it was rather a pity that the regulation adopted years ago of putting a black band round the inferior pipes had dropped out. There was no danger then of those with a black band being mistaken for something else. No doubt it was difficult to get a chemical standard. The stoneware pipe made in the Midlands could hardly be improved, because he knew in his own district in Lancashire they were getting pipes of the same manufacture, which were improved beyond conception compared with the pipes they got some years ago. With regard to the Stanford joint, he was in a district where they were practically waterlogged for a great part of the year, and he had always used a Stanford joint in preference to others on the market. He tested his pipes with water, and he did not like the test put down on the paper. He did not see the use of it.

Mr. Elford: That is a stress on the sectional area of the pipe.

Mr. Price remarked that if they were testing pipes they would not put this great stress on. He thought the Stanford joint practically met all requirements.

Mr. G. W. Lacey (Oswestry) said it was difficult in the case of certain articles to fix any standard. Take the case of steel rails. These naturally were wanted in certain sizes, and it was easy to standardise a certain number of sections, but then there was the composition of the steel to be considered. A pipe which was made in one part of the country differed altogether from one which was made in another, and it was not impossible to have many types of pipes on the market, all very good, to be used for different classes of work. The Stanford joint was a good one for obtaining true alignment, but it was not to be trusted altogether for watertightness. There were other cases in which standardisation had been very useful—cement, for instance, in which great improvements in methods of manufacture were noticeable. The more one could standardise as to quality the better; as to constructional methods, it seems rather more difficult of attainment.

Mr. J. S. Pickering (Cheltenham) said it was suggested that the chemical test was impracticable, and that the absorption test was to take its place. He would suggest that there ought to be a test for crushing. A hydraulic test, giving the tensile strain would go a long way to prove the quality of the material, but the most practical test was the crushing strain.

The President (Mr. R. J. Thomas) said it was very desirable that road materials should be standardised. There was now a most extraordinary state of things in the engineering world with regard to roads. The word "granite" had become a term covering every kind of hard material—basalt, quartzite, millstone grit—even limestones were advertised and sold as granite. It was very desirable, therefore, that the petrological description of the stone required should be specified. When the German engineers were over this year it was necessary to explain to them that granite was a term which covered a lot of materials nothing like granite. They were astounded by that revelation. Another standardisation they required was that of gauge. He bought material from a dozen quarries, and there were no two of them which supplied material of the same size. They all had their own gauges, and he therefore suggested it was desirable to standardise road material petrologically, and also with regard to gauge. He was on the committee which had to meet the Engineering Standards Committee to discuss the standardising of materials, and a sub-committee had been formed to discuss the question.

The vote of thanks having been passed,

Mr. Elford, in reply, said the making of a standard class of pipes had been considered by the committee, and a clause dealing with it would be included in the specification. He had its importance brought home to him some time ago when he was using some glazed bricks specified to be of best quality. A sample was submitted, and they were delivered at the works. When they came they all had "2" on them. The manufacturer had quite recently decided to mark all seconds bricks with a large "2." He need not say that the contractor was much surprised. The hydraulic test was for soundness. Mr. Pickering's point as to the inclusion of the crushing test had been very fully discussed by the committee, and they came to the conclusion that it was an unnecessary, troublesome and expensive test. It was tensile strength that a pipe was apt to lack, and by applying the hydraulic test they were putting on the pipe a full tensile stress. If they applied a crushing test they were putting the stress on the outside section of the pipe. They came to the conclusion that the hydraulic test was more useful and more easily applied. In regard to joints, he would like to say that the committee did not intend to lay down a standard method of jointing. The committee had had brought home to them from many sources the importance of having a joint that would give a large degree of initial concentricity. The object of the committee in suggesting a modified form of joint was not to ensure watertightness, that was a question of good workmanship. The committee thought it of great importance that there should be a form of joint which, without great trouble or the exercise of any great intelligence on the part of the man engaged in laying the pipes, would give a concentric joint. Personally he felt that the committee ought not to standardise the present form of socket. He did not suggest that the Stanford joint was suitable under all conditions, but it was a joint which gave initial concentricity. If something of the kind suggested was done, they might be able to get by-laws so amended as to be able to call for reasonable concentric joints in house drains. After all, these were the things they wanted to look to, and he hoped that in time good joints might be made universal. It was suggested that standardisation tended to stereotyping. Well, to his mind, standardisation should be progressive. If they had a standard which represented the minimum required for good work to-day, it might be necessary to raise that minimum to-morrow. It had been done in the case of Portland cement. In regard to the absorption test, he had carried out a good many tests, and had come to the conclusion that it was a very desirable one. He had had sent by the same maker two different lots of pipes. One gave an absorption test of between 8 and 9 per cent, the other an average of 0·38 per cent, an enormous difference. He thought that test would be one of the best included in the standard specification.

(To be continued.)

Exmouth's New Waterworks. The Exmouth Urban District Council's new waterworks at Dolton were formally opened on Tuesday last. The works carried out consist of a borehole, varying in diameter from 25 in. to 7 in., 338 ft. deep, pumping station, pipe line (rising main) 4¼ miles long to Squabmoor, and a reservoir 4 miles north-east of Exmouth. The pumping plant consists of suction gas engines in two units, each of 62 b.h.p. on anthracite coal; three-throw ram pumps in two units to lift from suction tank to Squabmoor. The air lift plant is in duplicate. The cost of the work is estimated at £15,000. The new pumping plant has been installed by Messrs. A. C. Potter & Co., London, to the specification of Messrs. G. H. Hill & Sons, Westminster and Manchester. In the initial stages of the scheme the surveyor, Mr. S. Hutton, rendered valuable service.

Pooh-Bah in Chilliwack.—The Judicial Committee of the Privy Council last week reserved judgment in the claim by the widow of Daniel McKenzie, on behalf of herself and two children, for compensation for the death of her husband. The Corporation of Chilliwack employed one municipal constable, named Calbeck, whose duties were those of police officer, sanitary inspector, lamp-lighter, path-master and pound-keeper. As the police-force he arrested McKenzie and another, and having locked them up in a wooden cell forming part of the court-house, left them there while he lit the street lamps and patrolled the streets. Unfortunately the wooden gaol caught fire, and by the time Calbeck, who carried the gaol keys, could be found it was too late to save either of the prisoners. The jury awarded the widow £600 and the children each £400, a verdict the Court of Appeal set aside. It is this decision upon which the Judicial Committee will give their judgment. Meanwhile, whatever the verdict be, we trust the Chilliwackians will draw the moral that the *operative* appointment of one officer for many and diverse offices is, though apparently a cheap device, a dear and dangerous one in the long run.

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Royal Sanitary Institute Congress at York.

THE CONFERENCE OF ENGINEERS AND SURVEYORS.

At the conference of engineers and surveyors, at which Mr. A. D. Greatorex, M.INST.C.E., borough engineer and surveyor of West Bromwich, and past-president of the Institution of Municipal and County Engineers, occupied the chair, the following papers —reproduced in our issue of last week — were submitted for discussion: "Sewage Disposal in Rural Districts," by Ascough Rodwell, engineer and surveyor, Skipton Rural District Council; "Sewage Treatment — Advantages of Land over Artificial Schemes," by John Manley; "One Solution of the Sludge Problem," by Arthur Hindle, M.INST.C.E., and P. Holt Whitaker, ASSOC.M.INST.C.E.; and "Notes on the Extension Seawards of the Gynn Outfall Sewer at Blackpool," by John S. Brodie, M.INST.C.E., borough engineer and surveyor.

SEWAGE DISPOSAL IN RURAL DISTRICTS.

In the absence of the author only one speaker offered any remarks on the paper on this subject submitted by Mr. Ascough Rodwell, engineer and surveyor to the Skipton Rural District Council.

Mr. F. E. Critchley (Gloucester) stated that in his district they were developing a kind of plateau or tableland on which a number of villas were being erected, there being no sewers within a long distance. They had tried several modes of treating the drainage from the houses, and had encountered many difficulties, the chief of which was with regard to the effluent. They were using as far as possible septic tanks with filter-beds. They had no stream, and the depth of soil was only from 10 to 12 in., after which they came to rock. The medical officer of health did not like the idea of discharging the effluent over such ground, because it was not known what buildings were going to be put up later, and his (the speaker's) desire was to get an expression of opinion from other engineers with regard to the matter.

SEWAGE TREATMENT: ADVANTAGES OF LAND OVER ARTIFICIAL SCHEMES.

Considerable discussion ensued upon the paper by Mr. John Manley, in which the advantages of land over artificial schemes of sewage treatment were discussed.

Colonel A. S. Jones, V.C., who was the first speaker, mentioned that the Army Council, having discovered that he had passed his eightieth year, had decided that he should retire at the end of seventeen years' work on the Aldershot Camp farm. They had not yet appointed a successor. Land treatment had been his theme for forty years, and he believed the value of natural purification was acknowledged everywhere. By forcing microbes to do more than they ought, filter-beds only became clogged, and the cleaning process which afterwards became necessary was a most expensive one. Moreover, they were not told what became of the dirty water from them. He thought it was becoming more and more understood that land must be properly attended to, and that there must be really honest attention by those responsible for its management. From the first it had been his aim to get the help of the best agricultural labourers he could find and interest them in their work, and any success he had attained on the Camp farm was due to the assistance he had obtained from men of that type.

Prof. Tyndale (Scientific Adviser to the War Office) said he had intimate knowledge of the Camp farm at Aldershot. The ground at first was let by the Government to a farmer, who naturally turned his attention to profit making rather than the purification of sewage—with the usual results. In a report which he made he was able to show that the system was wrong, and he was instrumental in getting Colonel Jones appointed to manage the farm. With the advent of Colonel Jones the aspect of the place completely changed. The farm was reorganised, under-drained, and put in a really fine condition, and he fully endorsed all that Mr. Manley had said in his paper with regard to it. The question arose whether it would be more economical to adopt artificial sewage treatment at Aldershot. He worked out a system of suitable artificial treatment, but found that no such process would give better results than or [illegible] any [illegible] over the farm. When the artificial treatment of sewage first came before the public, the latter, as in all cases of the sort, seemed to rush headlong into the matter, and everything had to be biological treatment just as everything nowadays must be ferro-concrete. (Laughter.) A vast number of artificial schemes were adopted, good, bad, and indifferent. He was naturally of an open mind. He supposed there was no system of artificial treatment with which he was not intimately acquainted, and there was no doubt there were thousands of cases where artificial treatment must be adopted, and gave all the results desired. At the same time he was glad to say that the old system had survived, and there were numbers of instances where sewage farming would always prove to be the correct method of dealing with sewage. At Aldershot all the conditions were favourable to the system, and it was essentially a case where sewage farming should be adopted. The other camp farms were working on the same system, and the loss varied between £1,500 and £2,000 a year. That on the face of it might seem a great deal, but if they looked at it in another way it was a cheap payment for getting rid of the sewage of 30,000 people, amounting to about 1,000,000 gallons daily.

Mr. G. W. Lacey (Oswestry) said he agreed that no one, even the strongest advocate of the system, would be inclined to insist that artificial treatment should be adopted in all cases, for there was no doubt that absolutely natural methods were in every case the best. It did not matter whether it was applied to sewage disposal or anything else; Nature's methods would always be the best. But there was such a thing as science, and science was progressive, and they owed much to it. If it were not for science, civilisation would not have reached its present high stage, and he thought it was rather out of place that the author of the paper should have referred in terms one did not like to read of those schemes which were really the originators of the biological treatment. These really deserved something more than a sneer, his view being that they were the pioneers of a very valuable system. It might also be considered that the Local Government Board would not have appointed a commission if there had not been ample ground for it—and they said it was generally more economical and satisfactory to employ artificial methods. Prof. Tyndale's contribution to the discussion was admirable. Given suitable land, by all means treat your sewage wholly and solely on the land. It might require preliminary treatment, and in his own case they had the dual system. They had desired in a recent scheme to adopt artificial treatment alone, but, having purchased land, the Local Government Board insisted on their making use of it, and they had therefore adopted a system of partial treatment on percolating filters and final treatment on land. The difference between the two effluents was very marked. The finishing treatment was a very valuable one indeed. With regard to the Aldershot farms, Colonel Jones regarded the idea of artificial treatment as the cultivation in a more condensed area of the same bacteria which fulfilled their work on land. Colonel Jones was an advocate of land treatment almost *per se*, and it was interesting to hear him pay a tribute to the value of artificial filters, inasmuch as their object was to some extent to reproduce the methods of Nature.

Councillor A. Upson (Maidenhead) said Mr. Manley's paper would not lead anyone to abandon artificial treatment for land. In the case of Redruth, which had been mentioned, he did not think sufficient data had been given to induce any engineer to reconsider his position, and in the information with regard to Wokingham the case was given away because contact beds had been constructed for a portion of the sewage. That being so, where was the argument for land treatment? He had been astonished at the expense of the land treatment carried on at Aldershot, and there were many engineers throughout the country who would be glad to do it at one-third of the cost mentioned.

Mr. J. D. Watson (chief engineer to the Birmingham, Tame and Rea District Drainage Board) said it was interesting to hear this battle of twenty years ago fought over again. They could now deal with the question with less bias, and he thought they

could admit there was a good deal to be said for all systems. He had been very interested to hear their old friend Colonel Jones, who was a veteran on this subject, but he was sorry indeed to hear that the War Office had not thought it prudent to continue him in office because he had become an octogenarian. He (the speaker) thought it was a mistake, because Colonel Jones had done good work at Aldershot. But they must not run away with the idea that, because at towns like Leicester and Nottingham, where they had land suitable for the purpose, land treatment was a success, they could purify the sewage of other great towns in the same way. There was one thing about the paper which he did not like. There was a tendency to sneer at the Royal Commission. The commission had done most excellent work—in fact, invaluable work—and if anyone in the room had read the whole of the reports he ought to get on his legs and speak, for in those reports they had the Alpha and Omega of the question. In them they had everything that could be said about sewage treatment, and the commission had approached the question from a most unbiassed point of view. There was not a single word in the reports against land treatment; on the other hand, they had appraised the different systems in a most excellent manner, and the very fact that they had sat and investigated the question for twelve or fourteen years was in itself evidence of the great amount of work that had to be done and close study that had to be made of the experiments of the various people interested in the work. He always felt it was necessary for a body like the Royal Sanitary Institute to express its mind with regard to the work of the Royal Commission, and express their appreciation of the work done.

Mr. R. W. Cass (Farnham) said they had a farm near Aldershot which had been very successful. It had been in existence for about twenty-five years, and was still as good as ever. What he wanted to know was whether, provided they had a good farm, there was more possibility of smell arising from it than would be the case with artificial works.

Dr. Fowler (Manchester) said that one difference between natural and artificial treatments which ought to be emphasised was that even under good conditions the results from a sewage farm were not always what they might appear to be. If they had land freshly ploughed and sewage was turned on to it for a certain period the effluent from it would not be good. At Wolverhampton the works manager and chemist, Mr. Clifford, had shown him a series of figures proving that, on any day, it would be possible for an inspector to go to the farm and take a bad sample—if he went at the right time. At the recent annual meeting of the Association of Managers of Sewage Disposal Works at Wolverhampton they saw a beautiful effluent going into the stream, but at any one of the numerous outlets on the farm the effluent would probably not be as good as that elsewhere, owing to the soil having been recently turned, allowing the sewage to get through. That showed the necessity for careful management. He would say this for land treatment: a great deal of the prejudice against it was due to the fact that the same scientific care had not been bestowed on it as had been the case with the more modern methods.

Mr. John Manley said it had not been his intention to condemn artificial schemes unnecessarily. He had no object in inducing any engineer to give up a system that was dear to him in favour of land treatment; his desire was to suggest that more attention should be given to the latter in certain cases. The mention of the word "sneer" had rather surprised him. He had certainly not thought of sneering at the Royal Commission, for he himself had derived not a little information from their reports. Mr. Manley added that the Blackwater river, into which the effluent from the Aldershot Camp farms flowed received sewage from the town of Aldershot. Samples had been taken by the Royal Commission both above and below the point of discharge, as well as by the Thames Conservancy afterwards, and it had been reported that the water below the camp sewage farm was purer than the water above, which contained the discharge from the town sewers.

ONE SOLUTION OF THE SLUDGE PROBLEM.

This was the title of a paper—also reproduced in our issue of last week—by Messrs. Arthur Hindle, M.Inst.C.E., and P. Holt Whitaker, Assoc.M.Inst.C.E., which was next considered by the conference.

Mr. S. S. Platt (Rochdale), who opened the discussion, said he supposed the litter to which reference was made in the paper was employed as a filter in addition to being used as manure.

Mr. R. W. Cass (Farnham) stated that he had had some difficulty in disposing of sludge. But they had adopted the method of building a thick wall of town's refuse round the sludge. The liquor drained away through this, leaving behind a material which made an admirable manure, for which the farmers willingly paid from 9d. to 1s. per load. The material was built up to a height of 7 ft.; there was no handling, the sludge simply being pumped in until the requisite amount had been deposited.

Colonel A. S. Jones, v.c., observed that they had used the litter from cowsheds in a similar way.

Mr. J. S. Brodie (Blackpool) pointed out that the authors had stated that the amount of wet sludge passed on to the beds was 2½ tons per day on the average, and the quantity of dried sludge taken out 16 cwt. He would like to know what was meant by dried sludge in that connection. He took it there was a considerable amount of moisture left in the sludge. With regard to the price obtained for the sludge, he presumed that it was 1s. 9d. at the works, and that contractors themselves removed the sludge from the beds.

Councillor A. Upson (Maidenhead) inquired the cost per ton of disposing of the wet sludge.

Alderman T. Burton (Warrington) inquired whether there was any discernible smell arising from the collection of the sludge.

Mr. Hindle, in the course of a short reply, said the moisture in the dried sludge amounted to between 35 and 45 per cent. The price of 1s. 9d. was, of course, at the works, and the contractor undertook the removal of the material, besides providing the litter required. He could not give the cost of disposing of the wet sludge; the whole operation really only consisted of the opening of a valve. There was no smell, except when the inlet valves were first opened, when there was some little odour in the immediate vicinity. The sludge, after being dried, was quite portable, and reached its highest value after an interval of twelve months. It could be cut into like hay after that lapse of time.

BLACKPOOL SEWER OUTFALL EXTENSION.

The paper on the Extension Seaward of the Gynn Outfall Sewer at Blackpool, which we also printed last week, was productive of an interesting discussion.

Mr. E. R. Matthews (Bridlington) said he considered the paper one of the most important and interesting the conference had had before them. Coming from a seaside town where they had two or three outfalls laid on the foreshore, he was naturally interested in the construction of such a work. He would like to know if Mr. Brodie had found the coating of the tubes with the bituminous preservative effective. He (the speaker) had laid a 30-in. outfall with flanged pipes, but from inquiries made he had found that a good report with regard to the use of steel tubes was not forthcoming, and therefore did not recommend their adoption to his committee. Did Mr. Brodie consider Karri wood the most suitable material for carrying the sewer? What distance below low-water mark of ordinary spring tides did the pipe extend? He did not see the object for the timbering. He would like to know also what was done with a view to holding down the pipes. He knew there were bedplates at the side at distances of 18 ft. Was the object to keep the pipe down so that a rough sea would not lift it?

Mr. H. Gilbert Whyatt (Grimsby) said he was rather interested in this matter because he might have to carry out a similar work himself in a short time—but in an estuary instead of deep-sea water. He questioned whether steel was the right material. The cost of the work at Blackpool had been only £1,950, and at that rate it might be worth considering whether it would not pay the town periodically to reconstruct instead of meeting the cost of what might be a more permanent undertaking. He would like to know whether the work was done in one tide or whether the operations occupied two or three tides. The work was stated to have been carried out on a specially high spring tide of 24 ft., which necessarily included a specially low tide. Was the whole length bare at the time, or a part of the pipe dropped into the water at a time and left to take its chance?

Councillor Dyer (Bridlington) asked whether the

steel pipes would last as long as cast-iron pipes in sea water.

Mr. T. W. Stainthorpe (South Africa) mentioned that some years ago he carried a sewer over the foreshore of the river Tees. He made use of cast-iron pipes; therefore he asked Mr. Brodie whether he thought he had adopted the right material in steel, and if the Local Government Board approved of it? Also had he considered the question of employing ferro-concrete in place of Karri piles?

Mr. C. Brownridge (Birkenhead) asked what kind of bituminous compound was used for covering the pipe? Also why had he not carried his cradles or slings further towards the end of the piles? Had he had any evidence of the pipes at the end sinking further in to the sand, or did the bed plates prevent that? Of course, Mr. Brodie had a special kind of foreshore to deal with, and his method could not be adopted in its entirety universally. It would be valuable, added the speaker, if Mr. Brodie could tell them the depth of the sand, and what was the nature of the subsoil. It was a practical paper, and he thanked the author for the excellence of it.

Mr. J. S. Munce (Belfast) joined in the commendation of the paper. He wished to inquire whether Mr. Brodie was not asked to level the foreshore alongside the pipe. He considered the author of the paper had done the right thing in adopting steel, and instanced a case in his own city in which a saving of £1,500 had been effected by the employment of steel covered with jute in preference to cast-iron. Their experience was that steel pipes were far superior to cast-iron pipes for foreshore purposes.

The President (Mr. A. D. Greatorex), in closing the discussion, said he had had occasion lately to relay an important main sewer owing to mining operations. In that work he adopted steel, for the reason that he was anxious to make the sewer act almost like a bridge in the event of future subsidences.

Mr. Brodie, replying upon the discussion, said, with regard to the bituminous material employed in coating the pipe, that he took very special care to get the best preservative to be found in 1907. Its efficiency was guaranteed by the makers of the pipes. Since the work was completed he could entirely corroborate what they had said, for the closest examination had failed to indicate on the exterior of the pipes any injury having been done to them. He could not speak as positively with regard to the interior of the pipes, but, as far as they were able to judge by means of the manholes, there was no indication either of anything having affected the metal. In regard to the piles, they had made use of pitch-pine at Blackpool, but the wood was very much worm-eaten, and was being replaced by Karri as occasion arose—which, he was sorry to say, was very frequent. In regard to the timbering for short lengths, that was done in 1907 at the suggestion of the Local Government Board. They proposed they should timber and introduce the steel straps which were made to fit the curvature of the piling merely for purposes of laying. He thought it a very sagacious suggestion on the part of the engineers to the board. The intention was simply to ensure the pipe being laid closely up to and against the surface of the old outfall pipe. They found that it answered as perfectly now as it did in 1907. The pipes had to be laid in one tide or they could not be laid at all. They had one or two false starts—that was to say, they did not float off because of the rough sea—but on a third attempt the sea was sufficiently calm, with a south-east wind blowing, that the work was done without a hitch. The pipe was towed into position at or near the time of high water, and at the fall of the tide was dropped exactly into the place prepared for it. In the final operations the assistance of a diver was unnecessary, but in any future extension this would be required. Answering the question with regard to the nature of the subsoil, Mr. Brodie said there were 6 ft. of sand, with a stiff yellow clay underneath. No difficulty was experienced in keeping the pipe ends clear. In reply to Mr. Stainthorpe, the site of the work was not one in which he would have suggested the use of ferro-concrete piles, and as to Mr. Brownridge's question, the cradling was carried to the point it was at the suggestion of the Local Government Board.

(To be continued.)

Londonderry's New Guildhall. The ceremony of opening the council chamber of the new Guildhall at Londonderry was performed last week.

STATISTICS OF COST OF ROAD MAINTENANCE.

THE IMPORTANCE OF RECOGNISING DEFINITE FACTS RELATING TO THE INFLUENCE OF VARIOUS CONDITIONS UPON COST AND EFFICIENCY.

Amongst the subjects to be discussed at the Third International Road Congress which will be held in London next year is: "Statistics of Cost of Road Construction and Maintenance." Communication No. 9. (See p. 18 of The Surveyor, July 5th, 1912.)

It is, of course, mainly in its administrative aspects that this matter demands attention, in order that light may be thrown upon the nature of the service performed by roads of certain classes or in certain localities, and the way in which the burden of their upkeep is distributed amongst taxpayers and ratepayers. It must not be forgotten, however, that, besides being able to work forward from statistics to financial and administrative considerations, we can also work backwards towards the physical facts upon which the statistics are based. A particular road costs so much a mile as the result of the interplay of different forces, some wholly favourable, some always adverse, and others which are sometimes favourable and sometimes adverse, the actual effect depending partly upon conditions immediately preceding and partly upon the other factors which come into play at the same time. There is, for instance, probably some county in England the rainfall of which, having regard to its amount and its distribution, is a favourable factor compared with the rainfall of Essex or of Breconshire; and there may be places where the topography is such that the effects of greater or less rainfall may be compared on roads on similar soils and in other respects similarly situated. The rainfall cannot be controlled, but we cannot judge of the effects of conditions which we do control unless we know what are the effects of the conditions that we cannot control.

The effects of various conditions upon the wear and deterioration of roadways are to be discussed under subsection C, but it is suggested that some statistical recognition of them may be possible with the materials now available, but scattered about the country, and that important economies might in some cases follow the recognition of effects which may here and there be disclosed by the costs accounts of surveyors. It is understood, of course, by all who have given attention to the matter, that surveyors generally have not been provided with the funds or the staffs necessary for the keeping of detailed costs accounts, but it is at the same time probable that the costs of maintenance of separate stretches of road in the same district are known with sufficient accuracy to make a comparison possible when the conditions affecting the different roads are so nearly similar that the influence of the factors that are not similar can be definitely traced. If, for instance, a length of two miles of undulating road crossing the spurs of a long hill is succeeded by a mile of the same road, with the same traffic, along a contour of the hill, and nearly level throughout, we may, if the costs accounts relate separately to these two portions, find that the road with an average gradient of 1 in 80, and some dead flats, costs so many pounds a year more than the similar stretch with an average gradient of 1 in 30. It is obvious, however, that where there are many differences in the conditions it is impossible to trace the effect of any one of them so definitely, either as regards the average state of the road or its annual cost.

It is not suggested that the costs accounts of every road should be kept for every odd length that happens to coincide with some natural condition, such as slope or subsoil; but it is suggested that where an arbitrary division falls near a spot where a marked change takes place, it may be moved to that place, so that the influence of different conditions may be gradually seen in the costs accounts. In other cases, stretches of road which are of the same character throughout may be selected as worth the trouble of keeping apart in the accounts. If, for instance, a surveyor could prove that a piece of road in side cutting cost £15 a mile on account of seepage water alone, he would have made out a case for the purchase of the land necessary for a catch-water drain and the expenditure needed to provide suitable culverts. Such figures must, of course, be used with common sense, and cost is not always the criterion; but the same separate contemplation of well-defined lengths of road as is useful in ascer-

taining differences in cost will help the surveyor to estimate the value and importance of factors affecting the comfort and convenience of users of the road. Apart altogether from the keeping of accounts in a manner intended to test the importance of different factors, there is, it is believed, a considerable amount of information available in the accounts as now kept in some counties and districts, and if during the next few weeks some of this information could be published in THE SURVEYOR it might form the basis of a suggestive and valuable Note in the Report to be presented to the International Road Congress next year, even if this note were no more than a reference to those issues in which the information appeared. The best way in which to give the information is to compare stretches of roads in pairs, each pair having similar and as nearly as possible the same amount of traffic, and differing in not more than one important circumstance. The difference in effect may be noted as one of the average state of the road, or as a difference in cost of upkeep.

SUGGESTED COMPARISONS.

The following are suggested as some of the comparisons which may be made, but any others which occur to readers of THE SURVEYOR may be noted in addition.

Nature of the Subsoil.—The actual difference in annual cost of maintenance due to a change from sandstone to clay, for instance.

Lengthwise Slope.—A dead flat may be compared with a steep slope as regards both cost and the state of the surface: and a very steep slope compared as regards cost with a moderate slope.

Surface Water Drainage.—A well drained road may be compared with one which remains waterlogged after rain, or with a road which is damaged by too rapid or too concentrated drainage along the edges of the crust, due to lack of outlets or an inadequate side drain. A length with proper ditches and outlets may be compared with a narrow road which acts as a watercourse whenever there is heavy rain.

Drainage of Crust and Soil.—Suitably drained lengths may be compared with lengths which are soaked with seepage water during and after wet spells, or with roads on embankments so narrow that they suffer in droughts, or from heavy rain following drought.

Material of Crust.—Valuable figures are available for whole districts or for single long roads; but definite comparisons of similar lengths during the same season would have a further value.

Width of Carriageway.—A length of suitable width compared with a length of road having a carriageway so narrow that the traffic is unduly concentrated, causing increased wear, or with a carriageway so wide that there is undue loss by weathering and occasional damage. Such a length of road is sometimes found where there is not enough width for the making of turf margins, although a carriageway from bank to bank or from hedge to hedge is somewhat too wide for economy.

Width between Fences.—A length having sufficient width may be compared as to cost of maintenance with a road having insufficient width and suffering from (*a*) lack of support between the edges of the crust and the ditches, involving frequent repairs, (*b*) no room for side ditches, (*c*) no room for the management of fences or for the overhang of vehicles, so that wagons carrying wide loads are diverted too much to the middle of the carriageway, (*d*) walls, close palings or banks, surmounted by thick hedges too close to the carriageway for the proper circulation of air to be maintained.

Shade and Exposure.—Generally definite comparisons between lengths of road having suitable trees properly spaced apart and standing at the right distance from the carriageway, with lengths of roads having trees too densely planted having regard to soil and situation, or planted in such a way that they exercise a bad influence upon the road.

Care must be taken in making these comparisons that the two stretches of road are not otherwise dissimilar.

Another point on which information as to cost of maintenance will be valuable is the effect exerted by hedges and trees in preventing winter or spring sunshine from thawing the surface of a road. The consequent licking up of the surface is recognised as an inconvenience, and the question arises as to whether it can be measured as an expense.

As regards summer and early autumn conditions, comparisons are needed between lengths of road which are shaded by suitable trees spaced in a manner conforming with the circumstances of a locality and other lengths fully exposed to sun and air. Can, for instance, any surveyor provide an example of a length of road costing more than some other length simply because it is too much shaded by trees or bushes? Or can anyone provide an actual case in which a length of road which goes to pieces in droughts has cost more to maintain than a neighbouring stretch which is similar in all respects except that it is shaded by large trees set closely together?

Wear and Tear at Edges.—A length with weak or insufficiently protected edges may be compared with a length having edges well protected and of adequate strength.

Other Comparisons.—Any other comparisons which may suggest themselves, or which demonstrate facts found to be of importance in the maintenance of roads, will be welcomed.

POLLUTION OF STREAMS BY COAL-WASHING WATER.*

By H. MACLEAN WILSON, M.D., B.SC.,
Chief Inspector, West Riding Rivers Board.

Coal as it comes from the pits often contains a considerable admixture of impurities, such as shale, clay, and pyrites, which greatly reduce its value, and especially so in the case of coal which is to be converted into coke for use in the iron and steel industries. The larger pieces of stone and shale can be picked out of the coal by hand, but when the coal and its impurities are broken up into small pieces this method of separation is impracticable, and it becomes necessary to wash the coal. The impurities are almost invariably of greater specific gravity than the coal, and when a mixture of small pieces of the two is agitated in water they gradually separate into two layers, the coal at the top, and the "dirt" at the bottom. All washing machines are constructed to take advantage of this difference of specific gravity, and are so arranged that the dirt is discharged from one part of the washer while the coal issues with the water from another part. The coal is separated from the water either by straining or settlement, but the water which finally escapes usually carries with it large amounts of fine coal in suspension.

In order to safeguard the streams and to recover as much water as possible, it is advisable, at every colliery, to have final settling tanks or ponds situated as low as circumstances will permit, so as to be available for the interception not only of the surplus water from the washers, but also of the surface drainage from the whole of the colliery premises. These ponds can readily be constructed by forming banks across a small valley or around a flat area with the spoil from the pit. The waste waters when turned into such a pond will percolate through the banks, and, thus filtered, may be made fit to discharge to a stream, or to be reused at the colliery. When the pond becomes full of settled solids its banks can easily be raised by further tipping. In some cases, ponds of this kind have been made ¼ acre in area, and with banks 25 ft. high.

It is gratifying to find that the measures of purification adopted by colliery proprietors have resulted in a great saving to them. When the dirty water from the washers was discharged untreated to the streams a much larger quantity of water was needed for washing the coal, and it carried with it a large amount of good coal in suspension, amounting in some cases to 200 tons per week. This coal is now almost always recovered and mixed with the washed coal. Where this is not done it can be used for burning in the colliery furnaces.

East Northumberland Water Supply Scheme.—A scheme of water supply, which it is proposed to carry out on a co-operative basis amongst local public authorities, is being developed in East Northumberland. The proposal is to form a joint water board to secure Parliamentary powers for utilising water from the Simonside Hills, at Great Tosson, and from the River Alwin.

* Extracts from paper read at the Industrial Hygiene Section of the Royal Sanitary Institute Congress at York.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

262. Wood Paving.—What contour should be given to a wood-paved (soft wood) road 60 ft. in width? Describe the best method to adopt in fixing the screeds. (A. B.)

264. Concrete Beam.—A concrete beam reinforced with steel rods is to be designed to carry a distributed load of 20 tons. The span is 15 ft. Show by calculations what size of beam you would use—the method and formulæ to be as simple and short as possible. ("Greenland Farm.")

265. Strength of Shafting.—A 10-in. shaft has a 4-in hole run through it; what fraction of its weight is removed? To what extent is its strength in resisting torsion affected?

266. Surveying.—Describe in detail the operation of measuring a horizontal angle with a theodolite. ("Surveyor.")

REPLIES TO QUESTIONS.

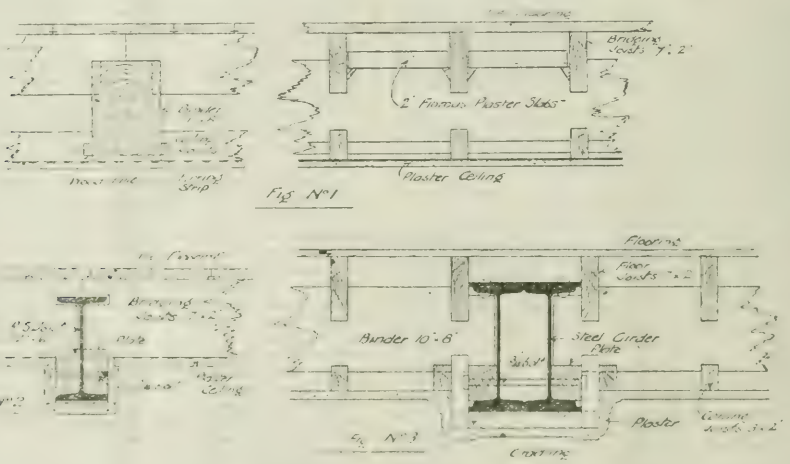
260. Refuse Disposal.—Where there is no system of sewers in a district, what are the best methods of collecting, removing and disposing of the fluid and solid refuse from the community?

For the removal of refuse from a community placed under such circumstances, the pail system for the solids and watertight cesspools for the liquid refuse, is the best and only successful method. No particulars or circumstances being given, the following is written under the impression that the local authority carries out the removal. In that case each house should be fitted with sufficient closet accommodation to successfully meet the requirement of the occupiers.

The closets should be well ventilated with the "aerolite" or other suitable type of ventilator and should have local impervious floors, consisting of concrete or other suitable material. The floor should be laid so as to have a fall towards the doors. The part underneath the seat should be slightly raised, thus causing the pail to fit tightly against the underside of the seat, an arrangement which goes a long way towards keeping the floor dry on the underside. The seat should either be made so as to allow the pail to be removed from the top or, better still, it should have a small door placed at the back through which the night-man can remove the pail without entering the closet. These pails should be emptied periodically at least twice per week, and at night. The contents should be taken away in a closed cart to a suitable isolated spot, and there treated either with lime or by some other suitable method. Where water-closets and sinks are in use it is necessary to construct watertight cesspools to receive the liquids as well as the solids, and these also must be emptied periodically at night time and taken away. The best method to adopt for emptying cesspools is that of pumping by compressed air into an airtight tank on wheels, thus preventing any nuisance from smells. The liquid part of the contents may be used for garden purposes by fixing a pump to the cesspool, thus drawing the liquids off and leaving the solids behind. In any case overflow pipes must not be allowed, otherwise the liquids will percolate into the soil, thus causing serious danger to health.

With regard to the treatment of the refuse, it is generally taken some distance away from any habitation, on to a piece of ground having a series of ploughed furrows, prepared, into which it is emptied, quicklime being added. After a time the refuse is ploughed into the land and fresh furrows made to receive the next dose. In some places the ashes and house refuse from the community is mixed with it and allowed to get fairly firm, and then carted away to go on the adjoining agricultural land.

If there were enough refuse to warrant the use of a small destructor, this would be the best and most sanitary method, but in that case a sewerage system would probably be installed. (C. F. B.)



Floor Construction.

263. Floor Construction.—Give sections showing clearly the construction of a double floor and a framed floor respectively. ("Junior.")

Double Floors.—Figs. 1 and 2 give sections showing two methods of forming double floors. Such floors are used where the span exceeds about 16 feet, although Tredgold gives it as his opinion that to ensure stiff ceilings single floors should not have a greater bearing than 12 feet. Where timber binders are used (as in Fig. 1) they should be given to ensure a free circulation around their ends in order to prevent dry rot and maintain the floor in a state of efficiency. Fig. 2 shows a R.S.J. as a binder and the underside of the girder cased with wood. It is not usual to place the binders at greater intervals than 10 feet. Fig. 1 also shows a modern

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
Assistants' and Students' Section	210
Association of Consulting Engineers	199, 219
Appointments Vacant	224
Blackpool Cleansing Department	213
Blackpool Sewer Outfall Extension	207
Contractors' Retention Money	199
Factors Affecting Cost of Road Maintenance	198, 208
Indian Students and Municipal Engineering	217
Institution of Municipal and County Engineers:	
Annual General Meeting in London	202
Notices	224
Law Notes	212
Local Government Board Inquiries	214
Mersey and Irwell Joint Committee Annual Report	198, 223
Mr. John Burns and Housing	199
Municipal Competitions Open	224
Municipal Contracts Open	224
Municipal Work in Bristol	220
Municipal Work in Progress and Projected	215
One Solution of the Sludge Problem	207
Personal	217
Pollution of Streams	199, 201, 209
Road Board's Policy	211
Road Construction and Maintenance in Herefordshire	197, 200
Royal Sanitary Institute Congress at York:	
Conference of Engineers and Surveyors	206
Sewage Disposal in Rural Districts	206
Sewage Treatment: Advantages of Land over Artificial Schemes	206
Sewerage and Sewage Disposal Apparatus	221
Standardisation	197, 202
Statistics of Cost of Road Maintenance	198, 208

method of sound proofing by using fibrous plaster slabs resting on wood fillets. It is now quite usual to construct all large floors as double floors; this is due to the present-day facilities for obtaining steel girders of any convenient size and section.

Framed Floors are principally used in large buildings such as hospitals, banks, halls, &c. Fig. 3 shows a section of such in which the girder is formed of built-up steel sections.

In consequence of the introduction of steel and the desire for fire-resisting buildings, floors composed of reinforced concrete or steel sections embedded in concrete are rapidly superseding the older forms of construction in which timber was a constructional factor. (H. F. W., *Tottenham.*)

Tramway Trailer Cars. The London County Council Tramways and Improvements Bill, one of the provisions of which allows an experiment to be made with trailers and coupled tramway cars on the South London tramway system, was read a third time and passed by the House of Lords last week.

Business Announcement.—Mr. S. H. Morden has opened offices at Broad Sanctuary Chambers, 11 Tothill-street, Westminster, and has been appointed sole London agent to the firm of Musgraves (Liverpool), Limited, of Liverpool and Newcastle-on-Tyne, sanitary engineers and manufacturers of "Invicta" porcelain enamelled fireclay ware and every description of sanitary appliances for use in hospitals, schools, asylums, and other public buildings.

Lord Crewe on Town-Planning. Delivering the opening address at the Summer School of Town-planning, which is about to be held at the Hampstead Garden Suburb, Lord Crewe on Saturday last observed that it was gradually being realised that the by-laws of local authorities were made for mankind and not mankind for them, but a good many angularities still existed, and it might be some time before the path of town-planners was made as easy as it should be. Referring to the creation of the new capital of India at Delhi, he said that to be convenient and suited to the Europeans who had to work there it could not be planned in a manner altogether foreign to Western ideas and Western life; at the same time, it must not be hostile in appearance or in spirit to the Mahomedan ideals of the past. Therefore, when the actual architecture of the new city had to be considered it would be clearly no easy task for the architects engaged upon it to combine the old and new in a manner which was necessary if a truly satisfactory result was to be achieved. In the meantime they had proceeded some little way in the planning and laying out of the scheme for the main parts of the town.

ROAD BOARD'S POLICY.

THE POSITION OF THE BOROUGHS.

Mr. L. S. McKenzie, city engineer, and Mr. W. H. Wise, assistant to the town clerk of Bristol, who on the 19th ult. attended a deputation to the Road Board, arranged for by the Association of Municipal Corporations, have reported to the city council as follows: "The objection of the association to the policy of the board was that, while considerable sums were being disbursed from the road improvement grant towards improving the road surfaces in rural areas, no money appeared to be available for road improvements within the areas of municipal boroughs, and the object of the deputation was to discuss the matter with the Road Board and to endeavour to induce them to change their policy.

"The deputation was received by the chairman (Sir George Gibb) and other members of the Road Board, and the case for the boroughs was presented by Mr. Fox (town clerk of Leeds).

"In reply, Sir George Gibb pointed out that at present the income of the Road Board was comparatively small, and he stated that the views of the Board were: That it was quite fair to give attention to the rural districts first, because there was no doubt that the rural roads, which were not constructed to carry motor traffic, were being rapidly destroyed, and the strengthening of the road surfaces was an urgent matter in order to avoid irreparable damage. On the other hand, municipal authorities were already bound at their own cost to maintain strong road surfaces in order to carry the normal traffic of their boroughs, and had therefore no claim on the road grant for that purpose. With regard to road widening, the board intended each year to allocate a share of the grant towards this object in boroughs, but they were opposed to doling out the money simultaneously to a number of borough councils to assist the promotion of small schemes, on the ground that the amounts would be so small that no tangible good would result. They preferred to take up a single scheme each year, and to devote to it the bulk of the fund available for road-widening. They had accordingly selected London this year, as being the most important place, and had agreed to contribute £875,000 towards the construction of a new road there, the estimated cost of which is £1,500,000. Having completed that scheme, they would proceed to deal with other towns."

Croydon and Motor-Omnibuses. The Croydon Borough Council have decided to seek powers to tax motor-omnibuses running in the borough.

Shorland's Patent Manchester Stoves and Ventilators. The new isolation hospital, Staines, Middlesex, is being supplied with Shorland's patent warm-air ventilating Manchester stoves with descending smoke flues, patent exhaust roof ventilators, and special inlet ventilators by Messrs. E. H. Shorland & Brother, Limited, of Failsworth, Manchester.

Surrey County Council and District Road Improvements. The Highway Committee of the Surrey County Council at the last meeting of the latter body reported as follows: "The committee have had under their consideration the principle of contributing to improvements carried out on district roads in the county, the practice hitherto, with the exception of making contributions to bridges on district roads, having been to recommend contributions to improvements on main roads only, the amount of such contribution being generally one-third of the actual nett cost falling on the local authority. There is no doubt that, owing to the great increase of traffic in recent years, certain district roads in the county are now carrying an enormous volume as compared with past years. Under these circumstances your committee feel that the burden of the full cost of the improvement should not fall entirely on the local authority, and it is recommended that in regard to all future applications for contributions to improvements on district roads in the county, the county council will, with regard to such improvements as they may approve, contribute one-fourth of the actual nett cost falling on the local authority upon the certificate of the county surveyor that the work has been properly executed." The recommendation was agreed by the county council.

Law Notes.

Edited by J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

Contract with Local Authority: Absence of Seal.—Some important questions as to the effect of an unsealed contract between a landowner and a local authority were decided in *Hoare* v. *Kingsbury Urban District Council* (Chancery Division, Mr. Justice Neville, July 5th). The plaintiff was the owner of a building estate abutting on a 20-ft. road, on a higher level than the land known as Stag-lane, and deposited plans for the erection of thirty-six houses. The chairman of the council suggested that the plaintiff should set back the houses, remove the hedge between his land and the road, level up the land, and throw a strip 20 ft. wide and 1,000 ft. long into the roadway, in consideration of which the council would adopt the strip and make up the widened road at their own expense. The plaintiff fell in with this suggestion and signed an agreement embodying the terms of the arrangement which was drawn up by the chairman. The agreement and plans were submitted and duly approved at a meeting of the council, and both parties proceeded upon the footing that they were bound thereby. The plaintiff duly performed his part of the agreement, and the council erected three gas lamps on the added strip and obtained the sanction of the Local Government Board for a loan to make up and sewer Stag-lane, and advertised for tenders, but proceeded no further. The plaintiff, after repeated applications to the council to perform their part of the agreement, brought this action for specific performance. The council then for the first time raised the question that they were not liable because their seal had never been affixed to the agreement, and this was their main defence. They also pleaded the Statute of Frauds. On behalf of the plaintiff it was contended—(1) that the agreement was not a contract within the meaning of sec. 174 of the Public Health Act, 1875, and therefore did not require to be sealed; (2) that the agreement was entered into with the council as the highway authority, and not as the sanitary authority, and therefore the section did not apply; (3) that there had been a sufficient part performance of the agreement to take it out of the Statute of Frauds; (4) that the contract was not necessarily of the value of £50 and upwards and so that the council were estopped by their own acts from repudiating the agreement. Mr. Justice Neville, however, though he agreed that the council could not rely on the Statute of Frauds, held that they were not estopped from setting up the defence that the contract had not been sealed. He held further that the agreement was made with the council as urban authority, under the section, and was for more than £50 in value, and therefore, not being under seal, it could not be enforced. The action was accordingly dismissed.

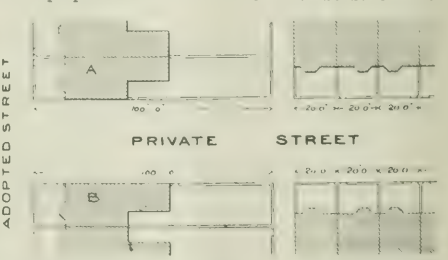
QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X, *combinations such as* X.Y.Z., *and words such as "engineer" and "surveyor," should never be used.*

Surveyor to Urban District Council: Duties: "Whole Time": Private Street Works.—"L. Q." writes: (*a*) Council Surveyor: Extra Services.—My council instruct me to prepare plans, sections, specifications, quantities, estimates, and apportionments for making up a number of private streets (value, say, £11,000), but they object to making any grant for extra services. I maintain that such work is outside and in addition to my ordinary work as their surveyor, and that I ought to be paid extra for such services. Am I not justified in asking for extra remuneration, and are not grants to surveyors a usual proceeding all over the country? (*b*) Surveyor's Whole Time.—My council say that I undertook to devote my whole time to the duties. I maintain that "whole time" means that I should not undertake private work. The clerk says that it means days and nights. The council take up most of my nights attending committees held at 6.30 p.m. to about 9 or 10 p.m. Am I not entitled to extra pay for overtime at nights? (*c*) Making Private Streets previous to Commencing to Build Houses.—Can my council insist upon new private streets being properly made and sewered before any houses are built? This is enforced in some urban districts, and they have no special Act under which they can act. In this district houses are built first, and the streets are afterwards made, a portion at a time, the consequence being that the houses are not built to proper levels, and when the streets are eventually made up there is a difficulty in obtaining proper gradients for the roads and footpaths.

(*a*) Under sec. 189 of the Public Health Act, 1875, the urban district council have power to make regulations with respect to the duties and conduct of their surveyor, which regulations do not require confirmation by the Local Government Board. Upon the appointment of a surveyor a committee or sub-committee usually draw up the regulations. A specimen list of the duties of a surveyor, emanating from an important English borough, is given in Mr. H. Percy Boulnois' "Municipal and Sanitary Engineer's Handbook" (3rd Edition), pp. 14-17, and in this list is included the preparation of plans, sections and specifications for flagging, paving, sewering or other works, and the superintending of the works. I do not know whether or not extra grants to surveyors for such work are usual (perhaps some readers of these notes will communicate their experience), but I should think this work (in the absence of any stipulation to the contrary on the surveyor being appointed) would usually be included in the ordinary duties of a surveyor. Sec. 150 of the Public Health Act, 1875, provides that the urban authority shall cause plans, &c., to be prepared under the direction of their surveyor, and the Private Street Works Act, 1892, provides that the surveyor shall prepare specification, &c. (*b*) In the above-mentioned list of duties is also included attendance at the meetings of the several committees when required. I think "whole time" includes all such time as is reasonably necessary for the effective discharge of the duties, and that payment for overtime could not be claimed, except perhaps in very exceptional circumstances. (*c*) Certainly. The powers of sec. 150 of the Act of 1875 (or of the Private Street Works Act, 1892, if adopted) are exercisable whether houses have been built in a street or not.

Private Street Works Act, 1892: The Benefit Principle.—"Equity" writes: I am instructed by my council to prepare plans, &c., for the making up of a private street, part of which is roughly shown on the plan forwarded. It is felt by some of the members of my council that a hardship will be inflicted on the frontagers owning the property marked A and B, commonly called "return frontages," inasmuch as they each have about 100 ft. of frontage, which includes the building and a back garden, while the remainder of the houses in the street have only 20 ft. frontage each; moreover, the frontagers A and B have already paid their proportions of the cost of the works in the



adjacent adopted street. May I ask your kind advice on the following points: (1) Can the argument that frontagers A and B have not a "benefit" in proportion to their frontages be well sustained? (2) If yea, and an apportionment is made according to the "degree of benefit," instead of according to the frontage, could an objection from the remaining frontagers be sustained on the score of the additional expense thrust upon them? (3) In the case of a street having none but "return frontages" who should bear the relief, if any, granted to them? (4) Would it be a correct application of the words "Contribute . . . a portion" in section 15 of the Act to relieve the individuals A and B, or the return frontagers assumed in 3, at the expense of the general body of ratepayers?

(1) So far as can be judged from the plan, and without knowledge of the locality or any special circumstances affecting the question, it would appear that the premises A and B will not derive five times as much benefit as the other premises from the works, and unless they do so it is clear that they will not benefit in proportion to their frontages. (2) It would be open to the other frontagers to raise an objection under sec. 18 (5), but it does not follow that such an objection would succeed merely because of the extra expense which would otherwise fall upon the objectors. If no application of the "benefit" principle entailing additional expense on some frontagers

were to pass muster that principle could never be applied at all. (3) and (4) It would appear that under sec. 15 the authority can only pay "the whole or a portion of the expenses" taken as a whole. That is to say they can pay all, or half, or a quarter, &c., of the entire cost, but not the specific amount applicable to any particular frontager or frontagers. Where a street has none but return frontagers this would enable the authority to relieve them of the whole or part of the expenses. But in the present case the section would apparently not enable the authority to relieve A and B individually. For this purpose the "benefit" principle must be adopted under sec. 10. See "The Law Relating to Private Street Works under the Act of 1892," by W. Carlyle Croasdell, p. 129.

By-Laws: Thickness of Walls: "Topmost Storey."—"E. B." writes: In Model By-laws, sec. 20, sub-section 7, it states: "Nevertheless in walls not exceeding 30 ft. in height the walls of the topmost storey may be 9 in. thick provided the height of this storey does not exceed 10 ft." Will this allow a building to be built with walls 9 in. thick provided the height of such building does not exceed 10 ft., or do the words "topmost storey" apply only to the case of a building with more than one storey?

In my opinion this clause only applies to buildings of more than one storey. To apply the term "topmost storey" to a single-storey building would be incorrect.

We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.

BLACKPOOL CLEANSING DEPARTMENT.

SUPERINTENDENT'S REPORT.

Mr. James Bee, superintendent of the Blackpool cleansing department, in his annual report states that the quantity of refuse dealt with at the destructor last year amounted to 18,372 loads, the weight of which was just over 18,943 tons. This quantity, though considerably below last year with regard to the number of loads removed, is only a slight decrease as regards tonnage, the figures for 1910-11 being 18,734 loads and 19,000 tons. The difference is accounted for by the carts taking larger and heavier loads.

There has again been a slight reduction in the cost of dealing with the town's refuse, which during the year averaged 1s. 0¾d. per ton, whereas the average cost per ton for the previous year was 1s. 1d. It is worthy of note that the cost has gradually decreased from 1s. 6¼d. per ton in 1906-7.

PROFITS FROM BY-PRODUCTS.

There is, it appears, a steady increase shown in the profit-earning by-products.

"I have pleasure in being able to report," says Mr. Bee, "that the tremendous increase which has taken place within the last half-dozen years in the revenue from the sale of products at the destructor has been maintained. During the year the unprecedented sum of £1,660 was derived from this source, an increase of £55 on the income obtained from last year's sales. To show the wonderful possibilities which lie in what is apparently the waste material of the town, it is only necessary for me to point out that during the year 1904-5 we were deriving what was then considered the respectable sum of £248. We have thus increased our revenue in eight years by £1,412."

A table of statistics shows how the money is obtained. Compared with 1910-11, there are considerable decreases in the sale of ashes and clinkers and mortar, but the yield from fish manure has risen from £558 to £815, which brings about the total increase. During the year 2327 loads of ashes and clinkers were disposed of, a decrease of 782 loads, which represent a loss of revenue of £102. The quantity of mortar manufactured was 1,490 tons, or 570 tons less than last year, which created a record by bringing a revenue of £470. This year the amount was £330.

DUST COLLECTION.

The work of removing the town's refuse has again been carried out in a satisfactory manner, a daily collection having been maintained in connection with the hotels, hydros, restaurants, and the larger boarding-houses; while from the ordinary company-houses the refuse has been removed from two to three times weekly. All other premises have had attention weekly.

During the year 202 large and 114 medium galvanised iron dustbins have been sold at practically cost price, to replace the less sanitary wooden receptacles.

The collection of waste-paper by means of a duplicate set of bags still continues to prove satisfactory. The experiment, which was tried at the beginning of the year, of allowing waste-paper to be collected by private enterprise, proved so inconvenient to tradesmen that it had to be speedily discontinued, and the work again taken over by the corporation.

The cost of refuse removal has been £5,360, divided into: Labour £2,017, carting £1,682, and hire of horses £1,661. The amount required for this work last year was £5,286, divided into: Labour £1,981, carting £1,621, and hire of horses £1,684. The cost of removal per ton is very little different from last year, labour having cost 2s. 0½d. per ton, carting 3s. 5¼ per ton, making a total of 5s. 5¾d., an increase on last year of ¾d., accounted for on carting.

STREET CLEANSING.

The system of collecting street sweepings by means of orderly trucks has been so successful that six additional trucks have been obtained. On the Promenade and in the main thoroughfares men are continually at work. During the past year, for instance, Bank Hey-street was swept no fewer than 4,181 times. All the principal streets are swept from ten to twelve times daily. The less important thoroughfares receive attention daily, and the back streets weekly.

The quantity of sweepings removed during the year shows a large increase, 4,969 loads having been removed by the carts, and 38,237 bins by the orderly trucks, making a total of 8,155 ordinary cart loads, this number being an increase of 485 loads on last year. The corporation carts engaged on this work were employed for 10,306 hours, and were supplemented on 2447 hours by hired carts, making a total of 12,753 hours. Last year the total was 11,814 hours. The streets swept within the borough during the year amounted to approximately 100 miles.

The expenditure in wages for carrying out the work of street sweeping for the year has been £6,777 for labour, and £713 for team labour and horse hire, a total of £7,490. This is an increase of £305 on the previous year, when £7,185 was expended. This does not include washing streets. The cost per mile has been £74 18s.

During the twelve months washing operations were carried out by the carts on 72 days. The water used amounted to 640,500 gallons, of which 15,050 were fresh water, and the remainder salt water.

In four days in January 1,209 loads of snow were taken away, at a cost of £108. The cost per load works out at 1s. 10d., or 1s. 2d: for labour and 8d. for carting.

It was necessary to grit or sand the streets on 184 days, compared with 211 the previous year.

STREET WATERING.

Mr. Bee adds: "During the past summer the utility of the new salt water main extensions was very early demonstrated, for during the prolonged drought, when we were prohibited from using fresh water, a plentiful supply of salt water was available, and this enabled us to water the streets without any restriction whatever. Moreover, this work can be done more efficiently and economically by using salt water, for after a road has been watered with it consecutively for three or four days it is practically dustless, even to the fastest motor car. Its deodorising properties are also a factor in support of its use, not only for street watering, but for flushing gullies and sewers. The salt water mains have now been extended so as to make us entirely independent of fresh water."

Street watering operations were carried out on 162 days. The quantity of water used amounted to 4,898,250 gallons, of which 3,975,300 gallons were salt and 922,950 fresh water. No fresh water was used after the beginning of June. As showing the economy of using salt water, last year the total consumption was 5,056 850 gallons. Fresh water used was 2,129,750 gallons, and salt water 2,927,100 gallons. The quantity of water used last year was the lowest on record. The cost of street watering was £714, or £7 per mile.

Town-Planning for Birmingham.—The town-planning scheme of the Birmingham City Council for Quinton, Harborne, and Edgbaston has formed the subject of a Local Government enquiry. The city surveyor, Mr. H. E. Stilgoe, gave evidence, describing the scheme in detail. He mentioned that the cost of constructing the road from Lordswood-road to Woodbourne-road would be £17,448, exclusive of owner's contributions. The total estimate for the construction of the roads, including the cost of compensation, was just over £100,000. He was perfectly certain the scheme could be carried out for the amount estimated.

LOCAL GOVERNMENT BOARD INQUIRIES.

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INQUIRIES HELD.

Alfreton U.D.C. (August 1st. Mr. F. O. Stanford).—£1,700 for street widening purposes in the Swanwick Ward, and £700 for the purchase of land for reservoir extension in the council's watershed in the parish of Ashover.—The facts were explained by the clerk (Mr. H. R. Cleaver) and the water engineer and surveyor (Mr. R. F. Ward). In regard to the waterworks extension, a small farm, adjoining the council's Butterley reservoir in the parish of Ashover, has been purchased, and a portion of it is to be used for the enlargement of the reservoir. There is an ample supply of water, but the storage capacity of the three existing reservoirs is insufficient to meet the requirements of a growing population in a dry season.

Bexhill T.C. (July 31st. Mr. H. Shelford Bidwell).—£1,950 for groynes, and £1,190 for the construction of an apron wall.—The application was supported by the town clerk (Mr. T. E. Rodgers) and the borough surveyor (Mr. G. E. Ball). The town clerk stated that in the course of the past two years 770 yds. of sea wall had been destroyed. The beach had sunk 16 ft. at the west bastion face since December, 1909. Mr. Douglas, the engineer, recommended the construction of apron walls to commence at the west bastion and proceed in an easterly direction to such length as may be found necessary to safeguard the works. They were of opinion that several groynes should be constructed without delay. The tenders for the apron wall were as follow: Messrs. Gradwell (Barrow-in-Furness), £3,056; Messrs. Crosby & Co. (Farnham), £1,770; Mr. Carey (Bexhill), £1,603. Owing to the excess of the tenders over the estimate, and the substitution of concrete instead of sand and shingle, the figure of £1,190 was altered to £1,770, which it is estimated will cover all the expenses. The town clerk added that the council were trying something in the nature of an experiment with regard to coast defence at a cost of £160, this consisting of faggot-work, such as was done in South America. This they had charged as revenue, but if the inspector thought that it was a matter of loan the council would like to have a loan for it.

Godalming T.C. (July 31st. Mr. A. W. Brightmore).—£5,000 for repaving the main streets.—The borough surveyor, Mr. J. H. Norris, stated that the traffic through High-street during twelve hours on the previous day included 574 motor cars, 507 horsed trade vehicles, 27 motor trade vehicles, 69 motor-bicycles, and 1,663 ordinary bicycles.

St. Helens T.C. (July 12th. Mr. H. Shelford Bidwell).—£7,000 for the culverting of Windle brook, between Kirkland-street and Westfield-street, and £1,598 for works of street improvement in College-street and Tontine-street.—The town clerk said the portion of the brook at present uncovered was a nuisance. The inspector: Was there an outbreak of infectious disease last year? The town clerk answered in the affirmative, and said the outbreak was of typhoid, and in close proximity to the brook. The medical officer said that from the point of view of public health it was extremely desirable that the brook should be covered. There would be no open part near any houses, but a small portion at the back of Water-street would not be covered.

St. Ives T.C. (August 2nd. Mr. P. M. Crosthwaite).—£1,837 for a water supply scheme.—The application was to pay for works completed, and included £362 for the maintenance of a supply of water to the borough during the construction of the reservoir; £250 for additional mains which were not included in the original estimate; £154 for a meter at the Waterhouse; £45 for a meter at Albert-place tank; and £90 for three large throttle valves. The waterworks engineer, Mr. A. P. I. Cotterell, stated that the reservoir was constructed according to plans, and cost £1,300 less than he estimated. On the other hand, the attendant's cottage cost £370 which was considerably more than he estimated. The money required was for additional work that was not anticipated.

Shoreham U.D.C. (August 2nd. Mr. Edgar Dudley).—£2,200 for the purpose of purchasing the town hall, which is at present held on a yearly tenancy. It was stated that the property was freehold, and was free from restrictions. There was a wharf which would be of great importance to the council when they required to unload material for the roads, and other purposes. The vaults might be adapted as baths in the future, should the council deem it desirable to provide them.

APPLICATIONS FOR LOANS.

Chelsea B.C.—£1,300 for a storage tank for the public baths.

Cheltenham T.C.—£3,596 for paving purposes.

Colne T.C.—£950 for new road works.

Coventry T.C.—£20,000 for the extension of electricity mains.

Darlington T.C.—£3,100 for road widening purposes.

Erpingham R.D.C.—£1,410 for the provision of cottages.

Gillingham T.C.—£2,345 for works of sewerage.

Lewisham B.C.—£10,000 for a moiety of the cost of property and works in connection with the reconstruction of Catford Bridge.

Oldham T.C.—£3,000 for additional electricity mains, and £500 for services.

Stockton T.C.—£2,500 for the purchase of land for the extension of the gasworks.

Wednesbury T.C.—£3,000, further loan for the extensions to public buildings, and £105 for school lavatories.

Willenhall U.D.C.—£100 for sewer extension.

LOANS SANCTIONED.

Bournemouth T.C.—£21,424 for the erection of science, art and technical school, and £12,780 for the erection of a public elementary school at Evelyn-road, Winton, both for a term of fifty years.

Hendon U.D.C.—£2,300 for a site for a secondary school.

Maidenhead T.C.—£260 for alterations at the town hall, and £200 for public conveniences.

Salisbury T.C.—£950 for a motor fire engine.

Thetford T.C.—£6,975 for fifty workmen's dwellings.

Tring U.D.C.—£600 for street works.

Wednesbury T.C.—£6,000 for the extension of public buildings.

FORTHCOMING INQUIRIES.

AUGUST.

	£
12.—**Sheffield.** For the erection of dwellings (Mr. Courtenay Clifton)	9,060
13.—**Beverley.** For the reconstruction of Hull Bridge (Mr. F. O. Stanford)	—
13. **Bridgwater.** For the construction of a road (Mr. F. H. Tulloch)	250
13.—**Dunstable.** For sewage disposal works (Mr. R. G. Hetherington)	2,178
13.—**Milford Haven.** For the purposes of the gas undertaking (Mr. P. M. Crosthwaite)	2,570
13.—**Reigate.** For private street works (Mr. W. O. E. Meade-King)	150
13. **Whitley Upper.** For housing purposes (Mr. Courtenay Clifton)	1,245
14.—**Aberavon.** For street, bridge, recreation ground, and water supply purposes (Mr. P. M. Crosthwaite)	16,265
14.—**Aberdare.** For electricity purposes (Mr. T. C. Ekin)	12,000
14.—**Boston.** For the reconstruction of a bridge (Mr. F. O. Stanford)	7,370
14.—**Croydon.** For wood-paving works (Mr. W. O. E. Meade-King)	4,443
14.—**Fylde.** For the completion of a reservoir (Mr. A. W. Brightmore) ...	124,500
14.—**Repton.** For sewage disposal works (Mr. R. G. Hetherington)	6,000
15.—**Abergavenny.** For water supply purposes (Mr. P. M. Crosthwaite) ...	17,200
15.—**Bath.** For the provision of a public convenience (Mr. F. H. Tulloch) ...	400
15.—**Coventry.** For drainage and street works (Mr. R. G. Hetherington)	80,757
15. **Leatherhead.** For the provision of a recreation ground (Mr. Edgar Dudley) ...	1,600
15. **Worcester.** For the extension of the pumping plant (Mr. T. C. Ekin)	1,675
16.—**Chepstow.** For cattle market and allotment purposes (Mr. F. H. Tulloch) ...	1,100

Municipal Work in Progress and Projected.

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The following are among the more important projected works of which particulars appear below: Buildings—Birmingham £4,477, Chelmsford, Glasgow, £60,000, St. Pancras; housing and town planning—Cardiff; roads and materials—Cardiff £36,500; sewerage and sewage disposal—Bath £21,256, Fleet £30,000, Leicester £118,916; water, gas and electricity—Merthyr £400 000.—Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Birmingham T.C.—Additional cottage baths are to be provided in Coventry-street at an estimated cost of £1 500, and a set of cottage baths erected in Lower Dartmouth-street at an estimated cost (including site) of £2 977.

Burgess Hill U.D.C.—The surveyor, Mr. E. Brown, has been authorised to execute the necessary works to ventilate the council chamber at a cost not exceeding £25.

Cardiff T.C.—The city engineer, Mr. W. Harpur, has prepared a sketch-plan for a cantilever bridge, 8 ft wide, which it is proposed to erect over the Taff railway at Blackweir. The estimated cost is £1,200.

Chelmsford T.C.—A public convenience is to be constructed in the cattle market. The Finance Committee have been authorised to consider a scheme for new municipal offices.

Chelsea B.C.—The council have approved a report by the borough surveyor, Mr. T. W. E. Higgens, recommending the provision of an additional storage tank at the public swimming baths of a capacity of 100,000 gallons.

Cheltenham T.C.—With respect to the competition for designs of the proposed municipal offices, it was reported at the council meeting last week that eight designs had been sent in by local architects, and that the Municipal Offices Sites Committee were evenly divided on two. As, however, no one of the designs sent in could be carried out for the sum stipulated (£11,000) they were unable to award the premium. The committee recommended that they be authorised to consult with the architects sending in the two best plans, "with a view to consider whether such modifications can be made as to meet the requirements of the council as to cost." Eventually the matter was referred back to the committee.

Glasgow T.C.—The Health Committee have resolved to establish a hospital for the treatment of consumptive patients. The initial expenditure will be £60,000.

Helston T.C.—It is proposed to erect a paper destructor in the south-west corner of Helston Downs.

Masham U.D.C.—Plans have been passed of a town hall to be erected by the trustees of the late Lord Masham, with the remainder of his bequest of £5,000 for the benefit of the town, after the provision of an isolation hospital. The new building, which is to cost about £3 000, has been designed by Mr. Houfe, architect, Harrogate.

Notts C.C.—The tender of Messrs. Ashwell & Nesbitt, at £5 489, has been accepted for the alteration of existing apparatus for the hot and cold water supply to the new county asylum blocks, the extension and improvement of the fire service, alteration of chapel heating, heating of medical superintendent's house, and additions to the kitchen and laundry apparatus.

St. Pancras B.C.—It has been decided to erect a new town hall, and to hand the existing hall over to the board of guardians.

Wandsworth B.C.—It has been agreed to co-operate with Fulham Borough Council in urging on the London County Council the necessity of building a new bridge over the Thames at Wandsworth, in place of the present insufficient structure.

Wednesbury T.C.—The tender of Messrs. Guest & Sons, of Stourbridge, at £8,500, has been accepted for the work in connection with the extension of the municipal buildings.

Wolverhampton T.C. The work-shops at the tramway car depot are to be extended at an estimated cost of £5,860.

HOUSING AND TOWN PLANNING.

Cardiff T.C.—The Housing Committee have approached the Property and Markets Committee with a request for the transfer of several parcels of land to them for the purpose of erecting thereon workmen's dwellings. Plans have meanwhile been submitted by the city engineer, Mr. W. Harpur, for some sixty-five cottages.

PARKS AND OPEN SPACES.

Cardiff T.C.—Among the works in contemplation for the unemployed during the ensuing winter is the making of a couple of bowling greens at an estimated cost of £544.

Derby T.C.—An offer of £6,800 has been made for 40 acres of land for the purpose of a recreation ground.

Eccles T.C.—It is proposed to spend £600 upon the provision of a bowling green at the recreation ground.

Margate T.C.—A sum of £13,000 has been paid for land for the purpose of an open space.

REFUSE COLLECTION AND DISPOSAL.

Stockton T.C.—It has been decided to provide two additional cells in the refuse destructor at a cost of £1,069. The borough surveyor, Mr. H. H. Sykes, explained that the destructor, which was opened in 1901, and contained only two cells, was extended four years later by the addition of two cells. The average total refuse dealt with in the first two years was 6,656½ loads per year, independent of trade refuse. For the year ending October last the quantity had increased to 9,104 loads. Since then the increase had even been more marked.

ROADS AND MATERIALS.

Aberdeen C.C. The road surveyor has received instructions to proceed with the reconstruction of that part of the Braemar-road between the 46th milestone and Balmoral-bridge.

Cardiff T.C.—The Public Works Committee recommend the relaying of some of the streets with wood blocks. Among the thoroughfares proposed to be treated are Queen-street, Bute-street, St. Mary-street, High-street, and Newport-road. The committee ask for permission to borrow £36,500 for carrying out the work.

Chelmsford T.C.—High-street is to be made up at a cost of £1,595.

Cheltenham T.C.—It has been decided to pave the whole of the promenade carriageway with sectional blocks at a cost of £3,596.

Derby T.C.—A recommendation is made by the Improvement Committee for the construction of a new street from St. Mary's-gate, at its junction with Queen-street, to King-street, at an estimated cost of £40,000.

Dulverton R.D.C.—A settlement has been come to with the contractors with respect to the Brendon-road contract, and the council have decided to take over the completion of the work (to cost about £1,700) themselves, under the supervision and management of the highway surveyor, Mr. J. Johnson.

Finchley U.D.C.—An intimation has been received that the Road Board are prepared to grant £500 towards the cost of widening the Great North-road at a point near Friern Watch, North Finchley.

Hammersmith B.C.—The tender of Messrs. Mowlem, at £6 789, has been accepted for paving the margins of the carriageways of Uxbridge-road with creosoted deal blocks.

Hove T.C.—Acting on the advice of the surveyor, Mr. H. H. Scott, the Works Committee recommend that the carriageway of Hove-villas be paved with creosoted deal blocks at an estimated cost of £1,705. The committee also recommend that the paving, kerbing and channelling on the east side of Wilbury-road shall be relaid with artificial stone slabs for a length of 250 ft. northwards from Church-road, at an estimated cost of £95. The committee further recommend that the paving on the south side of Coleridge-street be relaid with artificial stone slabs at a cost of £27. The council are advised by the

same committee to accept the tender of Messrs. McKellar & Westerman, of 136 Church-road, Hove, for carrying out the proposed new street works in Modena-road for a distance of 501 ft. northwards from Lawrence-road, for the sum of £173 10s.; also to accept the tender of Messrs. J. Parsons & Sons, of 176 Church-road, Hove, for carrying out the proposed new street works in Lyndhurst-road, from Holland-road to Silverdale-road, for the sum of £173.

Liskeard T.C.—It has been agreed to proceed with the improvement of Station-road at an estimated cost of £662, of which £477 may be obtained as a grant from the Road Board.

Loughborough T.C.—It is intended to carry out several street improvement and paving schemes.

Middlesbrough T.C.—The Middlesbrough owners at a recent meeting wrote suggesting that they should be allowed to pave Tavistock, Addison and Berner streets (off St. Barnabas-road) with vitrified bricks, on condition that they widened and paved Ormesby-road with setts for some distance. Alderman Hinton thought that bricks in a private street would last forty or fifty years and could then be turned. Alderman Mattison moved that they should not accept the offer because, he said, they had definitely decided that streets should be paved with wood, or whinstone setts. Councillor Forbes moved, and Alderman Hinton seconded, that they should accept the offer of the Middlesbrough owners. Alderman Mattison said that Alderman Hinton had once advocated the use of scoriæ bricks to the regret of the corporation. Alderman Hinton contended that there was no comparison, and the borough engineer (Mr. S. E. Burgess) remarked that in many residential streets to-day scoriæ bricks would be suitable and better than macadam when there was little heavy traffic. Alderman Mattison's resolution was carried.

Middlesex C.C.—It has been agreed to contribute half the cost of widening the Kingston main road at its junction with Manor-road, Teddington, which was estimated by the district council to entail a total outlay of £210. It has been further agreed to accede to the application of the Teddington District Council to bear half the cost of an improvement in the High-street of that town, between Waldegrave-road and Wade's-lane and between Wade's-lane and Cambridge-road. The total expenditure on the work was estimated by the district council at £326. The council have reconsidered the application of the Hampton District Council with respect to the widening of the main road along the frontage of Ferry House, and have informed them that if the property could be acquired for £825 plus £35 costs, the county council would contribute half the cost, subject to the part not required for the widening being dedicated as an open space. It has been further agreed to contribute one-third of the cost of rounding off the corner at the junction of the Upper Sunbury and Percy-roads, Hampton, the contribution not to exceed £32.

North Riding C.C.—The council have accepted a grant from the Road Board of £112 towards the tar spraying in various district roads in the Riding, and part of the work has already been done. They have also accepted from the Road Board a grant of £1,877 towards the cost, estimated at £2,503, of the tar grouting of new beds of macadam on certain of the main roads of the Riding, and part of the work has been proceeded with whilst the weather was favourable.

Notts C.C.—Some difficulty has arisen in Notts owing to the fact that locomotives exceeding 14 tons in weight, licensed in another county, have been brought into Nottinghamshire on payment of a daily travelling fee without the authority of the council being first obtained. The council have decided that authority for such locomotives to enter the county should not be granted except on special conditions drafted by the committee, amongst which were: That the locomotive should only be used for the purpose of drawing a single indivisible article, which could not be drawn by a locomotive weighing less than 14 tons, and that the owner would refrain from using the locomotive on any road the condition of which was unfit for such heavy traffic.

Tring U.D.C.—The surveyor, Mr. S. Gettings, has presented plans, specifications, estimates and provisional apportionments for the making-up of Longfield-road, and the sewering of Beaconsfield-road under the Private Street Works Act, 1892, the estimate for the former being £2,357, and for the latter £122. These plans have been approved, and the council have resolved to apply to the Local Government Board for a loan to cover the cost.

Westhampnett (Sussex) R.D.C.—The tender of Mr. John Sparks, of Yapton, has been accepted for steam rolling at 22s. per day.

Woolwich B.C.—The footway on the south side of Eton-road between Burrage-road and Armstrong-street is to be relaid with slab paving at an estimated cost of £72.—The London County Council have notified the borough council of their decision to undertake the widening of Church-street and High-street, Woolwich, at an estimated nett cost of £69,000, towards which the council had already agreed to contribute a sum not exceeding £23,000, and to include in the scheme the widening opposite Nos. 19 and 20 High-street, as to which favourable terms have been agreed.

SEWERAGE AND SEWAGE DISPOSAL.

Bath T.C.—The tender of Messrs. Firth & Co., at £21,256, has been accepted for the construction of a sewage disposal scheme for Twerton and Weston.

Chipping Norton R.D.C.—Mr. Stallard has been appointed engineer to prepare a scheme of drainage and sewage disposal for Salford. The local landowners have all refused to sell land for the purposes of a scheme, and it may become necessary to put the Compulsory Land Clauses Act into force.

Fleet (Hants) U.D.C.—The council have adopted the scheme prepared by Mr. T. J. Moss-Flower, 28 Victoria-street, Westminster, and Bristol, for the main sewerage of the district. It was also decided that Mr. Moss-Flower should act as engineer for the scheme. The work involves upwards of 16 miles of sewers, lifting plant, sewage disposal works, &c., and the estimated cost is £30,000. The scheme adopted was submitted in a limited competition, and the adjudicator, Mr. H. Percy Boulnois, M.INST.C.E. in his report to the council, said "it was the best and most practicable scheme for sewering the somewhat difficult district of Fleet," and that he "unhesitatingly recommended its adoption."

Leicester T.C.—A scheme has been prepared by the Joint Committee on sewage disposal for dealing with the large volume of water entering the sewage sluice in times of heavy rainfall, in order to secure the purity of the discharge into the river Soar. The estimated cost is £118,916. Consideration of the matter has been postponed to the next council meeting.

Tring U.D.C.—The surveyor, Mr. S. Gettings, has presented plans, &c., for extension of surface-water sewers in Miswell-lane and Aylesbury-road, the estimated cost being £200, and for house connections in Longfield-road, the estimated cost being £100. The council have decided to apply to the Local Government Board for a loan to cover the cost of these works.

WATER, GAS, AND ELECTRICITY.

Ashwell R.D.C.—The tender of Messrs. J. T. Bailey & Co., Limited of Ashwell, at £2,300, has been accepted for the execution of a water supply scheme.

Atherton U.D.C.—A sum of £2,000 is to be laid out on new gas and water mains.

Darlington T.C.—The yearly accounts of the gas-works show an increase in all departments. There was an increase of £2,107 in the nett profit. The waterworks have made a nett profit of £8,444, of which £7,000 has been promised in relief of the rates.

Dewsbury T.C.—The plant at the electricity works is to be extended at a cost of £5,400.

East Cowes U.D.C.—The surveyor, Mr. A. E. Barton, reports the completion of the new reservoir. The job, he states, is a very satisfactory one.

Haddingtonshire C.C.—It has been agreed by the Eastern District Committee to form Innerwick into a special water district, and an estimate has been submitted for the introduction of a supply of water for the district.

Holborn B.C.—A new scheme of lighting which was agreed to some time ago by the council is now being carried ont in New Oxford-street and High Holborn. The new lamps are of 80-candle power, and are of the Keith pattern. They are mounted on 18-ft. standards with inverted mantles and high-pressure gas. A scheme of electric light is also in use, and the council claim that when completed these thoroughfares will be the best lighted in London.

Islington B.C.—A sum of £1,000 is to be allocated to the rates from the surplus profits of the electricity undertaking.

Lampeter T.C.—An experiment is to be made with the electric light for a period of three months.

Lostwithiel T.C.—A new reservoir which has been erected in St. George's Park was inaugurated last week. It is of 80,000 gallons capacity, and has been built by Mr. W. E. Bennett, of Bodmin, at a cost of just over £800. Messrs. Jenkins, of Liskeard, were the engineers, and the work has been satisfactorily carried out in every respect.

Merthyr T.C.—Preparations are being made for the construction of the new reservoirs at Taf Fechan, which are estimated to cost £400,000.

North Walsham U.D.C.—The tender of the North Walsham Gas Company has been accepted for lighting the town on the same terms as last year—*viz.*, single burners, £2 4s.; double burners, £3 17s. 6d; extra time, 3s. 9d. per hour; town pump, £10 6s.

Torquay T.C.—To meet the increasing demand for electricity, a 1,000-k.w. turbo-alternator is to be installed at a cost of £6,500.

Walton-upon-Thames U.D.C.—The Walton and Weybridge Gas Company's tender for street lighting at £2 16s. per lamp has been accepted for the ensuing three years.

Westbury (Wilts) R.D.C.—The surveyor, Mr. W. H. Stanley, reports the completion of the Steeple Ashton waterworks, and the council have required all houses to be connected with the supply within a reasonable time.

MISCELLANEOUS.

Coventry T.C.—It is proposed to apply to the Board of Trade for sanction to spend £20,475 upon the purchase of tramway cars, the extension of the carshed, and the provision of passing places.

Glasgow T.C.—Delegates have been nominated to attend the annual congress of the Sanitary Association of Scotland, to be held at Montrose from September 18th to 21st.

Stockton T.C.—A new motor Daimler fire engine is to be purchased for £996.

INDIAN STUDENTS AND MUNICIPAL ENGINEERING.

Mr. Thomas Cole, secretary of the Institution of Municipal and County Engineers, has issued to the members of that body a circular in which he states that he very frequently receives applications from Indian students requiring attachment to municipal engineers for the purpose of gaining practical knowledge in municipal engineering generally, with the special purpose of passing the examination of this institution. They are usually prepared to pay a premium of from £50 to £100 for their Articles. Mr. Cole points out that the subjects of the institution's examination are as follows:—

(1) Engineering as applied to Municipal Work: 1st Paper—(*a*) Sewage Disposal; (*b*) Tramways Construction; (*c*) Bridge Construction; (*d*) Water Supply.

(2) Engineering as applied to Municipal Work: 2nd Paper (*a*) Geodesy; (*b*) Hydraulics; (*c*) Sewerage; (*d*) Road Construction and Maintenance.

(3) Building Construction: Strength of Materials—(*a*) Materials; (*b*) The Construction of Public and Private Buildings; (*c*) Building By-laws; (*d*) Public Baths and Hospitals.

(4) Sanitary Science as applied to Towns and Buildings: (*a*) Heating and Ventilation; (*b*) Scavenging and Disposal of Refuse; (*c*) Water Supply and Drainage of Buildings; (*d*) Disinfection.

(5) Municipal and Local Government Law as relating to the Work of Municipal Engineers and Surveyors, and the students would therefore desire to serve their Articles in an Office where they would receive practical experience in these subjects. In the majority of cases their theoretical education is high.

Those members of the institution who have works in construction, and who are desirous of taking a pupil, are invited to communicate with Mr. Cole on a form which is attached to the circular, and on which particulars of the premium required, the period of Articles, and the nature of the works in hand are required to be given.

PERSONAL.

Mr. C. Vernon Bright, surveyor of highways to the Braintree Rural District Council, has had his salary increased by £25 per annum.

Mr. F. C. Harvey, F.A.S.I., assistant surveyor to the Gosport and Alverstoke Urban District Council, has been elected a member of the Institution of Municipal and County Engineers.

Mr. Reginald Brown, of 21 Old Queen Street, Westminster, has been called in by the Uppingham (Rutland) Rural District Council to advise them on the question of sewage and sewage disposal.

Mr. A. W. Moore, for seventeen years road foreman to the Teddington Urban District Council, died on Sunday morning last after a short illness. He was highly esteemed by the men under his control, by whom his decease is much regretted.

Mr. J. Garfield, sewage engineer to the Bradford Corporation, has, at the request of the London County Council, been granted leave of absence to inspect the metropolitan sewage works, and advise the London County Council in regard to the disposal of sewage sludge.

Mr. Herbert Holloway, of Wolverhampton, whose death at the age of sixty was recently recorded, has left estate of the gross value of £101,103. As a public-works contractor he was responsible for the construction of the Wolverhampton Corporation Tramways and several large water and sewerage schemes.

Mr. J. S. Walker has been promoted to the position of deputy borough engineer and surveyor of Wallasey, rendered vacant by the death of Mr. B. Howdle, Assoc. M.Inst.C.E. For the past thirteen years Mr. Walker has been with the corporation of Wallasey, and previous to that he was in the borough engineers' offices of Bury and Aberdeen. The salary attached to the office is £260, rising to £350.

Mr. John Wilson, city engineer of Fort William, Ontario, is a native of Lanarkshire, and is thirty-two years of age. He was educated at Glasgow, and the West of Scotland Technical College, and was apprenticed to Messrs. Wm. Robertson & Son, Glasgow, civil and mining engineers, from 1897 to 1904, during the latter period of which time he was resident engineer at the lead mine of Strontian, Argyleshire. He went to Canada in his early twenties, and in 1906 was made assistant to city engineer Hancock, of Fort William. He succeeded to his present position in January of this year.

Mr. A. Rothera, engineer and surveyor to the Liversedge Urban District Council, has received a grant of £50 for the extra services rendered by him in designing the extensions to the council's sewage works. The council have also intimated that as the extensions progress the question of further grants will be considered. Mr. Walter Senior, now assistant surveyor to the Rothwell Urban District Council, has been appointed temporary assistant to Mr. Rothera during the time of the preparation of the working drawings, quantities, &c., for the sewage works extensions, at a salary of £100 per annum.

Mr. Frank G. Howell, who for fifteen years held the position of county surveyor of Surrey, passed away recently, we deeply regret to report, at Milford, near Christchurch. Mr. Howell was born in 1855, and was the son of Mr. Charles H. Howell, who was for a very long period also county surveyor, and designed and superintended the erection of the county hall at Kingston. Before receiving the appointment of county surveyor Mr. Frank Howell was for seven years associated with the work under his father. On his retirement in 1908 warm tributes were paid to him by various members of the Council, stress being laid upon the excellence of his work and upon the harmonious relations he succeeded in establishing between the local authorities and the county council. The esteem in which he was held by the magistrates and county councillors was shown by the very handsome parting cheque which he received, with which Mr. Howell built an observatory thoroughly equipped for astronomical work, which was his hobby. In February, 1909, it may be recalled, a complimentary banquet was given in Mr. Howell's honour at the Municipal and County Club by the highway surveyors of the

county of Surrey, who presented to him, in the course of the evening, a magnificent album containing about forty pages of original pen-and-ink drawings by Mr. Cottington Taylor, each page representing a district of the county. Sympathetic reference to Mr. Howell's death was made at the last meeting of the Surrey County Council by the chairman (Alderman A. W. Chapman) and Alderman Pain (chairman of the Highway Committee).

The Council of the Institution of Civil Engineers have resolved to propose at the next meeting the election of Mr. Thomas Coltrin Keefer, C.M.G., of Ottawa, Canada, as an Honorary Member of the Institution, because of the distinguished part he has taken in the engineering enterprises which have aided so largely the development and prosperity of the Dominion; and on account of the services which he has rendered to civil engineering during his long association with it since his entry into the profession in the year 1838.

FOR OTHER ADVERTISEMENTS

See End of Paper.

ASSISTANT SURVEYOR in Public Department, North of England. Salary £75 per annum. Only quick and energetic men need apply.—Box 1,178, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

TREDEGAR URBAN DISTRICT COUNCIL.

TO CONTRACTORS.

The above Council invite Tenders for the Construction of Subsidiary Sewers in their District, comprising about 23½ miles of 6-in., 9-in., 12-in., 15-in. and 18-in. Pipe Sewers, together with about 800 Manholes, &c.

The work is divided into three separate Contracts:

No. 1, comprising the Northern portion of the District.
No. 2, comprising the Central portion of the District.
No. 3, comprising the Lower portion of the District.

Preference will be given to the Contractor tendering for the whole.

The Council do not bind themselves to accept the lowest or any Tender.

Plans may be inspected at the Office of the Engineer to the Council, Mr. Wm. Lloyd Roach, Bedwellty House, Tredegar, any day during office hours.

Copies of the Specification, Schedule of Prices and Bills of Quantities can be obtained from the undersigned on making a deposit of Five Guineas, which will be returned after the receipt of a *bonâ-fide* Tender properly priced and filled in.

Tenders to be delivered not later than noon on Monday, the 9th day of September, 1912, endorsed "Tender for Sewerage."

H. J. C. SHEPARD,
Clerk to the Council.

Tredegar.
August 7, 1912.

ESSEX COUNTY COUNCIL.

HIGHWAYS COMMITTEE.

ST. STEPHEN'S BRIDGE, COGGESHALL.

Tenders are invited from Contractors for the execution of the necessary works involved in Widening the existing three-arch Brick Structure known as St. Stephen's Bridge, which spans the river Blackwater at Coggeshall. The widening is to be executed in brickwork.

Drawings may be seen, and Bills of Quantities obtained, at the County Surveyor's Office on and after Monday, the 12th inst.

Sealed Tenders are to be delivered not later than the first post on Wednesday, the 28th inst.

The lowest or any Tender not necessarily accepted.

PERCY J. SHELDON, M.INST.C.E.,
County Surveyor.

County Surveyor's Office,
Chelmsford.

August 7, 1912.

ESSEX COUNTY COUNCIL.

HIGHWAYS COMMITTEE.

WIDENING OF THE SPRINGFIELD BRIDGE, CHELMSFORD.

Tenders are invited for the execution of the necessary works involved in Widening the Springfield Bridge at Chelmsford.

Drawings may be seen, and Bills of Quantities obtained, on and after Monday, the 12th inst., at the County Surveyor's Office, Chelmsford.

Sealed Tenders, addressed to the undersigned, and endorsed "Springfield Bridge," are to be delivered not later than the first post on Wednesday, the 28th inst.

The lowest or any Tender not necessarily accepted.

PERCY J. SHELDON, M.INST.C.E.,
County Surveyor.

County Surveyor's Office,
Chelmsford.

August 7, 1912.

MADRAS CORPORATION, INDIA.

WANTED: ASSISTANT WATERWORKS ENGINEER.

The President, Corporation of Madras, invites applications for the Appointment of a Waterworks Assistant to the Special Engineer (J. W. Madeley, Esq., M.A., M.INST.C.E., M.AM.SOC.C.E., &c.).

The duties will be to assist the Special Engineer in the design, construction and maintenance of works connected with the Water Supply Distribution System of the City of Madras, especially cast-iron main laying and the installation and working of waste-water meters.

The salary will be Rs.400 (£26 13s. 4d.) per mensem. An allowance of Rs.30 (£2) per mensem will be paid to the Officer appointed so long as he maintains and uses on the work a first-class motor bicycle in good running order. No other allowance of any kind will be made.

Before sailing for Madras, the successful candidate will be required to sign a three years' agreement to be prepared by the Corporation. By mutual consent the appointment may be extended for a further period.

The Corporation reserves the right to determine the appointment at any time by three months' notice in writing or by payment of one month's salary.

The Officer appointed will be allowed ordinary first-class railway fares and second-class steamship passage to Madras, *viâ* Marseilles and Bombay, by P. and O. steamer. A like class return free passage will be granted on the termination of the appointment, subject to satisfactory service according to the conditions of the agreement. Half-pay will be granted on the voyage out from the date of leaving England.

Leave will be granted on full pay to the extent of one month for every eleven months of active service, but for not more than three months at a time.

Preference will be given to candidates who have had experience in the design and maintenance of water-pipe distribution systems, including detection and prevention of waste by waste-water prevention meters, stethoscopes and other means.

Applicants must not be more than 35 years old, and copies of certificates of age, testimonials and medical certificate of fitness for service in India must be enclosed with the applications, which must reach the undersigned *not later than* 31st August, 1912.

The applications will be sent out to Madras, where the selection will be made by the President of the Corporation.

The President reserves the right of rejecting all applications without giving reasons.

The Officer appointed will be required to commence his duties in Madras not later than eight weeks after he has received notification of the acceptance of his application.

Applications must be in writing, and should be sent to the undersigned in envelopes superscribed "Waterworks Assistant."

JAMES MANSERGH & SONS.
Agents to the Corporation of Madras.

5 Victoria-street,
Westminster,
London, S.W.
August 7, 1912.

ASSOCIATION OF CONSULTING ENGINEERS.

FIRST MEETING OF DULY ELECTED MEMBERS.

The first meeting of duly elected members of the Association of Consulting Engineers was held at the Institution of Electrical Engineers on Monday, July 22nd, Mr. G. Midgley Taylor, M.INST.C.E., presiding.

The hon. secretary read the list of members to date, eighty in all, explaining that some had only joined conditionally on their being satisfied with the rules in their final form.

The CHAIRMAN then said the business of the present meeting was to receive the rules presented at the meeting held in January and the report and proposals of the Provisional Committee, and to elect the first committee of the association. In making the following remarks he wanted members to understand that he was not speaking for himself alone, but from a document prepared by the committee and with which the committee were in absolute and full accord. They were only following the lead of the United States and Germany in the formation of an Association of Consulting Engineers to look after their own interests. If they could not look after their own interests better than anybody else he would be surprised. In the formation of an association of this nature it was only natural that certain questions should arise, and one of the most important that had arisen was, What is a consulting engineer? The committee had devoted considerable attention to the matter, and had, after consultation with their legal advisers, adopted the following definition:—

"A consulting engineer is a person possessing the necessary qualifications to practise in one or more of the various branches of engineering who devotes himself to advising the public on engineering matters or to the designing and supervising the construction of engineering works, and for such purpose occupies his own office and employs his own staff, and is not directly or indirectly concerned or interested in commercial or manufacturing interests such as would tend to influence his exercise of independent professional judgment in the matters upon which he advises."

The next question which had been asked was, Why was it necessary to form a new association when there were such ancient and honourable institutions as the Institutions of Civil, Electrical and Mechanical Engineers? All the members present were connected with one or other of those honourable bodies, and they would remain loyal to them; but it was felt there was a necessity for the formation of a society specially devoted to the small proportion of consulting engineers who belonged to the vast numbers of those various institutions. The committee thought that probably not 5 per cent of the members of the three important institutions in question complied with the definition of a consulting engineer that the committee had already laid down, and that there had up till now been no source from which any one could obtain definite information as to who was an independent consulting engineer and who was not. The association, subject to the rules being amended, would be composed of those members of the three institutions on whom the rules of professional conduct drawn up by the Institution of Civil Engineers, and since accepted by the Institution of Electrical Engineers, were always binding, as distinguished from those members who were only bound by them when acting in a consultative capacity. The association did not suggest that any duly qualified engineer should not be consulted on any engineering matter on which he was an expert; but they did say that it should be possible to distinguish the independent consulting engineer from the expert who might be closely identified with manufacturing or contracting interests. The objects of the association were set out in the Articles of Association, and they were, briefly, to uphold the standard of professional conduct and to promote the professional interests, rights, powers and privileges of consulting engineers. Those objects were equally in the interests of the public and of consulting engineers, and could obviously best be promoted by the creation of such an association as this. Since the meeting in January last the committee had again reviewed the rules which had now been put into legal form. The Articles of Association and the rules, as proposed by the committee, were in the members' hands, including the alterations of the original rules, which the committee now asked the members to approve, and which were as follows:—

(1) That the subscription be raised from 1 guinea to 2 guineas.

(2) Corporate membership of the Institution of Civil Engineers or full membership of the Institutions of Electrical or Mechanical Engineers be accepted as evidence of technical qualifications for membership of the association.

(3) That members be entitled and requested to use the abbreviation M.Cons.E. when stating their qualifications.

(4) That the committee be increased to 18, of whom not more than 12 shall be London members.

The treasurer would tell the members that the association could not make both ends meet and become useful—by circularising members in regard to things current and probably by having some quarterly communications—if the subscription were only 1 guinea a year. With regard to the alteration of the rule which provided that corporate members of the Institution of Civil Engineers only should be admitted, the committee, after mature deliberation, thought they should throw their ranks open not only to corporate members of the Institution of Civil Engineers but also to full members, both the Electrical and Mechanical Institutions. The president-elect of the Electrical Institution, one of the most eminent men in his profession, was not a member of the Institution of Civil Engineers, and therefore, although anxious to join, would have been ineligible under the rule in its original form. After the rules had been finally approved by the meeting, the earliest opportunity would be taken to submit the Memorandum and Articles of Association for the approval of the Board of Trade and to register the Association, after which the final rules and list of members would be printed and circulated among the members, and Government departments and engineering and public bodies will be notified of the formation of the association. It was felt that the association, as the only body representing consulting engineers, would form a useful channel through which the opinions of consulting engineers could be ascertained and with whom bodies representing other engineering interests could usefully confer. It was hoped that all members would assist the association by reporting for the consideration of the committee any matter affecting consulting engineers which, in their opinion, could be usefully dealt with, and also by inducing all eligible consulting engineers who had not yet done so to join the association. He formally moved that the Memorandum and Articles of Association, including the alterations and additions which had been referred to, should be approved and adopted. In the document in the members' hands the proposed rules were included, and in addition to the specific alterations he had mentioned there were a number of new rules and a number of slight verbal alterations which had been put in by the honorary solicitor, on the advice of counsel, but they were merely formal.

The HONORARY TREASURER (Mr. S. R. Lowcock) said he did not think it was likely that the association could ever become a very large body, as the number of engineers who were eligible under these rules was, as the chairman had already pointed out, limited. With a comparatively small membership, and an annual subscription of only 1 guinea, the association would be always in difficulties, and could not be effective in the way he was sure they all desired and intended. Although it was not an association for profit, to enable it to be carried on properly they must not only make both ends meet, but must have a small margin. In addition to the annual expenses, the preliminary expenses, registration, printing the Memorandum and Articles of Association, and list of members had to be provided for, and from the estimates he had made he was quite sure it was not possible to conduct the business of the association properly with an annual subscription of less than 2 guineas.

Mr. CHARLES BRIGHT congratulated the committee on the care with which they had considered the whole subject, but he thought a subscription of a guinea should be sufficient for an association of that kind. He did not wish his remarks taken in any spirit of animosity.

Mr. W. FAIRLEY said he had rather expected the subscription would be raised above 2 guineas, because there must be an ordinary paid secretary in addition to the honorary secretary.

The CHAIRMAN said he trusted the meeting would approve of the proposal to increase the subscription. If they got a large membership they could, if thought advisable, reduce the subscription back to a guinea.

The meeting then approved the alterations and the

addition (with regard to the use of the abbreviation "M.Cons.E.") set out above.

The Chairman then moved, and Mr. W. R. Cooper seconded, a resolution that the Memorandum and Articles of Association, and the rules as amended and as printed in the document before the meeting be received and adopted.

Before putting the resolution to the meeting, the Chairman invited discussion on any points members might raise. After replying to questions by Mr. M. G. Weekes and Mr. J. H. Blizzard, the chairman put the motion, which was duly carried.

With regard to the constitution of the committee, the Chairman remarked that the committee were anxious to have a certain continuity of action for the first year, and they issued among themselves balloting papers for the London members, with the result that the twelve names printed in the Articles of Association received the majority of the votes. The hon. secretary and hon. treasurer were also (*ex-officio*) members of the committee. In accordance with the rules, one-third of the committee retired every year. The committee were not empowered to recommend names for filling up the four vacancies so created, and those who retired were not eligible, under the rules, for re-election, but it was open for any member of the association to propose a member of the committee, and they would be balloted for at the general meeting. With regard to the country members, the selection was one that required careful consideration, and the committee asked that, in the first instance, the election should be made by the twelve London members, whose election he invited some member to move. The suggested committee included representatives of civil, electrical and mechanical engineering.

Mr. J. H. Blizzard proposed that the members suggested by the committee (Messrs. John Sydney Alford, H. Percy Boulnois, William Tregarthen Douglass, Baldwin Latham, Ernest Lawson Mansergh, William Morris Mordey, William Henry Patchell, Henry Rofe, John F. C. Snell, Edmund Herbert Stevenson, James Swinburne and G. Midgley Taylor) be the London members of the committee for this year.

Mr. A. A. Campbell Swinton seconded, and the motion was duly carried.

The Chairman then proposed that the list of country members of the committee be left vacant for the present, on the understanding that the committee would fill the list up with the best names they could find for the provincial towns, but he invited suggestions from members. The committee felt that upon the country members would largely depend the amount of support the association would receive from the various provinces they represented.

Mr. Weekes seconded, and the motion was duly carried.

Votes of thanks to the Institution of Electrical Engineers (for the use of their rooms), to the hon. secretary (Mr. A. H. Dykes), to the hon. solicitor (Mr. F. W. Wright), and to the chairman (Mr. G. Midgley Taylor) closed the proceedings.

Problems in Engineering.*—This reprint from the popular students' section of our contemporary consists chiefly of questions that have been set at the examinations of the Institution of Civil Engineers and of the Institution of Municipal and County Engineers. There is no index to the work, but the matter is classified under the heads of Mechanics and Hydrostatics, Strength and Elasticity of Materials, Theory of Structures, Surveying and Levelling, Water Supply and Hydraulics, Sewerage, Sewage Disposal, Road Making and Tramways, Building Construction and Materials, Law, and Miscellaneous. This book is calculated to be of considerable use to students in these subjects, but it would have been an advantage if the source of the questions could have been stated. The answers have in general been given rather more fully than would be the case at an examination, with the object of explaining the principles to a student without his having to refer to a text-book for them. The price brings the work within the reach of all students, and there is so much useful matter compressed into a small space that even the best-prepared candidate cannot afford to be without it. *Sanitary Record.*

* "Problems in Engineering, with Solutions." Being Questions and Answers reprinted from the Assistants' and Students' Section of The Surveyor and Municipal and County Engineer. First Series, 1909-10. Edited by Sidney G. Turner, A.M.Inst.C.E. Price 5s. nett. London: St. Bride's Press, Limited, 2a Bride-lane, E.C.

MUNICIPAL WORK IN BRISTOL.

CITY ENGINEER'S REPORT.

Some of the most important works carried out during the past year by the Bristol city engineer's department have been designed to prevent the periodic floodings that have occurred in the district of St. George, both before and since the inclusion of that area within the city boundaries. Due, in some parts, to the areas being so depressed that the storm waters could not easily discharge into the main sewers, and to the fact that since the system of the main sewers in St. George was carried out, nearly forty years ago, a very considerable portion of the district has been built over, with the result that a large increase of impermeable area has taken place, the rainfall from the hilly portions now finds its way very rapidly to the lower portions, causing a congested condition of the sewers and a consequent flooding of low-lying parts. This was the case at Chaplin-road, where the evil has been met by the construction of a storage tank under the street which retains the storm waters until such time as the main sewer is relieved, or, alternately, by discharging the surplus through a storm overflow into the river Frome. The flooding at Lypiatt-road was caused by a too great concentration of sewers at one point, and this has been met by diversion.

At Redland the sewage from the upper part of Cotham had to pass through a culvert constructed under the Clifton Extension Railway, which, although sufficient for the needs of the district when first made, became inadequate from the extension of roads and buildings. This culvert has been reconstructed of an increased size.

At Baptist Mills the flooded area had been very much reduced by preventive works in the past, and it is hoped that those completed by the department during the year under consideration will prevent a recurrence of any further trouble.

It must be remembered that, physically, the city of Bristol is built in a basin surrounded by hills, down which the storm waters pour rapidly on their way to the river Avon, which is their only outlet; and, if a combination of a very high tide and a severe storm occurs, temporary inconvenience must arise in some of the lowest parts of the city where basements have been constructed below tide level.

The number of houses built during the year shows a further decline, only amounting to 204, but there were 150 fewer empty houses than last year.

The surface treatment of macadam roads with tar was again carried on extensively in the early part of last summer, and satisfaction is expressed in the annual report of the city engineer—from which these particulars are extracted—that, in spite of the great change in modern appliances for locomotion, the total cost of maintaining the macadam roads shows very little increase over the cost five years ago, while the number of loads of sweepings and slop removed was over 20,000 less than the yearly average prior to this treatment being introduced.

The report, which bears the signatures of Mr. Lessel S. McKenzie, Assoc.M.Inst.C.E., the newly appointed city engineer, and Mr. T. H. Yabbicom, the consulting engineer to the corporation, states that the total area of the city is 17,004 acres, and its population 359,400. The total length of highways is 354 miles, and that of sewers 358 miles. Highways of a length of 26½ miles are lighted by 695 electric arc and 25 incandescent electric lamps, and there are 9,288 gas lamps, 178 oil lamps, and 5 acetylene lamps. Twenty-one bridges are maintained by the general district rate. The length of highways added to the city during the period covered by the report is 1½ miles.

"Velography."—In a booklet which has just been issued by Messrs. Norton & Gregory, Limited, of Castle-lane, Buckingham-gate, London, S.W., there is given an interesting description of that firm's well-known method of plan reproduction, "Velography," pointing out the many different uses to which the process can be put. The great increase of their business has again compelled the company to extend their premises, and their plant has been increased by the addition of the most up-to-date machinery they have been able to devise. "Velography" copies are claimed to be equal in every respect to original drawings, the finest details being perfectly reproduced in a deep and absolutely permanent black. An important point is that they are true to scale, being unattached by liquid from start to finish.

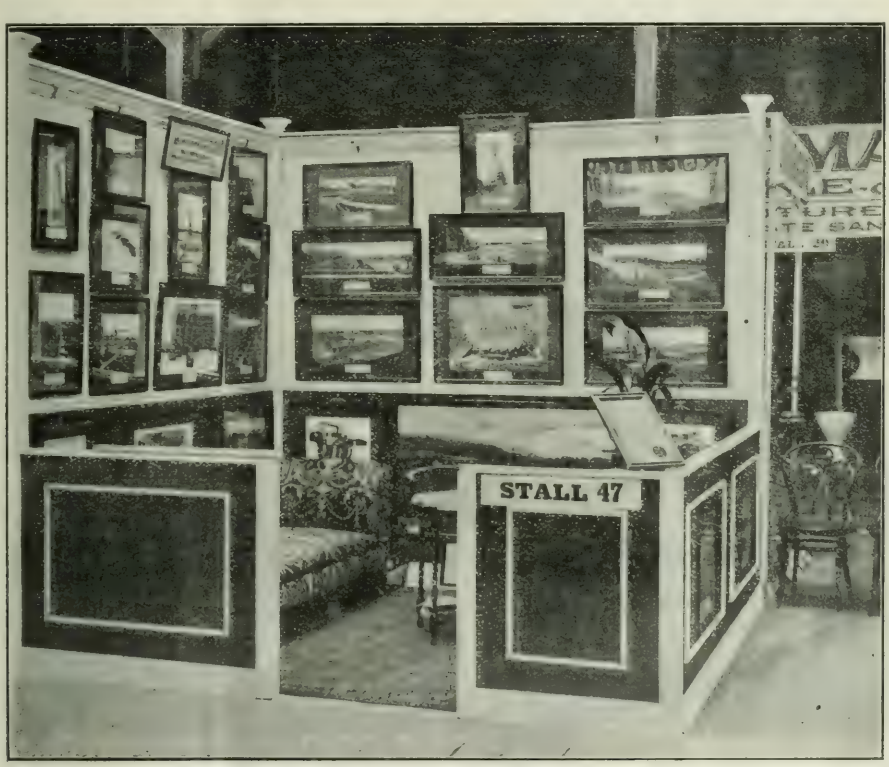
SEWERAGE AND SEWAGE DISPOSAL APPARATUS.

ADAMS-HYDRAULICS' EXHIBITS AT YORK.

We referred in our last issue to Messrs. Adams-Hydraulics' Stall, No. 47, at the York Exhibition of the Royal Sanitary Institute. In view of the fact that the firm have their large and handsome showrooms at their works fitted up with every type of apparatus in work, they considered it sufficient to show a series of photographs descriptive of a few of the more than 5,000 installations which they have fitted up in connection with works of sewage disposal, sewage lifting, and so forth. These photographs, numbering about forty, were shown on the walls of a tastefully fitted up lounge. They were all in sepia, richly mounted and framed, the pictures varying in size from 18 in. by 18 in. to 4 ft. 6 in. by 3 ft. One of the latter size is specially noteworthy as showing the bacterial filters at Horsforth, where three of Messrs. Adams' latest distributors (the "Adamic") have recently been fitted in place of those of another maker.

in which the extreme appreciation of the working of these lifts is expressed. This plant has effected a saving to the corporation of some £700 or £800 a year.

Interesting views were shown of Messrs. Adams' automatic apparatus for operating bacteria beds, where the airlock feed supplies each bed, and the timed withdrawing syphon discharges the contents of each in rotation and automatically. Probably the most imposing of these photographs was that descriptive of the Chiswick works. A picture of considerable interest was Mr. Dibdin's first bacteria bed at Barking, which was followed by the bacteria beds at Sutton, where, for the first time, automatic syphonic apparatus (made by Messrs. Adams) was used, when in the early years of bacterial purification the latter place became the Mecca of all sanitarians. It is interesting to remember that, while the pendulum has swung so far in the direction of percolating beds, contact beds are still being constructed, and that the effluent from many beds which have been in constant operation for the last ten years is as perfect and as pure as the effluent from any percolating bed to-day.



View of Lounge, Adams-Hydraulics' Exhibit, York.

Another specially interesting picture was that of the Exminster sewage lift, where the tower which supports the flushing tank is formed of the pipes of which the apparatus is composed, one limb of the tower serving as the supply main, from which the sewage is delivered to the flushing tank. Another limb serves for the discharge main from the flushing tank to the air cylinder.

A view which received considerable attention was the Douglas enlargement showing the magnificent bay with its hundreds of hotels and important boarding-houses, with the town rising up behind. The whole of the sewage from this area is raised by means of the sewage from the higher grounds by Messrs. Adams' patent automatic sewage lifts. This important installation was commenced some nine years ago after considerable discussion as to the wisdom of adopting the Adams' patent automatic lifts in lieu of non-automatic compressed air ejectors. The former were decided upon, and now, at the expiration of nine years, the Corporation of Douglas have presented Messrs. Adams with a testimonial under their seal,

A fine enlargement of a photograph of Messrs. Adams' patent conical manhole cover showed to advantage the continuous curved side which has been so valuable a feature in making this cover unique; the firm claim that it was the first cover made having a curved exterior, and that it still remains the only cover of this complete form. One very noticeable point in connection with this exhibit is the fact that Messrs. Adams-Hydraulics were the pioneers in the use and the original inventors of most of the apparatus shown.

Among the many visits arranged for the delegates at the congress was one to Messrs. Adams' showrooms and works. In their showroom various apparatus and plant were to be seen in operation, as, for instance, automatic sewer flushing syphons, alternating syphons, low-draught dosing syphons, automatic sewage lifts, and timed discharge syphons, and so on; in fitted ironwork, large penstocks with the Hingston two-speed gear, Adams' patent conical penstocks, Templeman's safety standpost, floating arms for storm water, decanting valves, and many other

fittings used in connection with water and sewerage work. Various sizes of Adams' well-known patent conical cover were also shown, demonstrating the extreme value of the continuous unbroken curve, which takes the place of the ordinary vertical side, making it, in the view of the firm, the only really safety cover manufactured. It is worthy of note that since the introduction of this cover by Messrs. Adams (prior to which all covers had vertical sides) an enormous number has been sold, and that this cover is now practically the type adopted by all engineers. Hundreds of testimonials have been received by the firm in which the high appreciation of the patent "Conical" is expressed.

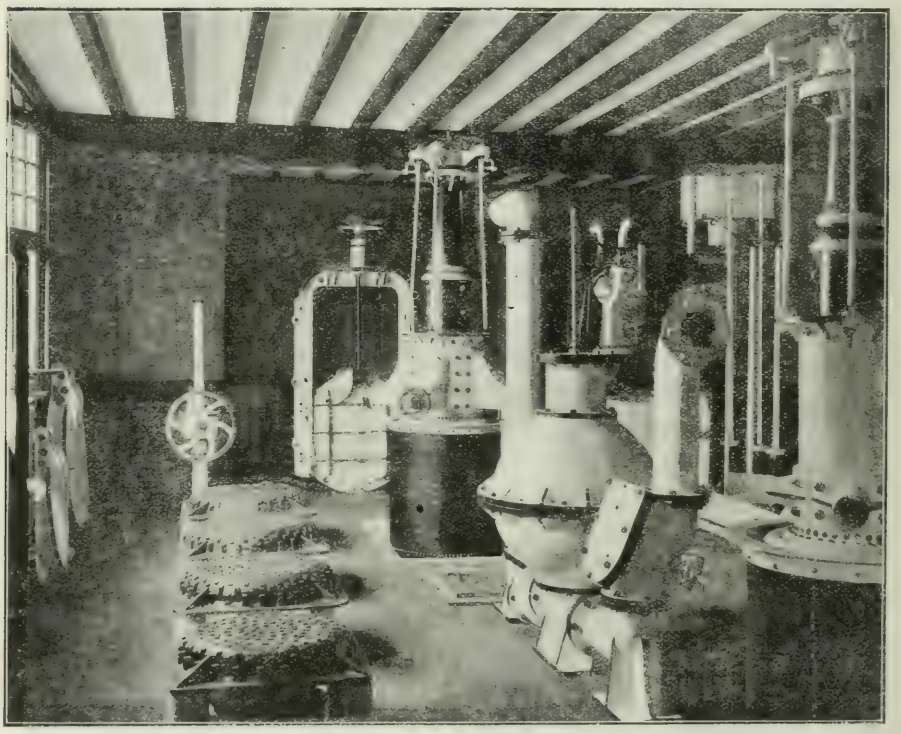
The immense improvement recently effected by Messrs. Adams in distributors, by the introduction of their new "Adamic," was well seen by comparing a large example of the latter with one of the former "Cresset" type, which, with all its advantages, has now been surpassed by the new "Adamic." This distributor has been made to overcome a difficulty inherent in every type of revolving distributor. The difficulty has been in the past to construct a distributor which would deliver a large variation in volume under a minimum head. It has been necessary formerly in such a case to use certain standby overflow arms, delivering the minimum discharge through two or more arms at a lower level and the maximum over the standby or overflow arms. This has meant that only one half of the arms have been available for driving power under the smaller head, when the greatest force was really necessary, with the result that in windy weather, or in exposed positions, it was impossible for a distributor to revolve with any certainty under the minimum. In the new "Adamic" distributor all the arms are used for the minimum delivery as well as for the maximum (a special connection between the arms and the revolving body making this possible), and, further, it is possible to deliver a volume which may vary as much as from 1 to 6 under a head of 18 in. This distributor will work with ease under a head of 6 in. The value of great variation in volume will be well understood by those who, having constructed filters and distributors which were capable of dealing with the flow, have found that as the flow increased, while the filters themselves were capable of producing an effluent with a larger volume, it has been impossible to get this larger volume on to the filters under the available head because of the limitation of the distributor itself, which, owing to its construction, could not deliver any greater volume than that which it actually passed at the time—*i.e.*, say, three volumes—the result being that new filters have had to be constructed. The "Adamic," as has been already said, will under the same head deliver a volume up to six times, if necessary, and thus would save the construction of the additional filters, to which we have referred.

We should mention in connection with distributors a new fitting, by means of which part of the sediment is withdrawn from the sprinkler arm and at the same time a concussion of water created in the pipe helps to clear any stoppage in the spray holes. This should be a very useful fitting for revolving distributors, as it obviates the risk of chokage from neglect, and this without the addition of any elaborate plant.

Messrs. Adams also showed their new ejector operated by compressed air electrically compressed, as well as installations of their automatic sewage lift for raising sewage by means of the sewage itself.

Visitors were much interested in the works themselves, which cover a large area, the lighter machinery and fitting department and foundry being on the east side, adjoining the river front, while the sewage disposal and heavier plant shops lie on the west side. Large new shops have recently been added to enable the firm to turn out more expeditiously heavy doors and sluice gates, which are now becoming a speciality with the firm.

The visitors were also able to see an 80-ft. distributor in actual operation under testing conditions. This more practical exhibit, combined with the photographic display of which we have already spoken, made one of the most interesting and instructive items on the congress programme.



A View in Adams-Hydraulics' Showroom, York.

Mansion House Well. The Corporation of the City of London proposes to spend about £1,400 on sinking an artesian well at the Mansion House.

MERSEY AND IRWELL JOINT COMMITTEE.

CHIEF INSPECTOR'S REPORT.

The present year completes the twenty-first year of the existence of the Mersey and Irwell Joint Committee. In the past two years, according to a report covering that period which has just been issued by Mr. Hugh Stowell, ASSOC.M.INST.C.E., the chief inspector, three new sewage works have been completed in the area under the jurisdiction of the board. Alterations and additions have been, or are being, carried out at thirty-five sewage works, and twenty-three local authorities have carried out extensions to their sewerage to intercept districts not fully dealt with, or to provide for the growth of their districts.

Good progress is shown in the number of efficient sewage works. The percentage of efficient works to the total number of works in operation has risen from 66 to 77 per cent, an improvement which, it is satisfactory to note, has been brought about, in most cases, without the necessity of legal proceedings. An unsatisfactory feature of the report is the position of the county boroughs, who have only five efficient sewage works out of fourteen, although at all the inefficient works extensions are either in progress, or schemes are under consideration or have been adopted. Among the total number of twenty-nine inefficient works are seven where extensions are in progress, five for which schemes have been submitted to the Local Government Board, and nine for which extension schemes are under consideration. Of the remaining eight works, four are to be abandoned on the completion of larger schemes which will intercept the sewage at present inefficiently dealt with, leaving four works where in the near future extensions will have to be taken in hand.

CLASSIFICATION OF WORKS.

"The classification of sewage works with regard to efficiency is not," says Mr. Stowell, "easy to settle, and many factors have to be taken into consideration, a very important one being the question of management. There are instances in the watershed where works, although not up to modern requirements, are nevertheless dealing satisfactorily with their sewage owing to careful and good management. On the other hand, there are instances of sufficiently designed works proving inefficient owing to unsatisfactory or insufficient attention, but these are chiefly at the smaller works, where continuous supervision by a skilled manager cannot be afforded. This is a very strong argument in favour of concentrating, where possible, the treatment of sewage instead of installing a number of small isolated works which cannot be so effectively supervised. Sewage treatment on modern scientific lines must be recognised as an operation needing skilled management, which should be provided for by the appointment of experienced and sufficiently paid managers, an expenditure which will undoubtedly prove economical rather than otherwise.

RECENT SCHEMES.

"The noticeable features of recent schemes in the watershed are the continued use of chemical precipitation, which, in this watershed perhaps more than in any other area, has always held its ground, the preference for percolating filters rather than contact beds, and the provision of tanks for the treatment of storm water. Since the last report it has been possible to observe the operation of these tanks at several works where they have been constructed, and the amount of sludge and detritus arrested has been surprising. This is all polluting matter, which was formerly largely discharged into the rivers, and a great improvement has undoubtedly been effected in this direction."

During the past two years (ending December, 1911) 5,220 inspections have been made at sewage works, and 952 samples have been taken, of which 349 were condemned as being of a polluting character, and 603 were passed. Mr. Stowell points out, however, that it is not possible to judge of the progress towards efficient sewage purification by these figures, as a large number of samples are always taken from works which are known to be inefficient, and where pressure is necessary for improvement; for instance, of the 349 samples condemned, just over one-third came from only three sewage works belonging to county boroughs.

RIVERS.

During the exceptionally dry summer of 1911 a certain number of complaints were received and investigated by the joint committee. In every instance but one these complaints referred to the smaller tributary streams, and in the one exception, the complaint about the river Irk was directly attributable to the state of the Wince Brook.

The complaints investigated were generally found to be due to the fact that either the streams were receiving little or no fresh water, and had become merely channels for conveying effluents from sewage works or manufactories, or that the whole stream was being impounded (often several times) and stagnating, with consequent putrefaction of the deposit. Mr. Stowell points out that the joint committee's powers only allow them to require a manufacturer to use the best practicable and reasonably available means for purifying his effluent, and that in ordinary weather such purification is sufficient to prevent nuisance when the effluent is discharged into a normal flow of water; but effluents from such works as bleach-works and print-works, even when reasonably purified, are liable to cause nuisance when not diluted with brook water, and are impounded, or travel over rough, ill-regulated beds of streams. Mr. Stowell adds: "A large diminution of complaints would occur on streams mainly used for manufacturing purposes if all mill dams were regularly cleaned and the beds of streams regulated to allow of an even and concentrated flow. An interesting work on these lines is being carried out in Germany, in the Emscher watershed, where one of the duties of the Watershed Board is the regulation of streams, and they consider that for the prevention of nuisance dilution is not so important as the condition of the bed of the stream. The regulation works consist mainly in substituting concrete channels with a good gradient and smooth surface for the irregular natural bed. It is said that since the regulating works have been carried out, the smaller streams, which in that district had been utilised for conveying practically unpurified sewage, often septic, do not give rise to objectionable odours, though previously they were an intolerable nuisance. This is a work which local authorities ought seriously to consider, especially with respect to smaller streams running through inhabited areas, and there are instances in the watershed where such work has been undertaken with obvious advantage.

"Increasing use is being made of the water even of the main rivers for manufacturing purposes, and a point has been reached when it may be said that practically all the main rivers are available for such use after filtration. When it is stated that such water can be made available at a cost not exceeding one halfpenny a 1,000 gallons, it will be understood that good work is being accomplished. Much improvement is, however, still necessary, especially as regards sewage pollution from the larger sewage works and elimination of colour from trade effluents."

City of London Improvement.—The Corporation of the City of London have decided to give immediate notice to acquire the ground needed to widen the public way between 57 and 69 Leadenhall-street, at a cost of £252,800.

Housing of the Working Classes.—In the House of Commons, on Tuesday, Mr. M. Barlow (Salford) introduced a Bill to amend the Housing of the Working Classes Acts, 1890 to 1909, and the Small Dwellings Acquisition Act, 1899, and to encourage the private ownership of dwelling-houses and business premises among the working classes. The Bill was read a first time.

Safety Locks for Automatic Lifts.—Messrs. Smith, Major & Stevens, Limited, lift engineers, Abbey Works, Northampton, send us particulars of a safety lock which they claim has removed all possibility of danger in connection with the operation of automatic lifts. With this the door or gate must first be completely closed. Until that is done, nothing more can be effected. Next follows the latching of the door, and until that is securely done it is impossible to give current to the machine. Finally current is given. On opening the door the reverse order is equally definite. First the current is cut off, then only can the gate be unlatched, and finally opened. By some recent improvements the general principle described above has been further strengthened against wilful interference by mischievous persons.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. Thomas, M.Inst.C.E., County Surveyor, Buckinghamshire.

EXAMINATION.

The October, 1912, examination will be held in Birmingham on the 10th, 11th and 12th of that month.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* **The Surveyor** *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

SURVEYING ASSISTANT.—August 10th.—Borough engineer's office of a large Midland town. £130.—Box 1,174, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

TEMPORARY TRAMWAY ASSISTANT.—August 10th.—Engineer's office of large Midland town. £140.—Box 1,173, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

ASSISTANT SURVEYOR.—August 10th.—Rothwell Urban District Council. £65 per annum.—Mr. W. Dodgson, clerk.

CLERK OF WORKS.—August 10th.—Corporation of Northampton. £4 per week.—Mr. A. Fidler, borough engineer.

CLERK OF WORKS.—August 12th.—Thetford Town Council. £2 per week.—Mr. J. Houchen, town clerk.

SURVEYING ASSISTANT.—August 12th.—Corporation of Southport. £2 10s. per week.—Mr. J. Ernest Jarratt, town clerk.

CLERK OF WORKS.—August 13th.—Swansea Rural District Council. £2 10s. per week.—Mr. E. Harris, clerk.

ENGINEERING ASSISTANT.—August 16th.—Surrey County Council. £120—£200 per annum.—Mr. A. Dryland, county surveyor.

SECOND ASSISTANT ENGINEER.—August 16th.—Public Works Department, Shanghai. 250 taels (a tael is valued about 2s. 8d.) per month.—Messrs. John Pook & Co., 63 Leadenhall-street, London, E.C.

ASSISTANT INSPECTOR OF NUISANCES.—August 17th.—Chorley Town Council. £100 per annum.—Mr. J. Mills, town clerk.

JUNIOR ASSISTANT.—August 19th.—South of England county surveyor's office. £109—£130.—The Surveyor, 24 Bride-lane, Fleet-street, E.C.

ASSISTANT IN SURVEYOR'S OFFICE.—August 20th.—Hindley Urban District Council. £78 per annum.—Mr. Thomas Robey, clerk.

JUNIOR ASSISTANT.—August 23rd.—Corporation of Smethwick. £65 per annum.—Mr. Alex. Hosken, borough surveyor.

TEMPORARY TOWN PLANNING ASSISTANT.—August 23rd.—Corporation of Northampton. £2 per week.—Mr. Alfred Fidler, borough engineer.

HIGHWAY SURVEYOR.—August 24th.—Watford Urban District Council. £150—£180.—Mr. W. Hudson, clerk.

ASSISTANT ENGINEER.—August 31st.—Darjeeling Municipality, India. 150 rupees monthly.—The Chairman.

CHIEF ENGINEER AND COUNTY SURVEYOR.—October 7th.—London County Council. £2,000.—Sir Laurence Gomme, clerk.

MUNICIPAL COMPETITIONS OPEN.

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ST. AUSTELL.—August 22nd.—For plans and maps of all sewers and connections, together with water main and branch pipes and connections in the district, for the rural district council.—Mr. J. Stephens, clerk.

GOOLE.—September 1st.—Competitive designs and estimates for municipal offices, for the urban district council. Two premiums (£30 and £15).—Mr. R. Tyson, clerk.

CHORLEY.—September 9th.—Designs for a school, for the corporation.—Mr. J. Mills, town clerk.

LLANELLY.—September 30th.—Competitive designs and estimates for school buildings for over 1,000 children, also domestic subjects centre, for the Education Committee.—Mr. G. E. Halliday, F.S.A., F.R.I.B.A., Castle-street, Cardiff, will act as assessor and award premium.—Mr. I. W. Watkins, clerk, Education Offices, Coleshill-terrace, Llanelly.

WANDSWORTH.—October 14th.—Competitive designs for public swimming bath at Balham.—Mr. P. Dodd, borough engineer, 215 Balham High-road, S.W.

GLASGOW.—October 29th.—Preliminary sketch designs are invited by the corporation for the extension of the municipal buildings. Honorariums of 100 guineas to five selected designs.—Mr. John J. Burnet, A.R.S.A., 239 St. Vincent-street, Glasgow, is assessor.—Applications to the clerk, Mr. J. Lindsay, town clerk.

HUDDERSFIELD.—October 31st.—Designs for laying out certain areas as a town planning scheme, for the corporation. Premiums of 100, 50, and 25 guineas.—Mr. J. Henry Field, town clerk.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* **The Surveyor** *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

Buildings.

ABERDARE.—August 10th.—For the erection of thirty-two tenement dwellings, for the urban district council.—Mr. T. Phillips, clerk.

HUNTS.—August 10th.—For the enlargement of a secondary school, for the Education Committee.—Mr. S. G. Cook, clerk, County Education Offices, Huntingdon.

WOMBWELL.—August 10th.—For the erection of public baths, for the urban district council.—Mr. P. M. Walker, clerk.

SLEAFORD.—August 10th.—For repairs to bridges, for the rural district council.—Mr. E. Clements, clerk.

KINGSTOWN.—August 10th.—For the erection of baths and wash-houses and caretaker's house, for the urban district council.—Mr. J. Sherlock Vaughan, town clerk.

DISS.—August 12th.—For the erection of a cottage at the waterworks, for the urban district council.—Mr. A. Cooper, surveyor, The Terrace, Diss.

MERTHYR.—August 12th.—For the erection of forty-eight dwellings, for the corporation.—Borough Architect, Town Hall.

CARDIFF.—August 12th.—For the erection of two cottages, for the corporation.—Mr. W. Harpur, city engineer.

TAVISTOCK.—August 13th.—For the construction of works of water supply, for the rural district council.—Mr. A. Kenneth G. Johnstone, clerk.

DEAL.—August 14th.—For the enlargement of school buildings, for the education authority.—Mr. A. Brown, town clerk.

RADCLIFFE.—August 14th.—For alterations and additions to the technical school, for the education authority.—Mr. S. Mills, clerk.

BARNSTAPLE.—August 15th.—For works at Knowle Braunton, including reinforced reservoir, and water main, for the rural district council.—Mr. R. E. C. Balsdon, clerk.

BLAYDON.—August 16th.—For the erection of sixteen to twenty houses, for the urban district council.—Mr. G. Symon, surveyor, Blaydon-on-Tyne.

SOUTHEND.—August 17th.—For the erection of a lodge and refreshment-room, for the corporation.—Mr. E. J. Elford, borough engineer and surveyor.

HANTS.—August 19th.—For the erection of a classroom, for the county council.—Mr. A. L. Roberts, architect to the Education Committee, The Castle, Winchester.

HANTS.—August 21st.—For repairs, decoration, redrainage and conversion works, for the county coun-

The Surveyor

And Municipal and County Engineer.

Vol. XLII. AUGUST 16, 1912. No. 1,074.

Minutes of Proceedings.

Road Reform.

A considerable portion of the matter which we reproduced last week from the annual report of Mr. G. H. Jack, county surveyor of Herefordshire, bears upon the subject of road reform, and the report furnishes strong evidence of the soundness of views which we have put forward on this subject for some time past. Clearly many of Mr. Jack's roads need catchwater drains and that kind of drainage which effectually and quickly reduces the water level after rain to a considerable number of inches below the surface of the crust. His road crusts lack sufficient thickness—4 in., for instance, being hopelessly inadequate on clay soil, even for by-roads. As regards the immediate future, surveyors who are better situated as regards subsoils must not overlook the fact that a system of road reform which has been advocated in these pages is not capable of application in the simplest manner to roads with very thin crusts on soils which are soft for even a small part of the year. We allude to the system by which a small proportion of the total mileage of roads is thoroughly reformed every year and provided with crusts of adequate thickness and suitable type, this being done with the funds provided by starving not the whole mileage, but those parts of the roads which are to be reformed during the next few years, more especially the parts the reform of which will be undertaken in the year immediately following. It is assumed that these lengths of road are carefully preserved as far as possible by constant small repair, a little more than usual being spent in this way in order to save a far larger sum represented by the road metal withheld. This system can be applied either when the soil is a hard and good one, such as chalk or hard gravel, or when the crust, though a bad one, is fairly thick. It cannot so easily be applied in the case of roads with thin crusts on weak soils, or on soils which become very soft for a part of the year.

We venture, however, to suggest that in such cases the desired end may be gained by the same system carried out in two stages. Suppose that a 4-in. crust, on clay, demands heavy annual expenditure per mile, largely incurred by the use of considerable quantities of costly road metal. Let us in imagination take a length of, say, 10 miles and deal with it in five years. The first year starve the first 5 miles, treating the last 5 miles as before. The second year reform the first 5 miles as regards drainage, camber and earth-work generally, and put down a crust of adequate thickness of cheap materials, especially thick at the edges, in the meantime starving the last 5 miles and putting no hard metal at all on any part of the 10 miles. The third year make up 3 miles thoroughly with a wearing crust of hard metal on what remains of the cheap subsoil, the whole thickness being adequate, the least possible amount of material being put down on the remaining 7 miles. The fourth year do the same with the next 3 miles, starving the remaining 4, but keeping the first 3 miles with great care. The fifth year reconstruct the remaining 4 miles, thus bringing the whole up to its final state of strength and efficiency. Each length of road would thus pass through the following phases: (1) Starvation with constant small repair; (2) Reconstruction as regards drainage, earth-work and levels, and the placing of, say, 10 in. of fairly good sandstone or limestone; (3) Constant small repair of this surface during a period of small settlements and the wearing down of the 10 in. to say 7 in; (4) The scarifying and careful preparation of this crust and the placing of a course of 4 in. or 5 in. of hard stone as a wearing layer. The final result will be better, we imagine, than that which would be obtained by doing the drainage and reconstruction work on the bed and forthwith placing the final crust. The above is, of course, a mere sketch, and the actual procedure would vary with different circumstances.

Space does not permit of further comment on Mr. Jack's valuable report, but we note that he recognises that the high speed of motor vehicles at sharp bends is a cause of expense in road maintenance—the effect being, it may be observed, increased by the fact that on open roads and on turnings which have been "improved" a large proportion of the vehicles bending to the right use the same part of the road as those proceeding in the other direction. Lastly, it may be observed that Mr. Jack states in one part of his report that on the much used part of the roads "the water binding will have to give way to something more adhesive and waterproof." He states elsewhere, however, that on the strong roads and roads not subject to engine traffic "the existing system of waterbound metalling with Clee-hill binding material will suffice for a long time to come."

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Conversion of Old Sewers into New.

The paper read by Mr. O. E. Winter, Assoc.M.Inst.C.E., borough engineer and surveyor of Hampstead, at the annual meeting of the Institution of Municipal and County Engineers last month, deserves a better title than that under which it was presented. "Maintenance, flushing, and cleansing of sewers" indicates an uninteresting description of some of the humdrum administrative duties of a municipal engineer, whereas the paper, which we print on another page, contains some

very interesting data upon two unusual methods of reconstructing and bringing up to date of old brick sewers, the effects of flushing and cleansing sewers, and the source of offensive odours from sewers. The fact that, in some cases, pipe sewers 15 in., 12 in., and even 9 in. in diameter were found to be large enough to take the present flow in existing brick sewers varying from 3 ft. by 2 ft. to 4 ft. by 2 ft. 8 in., gives some idea of the waste of money occasioned by the old-fashioned ideas of the sizes of sewers, and shows the saving effected by modern methods of scientific calculation. The information given as to the effective life of brick sewers is also interesting, and gives grounds for assuming that, when constructed of the best material throughout, they may be expected to have a life of forty to fifty years. At the same time we do not think this provides any good reason either for increasing or reducing the periods for which loans are granted by the Local Government Board for works of this kind, as suggested by some of the speakers during the discussion upon the paper. The method adopted by Mr. Winter for renewing the inverts of those sewers where the present flow of sewage did not permit of any reduction in the size of the sewer was ingenious, and it has enabled him to convert the old sewer into a new one, probably more durable than the original, at a comparatively small outlay considering the difficulties of execution.

The most interesting feature of the paper, however, which does not appear to have been mentioned in the discussion, is the result of the thorough cleansing of the sides and crown of the sewers. As the alterations to the sewers were completed, there was a marked improvement in the air within the sewers, but in addition to this the very efficient system of regular cleansing of all the sewers carried out by Mr. Winter's staff is well worthy of imitation. The author's expression of opinion as to the importance of regular and systematic flushing of sewers is emphasised by his further statement that it is "*absolutely necessary* in keeping the sewers in a clean condition and free from nuisance." In this matter the words "regular and systematic" are the essential qualifications to bear in mind, as irregular, occasional flushing here and there in a system of sewers is almost as bad as none at all so far as the effective prevention of nuisance is concerned. In large towns an efficient staff of flushers can be maintained, but in smaller towns and districts the use of automatic flushing syphons suitably arranged, and inspected at regular intervals for the purpose of giving any attention that may be necessary, and adjusting the rate of supply of water to give a greater or less number of discharges per week according to the season of the year or other special circumstances, would appear to be the most satisfactory method to adopt. In this connection it is interesting to note the testimony of some of those who took part in the discussion as to the efficiency of automatic tanks, and also to the success of the special pipe joint used by Mr. Winter in the work described in his paper. The experience related in the paper fully justifies the opinion expressed by Drs. Andrewes and Hurtley in their report to the Hampstead Borough Council on sewer ventilation to the effect that the source of smells from ventilating manhole covers is to be found in decomposing organic matter and fungoid growths on the sides of sewers, and not in the flowing sewage itself.

* * *

Madras Water Supply: Mr. Madeley's Report.

We are indebted to Mr. J. W. Madeley, M.Inst.C.E., for the opportunity of placing before our readers the main features of his water distribution scheme for Madras City, as set forth in a report of unusual interest and great value which he has kindly sent us. With regard both to the collection and the distribution of the water, the conditions at Madras are unusual. The natural features of the country whence the water is derived, and the methods of cultivation pursued, while they have rendered possible the collection and storage of a sufficient supply of water at a moderate cost as regards capital expenditure, are, at the same time, such that great care has to be exercised in order to preserve the water from contamination, while the moderate rainfall, the great rate of evaporation under a tropical sun, and the lack of certainty that really heavy falls of rain will follow one another at short intervals, even in the monsoons—all these factors introduce an element of uncertainty as regards the run-off, which must be counteracted by sufficient storage and by great care in the matter of waste prevention.

Mr. Madeley has, however, the satisfaction of knowing that there is always available in case of need that share of the water which is at present used in irrigation. The public works department, which places the water partly at the disposal of the corporation and partly in the hands of its own irrigation branch, has, during the past nine years, derived on an average a revenue of nearly Rs.22,000 from the water used for the supply of the city, and only some Rs.10,000 from the water used for irrigation. In the year 1889–1890 we find, in turning up the records, the shares were nearly Rs.11,500 from the corporation, and Rs.22,500 from irrigation, and in 1896–1897 we find, corporation Rs.16,700, and irrigation Rs.20,800 (nearly). It is clear that from this point of view the conditions have changed, the corporation share having become the larger instead of the smaller. A more important consideration is, however, that the revenue from irrigation, even if taken to represent a total crop value eight or nine times its amount, represents only some $2\frac{1}{2}$ per cent on the amount of the estimate for the works distribution alone. There is the further consideration that there are obvious disadvantages in cultivation by irrigation within the limits of the city. Paddy fields are not a very desirable feature even in those parts which are occupied partly by large bungalows standing in park-like compounds of great size, and partly by native villages which have most of the features of mofussil villages, and some of which consist largely or wholly of mud huts thatched with palm leaves. In view of the prevalence in Madras of a mild form of malarial fever, it is very desirable that the breeding places of mosquitoes should be as far as possible eliminated. A good water supply, by reducing the necessity for using wells and ponds, and by making it possible to flush the sewers properly, will doubtless go far towards making the more open parts healthier and, when supplemented by the improved system of sewerage, on which Mr. Madeley is also engaged, will have a further beneficial effect in the areas of a definitely urban type.

* * *

Some Notable Features of the Scheme.

As regards the distribution of the supply, the most striking features of the city are its flatness, its great size, and the marked distinction between the parts that are in themselves little cities or small towns and the other parts which are occupied by scattered houses and their grounds, by fields, by villages, and by country roads. It is no easy task to design a water-supply system which will suit the commercial seaport town of Georgetown, the native city of Triplicane, suburban Egmore, the town of Mylapore, and the villages scattered about in Adyar, all within the city limits. As regards the use of local pressure reservoirs it is worthy of note that Mr. Madeley proposes to hold these in reserve in order that, with the system of distribution mains which is now to be provided, it may be possible to furnish a considerably larger future population with a supply per head per day in excess of that now contemplated, simply by erecting these tanks in suitable places.

That part of the report which deals with rainfall, evaporation, and the available run-off is well worth study as an investigation of interest in itself, apart from its particular application, and the same may be

said of a great deal of the matter under the head "Prevention of Waste," a very useful study of this subject as applied to the conditions of an Oriental city. The Public Works Department of Madras is to be congratulated upon the fact that when the report based upon the instructions given to Mr. H. Nowroji—and faithfully carried out by that officer—came for scrutiny to the Technical Section of the Chief Engineer's Office, it was dealt with in a vigorous fashion which resulted in the recommendation, adopted by the Government, that Mr. Madeley should be entrusted with the preparation of a coherent scheme for which he could make himself responsible. The earlier instructions, it may be noted, had included two conflicting orders: the cost of the distribution scheme was to be kept "as low as possible" and it was to ensure "a complete and satisfactory distribution of the water provided." The report before us, relating as it does to the water supply of an Indian city of over half a million inhabitants, is one of the most important and valuable documents of the kind that we have ever seen, and marks an administrative change of much importance to the city and Presidency.

* * *

Sanitation in Small Urban Districts.

We have on more than one occasion directed attention to the excellent work which is being done by the Local Government Board in holding inquiries into the sanitary circumstances and administration of districts in which the public health services are not being carried out in an efficient or up-to-date manner. We have before us such a report in regard to the urban district of Mallwyd, Merionethshire, in which Dr. Morgan Rees, the board's medical inspector, expresses the opinion that the district abounds in conditions inimical to the health of its inhabitants, and that little has hitherto been done by the district council to secure removal or amelioration of these conditions. The worst features appear to be the inadequate provision of housing accommodation and a small water supply, which is liable to contamination. It is interesting to observe that the joint appointments of surveyor, inspector of nuisances and waterworks manager are filled by an officer who "holds no special qualification," and who is rewarded with the princely payments of £3 a year in respect of each of the first two offices, while his salary for the last-named appointment is 9d. a week! It is only fair to point out, however, that Dr. Rees expressly states that, while the council are to blame for their large degree of failure to carry out their duties as guardians of the public health, it must be recognised that the decreasing population, the dwindling industry, and the low assessable value of their district are circumstances that tend to hamper effective action on their part.

The circumstances which exist in Mallwyd are merely a particular example of a general evil—namely, the practical impossibility of securing sanitary efficiency in small urban districts. This matter was dealt with at some length in the annual report for 1904-5 of the board's medical officer. "It is a matter for serious consideration," he said, "whether the creation of small urban districts is in the true interests of efficient sanitary administration. Subdivision of administrative districts leads, in the aggregate, to larger disbursements in the way of salaries, due to the multiplication of officers, and in the way of office accommodation for these and for the local authority. To justify this increased expenditure the counterbalancing consideration should be increase of administrative efficiency. In districts that, after subdivision, still remain of considerable importance, this result may, perhaps, be attained, but it may be apprehended that a point of subdivision is not infrequently reached at which the increased expenditure is accompanied by diminished efficiency. If a district be so small that the salaries offered cannot secure competent officers; that it cannot afford the expenditure necessary for works of water supply, sewerage, and so forth; that it is unable to provide efficient means of disinfection and hospital accommodation for its infectious sick, and so has to attempt, often without success, to effect these ends by combination with neighbouring authorities—the result of subdivision is clearly decrease in efficiency of administration.

* * *

Town Planning Progress.

"The dreams of the idealist must be transmuted by the alchemy of common sense into something practical before they can serve as a basis for town planning and the laying out of garden cities." Although these words formed the conclusion of the paper on "Housing and Town Planning Progress," which was read at the Royal Sanitary Institute Congress by Mr. H. Gilbert Whyatt, ASSOC.M.INST.C.E., the borough engineer and surveyor of Grimsby, they might appropriately have been placed at the head as a "text." After giving statistics showing the progress which has been made in regard to town planning since the Act of 1909 came into force, Mr. Whyatt pointed to certain practical aspects of the question. In regard to restricting the number of houses per acre, he emphasised the fact that small houses must be allowed—"otherwise two or three families will inevitably arrange to occupy one house, and the interior of the house will be a slum, while the exterior is everything that could be desired in a garden city." Moreover, it must be remembered that unless the preparation of a scheme is followed by the development of the land by the builder, the scheme is abortive, the landowner is injured, and houses will be erected on other estates which are not subject to town planning restrictions. Mr. Whyatt also performed a useful function in pointing out what can be done without the preparation of a formal scheme under the Act. If there are no relaxations of by-laws, and if landowners will agree to lay out their estates on town planning lines, there is no need to go to the Local Government Board at all, and both time and labour will be saved. Further, a voluntary scheme of this kind implies that harmony between the landowner and the local authority which is so necessary if any effective work of town planning is to be accomplished.

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Housing and By-Laws.

The Engineering and Architecture Section of the Royal Sanitary Institute Congress was under the able presidency of Mr. J. Walker Smith, M.INST.C.E., the chief engineering inspector to the Local Government Board for Scotland. In his inaugural address, which we publish in another column, Mr. Walker Smith spoke generally of the respective functions of the architect and the municipal engineer in regard to town planning, and instanced as an example of what ought to be done the commission of engineers and architects which was appointed to co-operate and collaborate in planning the new city of Delhi. Speaking of the housing problem, Mr. Walker Smith made some very pertinent observations as to the undesirability of perfectly rigid by-laws. It is, of course, necessary for the public to receive adequate protection against the operations of the professional jerry-builder; but when it is realised that existing by-laws only too frequently operate to render remunerative development of land for housing purposes an impossibility, the case for a wise relaxation should need no further advocacy. The Scottish Dean of Guild Courts, the constitution of which was explained by Mr. Walker Smith, have very useful powers in this direction, which could with advantage be conferred on a body in England which might be charged with the power and duty of suspending or modifying by-laws upon good cause being shown.

The Water Supply of Madras City.

PROPOSED NEW WORKS: MR. J. W. MADELEY'S REPORT.

In 1907 Mr. J. W. Madeley, M.INST.C.E., was appointed special engineer to the corporation of Madras, for the new works of water supply and sewerage. As regards the latter he was entrusted with the design of the scheme of sewerage to supersede the existing partial and unsatisfactory drainage of the city, as well as with the organisation and execution of the works. With respect to water supply it was intended that he should carry out the improvements recommended by Mr. H. Nowroji, who had been previously deputed to prepare a scheme. In the meantime, however, ideas on the subject had enlarged, and it was clear that the instructions given to Mr. Nowroji had not been wide enough nor sufficient to form the basis of a satisfactory scheme, though contributing to its substance. The proposals, together with Mr. Madeley's remarks, were considered by Government in 1909, being submitted to scrutiny in the Technical Section of the Chief Engineer's Office. As the result of this study the president of the corporation was requested to have the plans and estimates revised by the special engineer, the scheme to be placed before the corporation and the Government was to be that prepared by him, and he was to take full responsibility in the matter. In accordance with this order Mr. Madeley went into the whole matter and prepared a report, a copy of which he has kindly sent us. It is dated September, 1911, and contains a clear account of the factors affecting the situation, and Mr. Madeley's proposals for the distribution system within the city. It may be pointed out that in the meantime a covered conduit is being made to replace the old open channel from the reservoir to the city boundary, and will probably be finished by the end of 1912. The works which form the main subject of the report are the pumping station, the elevated tank and the system of mains; but references are also made to the reservoir, and the subject of the sufficiency and extent of the available supply is gone into very carefully. Use will be made of the old mains where they are still serviceable.

In the introduction to his report Mr. Madeley urges the importance of carrying out with as little delay as possible the following works:—

(1) The construction of the pumping station and the erection of the pumping engines.

(2) The erection of the elevated tank.

(3) The laying of the two large mains to the north and south of the city respectively.

It is expected that the conduit from Red Hills tank will be finished by the end of 1912, and the filters, now in course of construction at Kilpauk, some six months later, and these will come into use as soon as the pumping machinery, for which a contract has been let, is completed.

Special attention is drawn to the importance of preventing waste, and the use of taps with limited discharge is recommended for street fountains.

The total cost of the works recommended in the report is a little over 42 lakhs of rupees, or, in round figures, £280,000, and the following abstract gives the chief items of the estimates:—

	Rupees.	Sterling.
Engine and boiler house, engine foundations, pump wells and chimney	1,82,850	£12,190
Engines, pumps and boilers...	3,90,000	26,000
Elevated iron tank and low-level storage channel ...	3 20,300	21,353
Certain connections	20,700	1,380
Pipes and specials, valves, meters, laid complete, including labour and materials	30,30,000	202,000
Masonry work connected with distribution scheme... ...	2,65,110	17,674
Total	Rs. 42,08,960	£280,597

It is proposed to instal more powerful pumping engines and to construct a higher elevated tank than was originally contemplated. There has also been a large increase in the cost of labour and materials.

Supervision will be necessary in order that the water may be drawn off from the purest stratum only, and not from the top, where floating impurities collect, nor from the bottom, where sediment accumulates. The conduit will require periodical inspection, and the roughing filter frequent cleansing. Above all, it will be necessary to work the filters carefully and in a systematic manner. The pipe system will need careful watching to prevent contamination and the waste or misuse of water. The whole system should be under the supervision of an expert engineer. Mr. Madeley concludes his introduction by pointing out that Madras has now reached a stage of development at which it is desirable to place the different works of the corporation under different men, to each of whom would be delegated such powers that the chief engineer of the corporation would be saved much of the routine work that now occupies a large share of his time.

THE QUANTITY OF WATER AVAILABLE.

The general scheme, of which the distribution works described in this report are a part, allows for a supply of 25 gallons per head per day. This is likely to be exceeded unless the supply is carefully conserved. The rate in Bombay is about 40 gallons, and in Calcutta 27½ gallons of filtered water and 20 gallons of unfiltered water. In August, 1909, it was strongly urged by certain members of the corporation that a much larger supply should be provided, and it was, in consequence, decided that the quantity available should be ascertained before the 25 gallons was accepted as a final figure. The investigations included a study of—(1) Increasing the storage capacity of the Red Hills tank; (2) raising the lowest level for the use of irrigation water from Red Hills tank [that is, curtailing the use of the water for irrigation]; and (3) the effect of pumping at Red Hills upon the health of the inhabitants of Madras. [This "pumping at Red Hills" means the use of pumps to lift the water from the tank into the supply channel, when the level is so much reduced that it no longer flows in. The quality of the water so pumped is usually inferior to that previously drawn off.]

THE EXISTING WATERWORKS.

The Madras water supply is a part of a project for utilising the water of the Corteliar river, the upkeep and maintenance of the works being in the hands of the Public Works Department. The quantity used for irrigation is about three times that supplied to the city. The corporation pays 1 rupee per 1,000 cub. yds., or a little less than a tenth of an anna (tenth of a penny) per 1,000 gallons, and maintains a staff of men to prevent contamination of the Red Hills tank by cattle-washing, bathing, &c. A general idea of the situation may be obtained from Fig. 1, which is based upon one of the plates in the report. The anicut (weir) at Tamarapakam, where the river crosses the dotted line in Fig. 1, diverts the water of the Corteliar river into the Cholaveram tank by a channel, which also intercepts the waters of some small tributaries. A part of the run-off of the Corteliar catchment is, however, diverted into the Coum by the Kasavaram anicut. The smallest of the catchment areas shown is that of the Red Hills tank itself. It may be pointed out that these rivers only flow for short periods in the year, and are, under natural conditions, usually either sandy wastes or a succession of buffalo wallows, and stretches of sun-baked mud, thinly grassed.

When they flow, during the rainy season or in occasional cyclonic storms, the water is diverted to the "tanks" or shallow ponds which are dotted thickly over most of this coastal plain, and occupy a considerable portion of the total area. The water is used for irrigating crops, and in favourable seasons the irrigated area "under" one tank reaches nearly to the shallow end of the next tank. In many cases the seepage under the bund at the deep end supplies wells from which water can be drawn when the tank itself is dry or when the pools at the deep end are below draw-off level. In addition, there is some direct use of the receding waters on the nearly level ground along the shallow upstream margin, and when the water recedes from this area grass springs up and provides grazing land for a period depending upon the very variable, but sometimes considerable, casual rainfall of the dry season. It is from two such tanks, improved, protected, and adapted for the purpose of a water supply, that the supply of Madras

city is derived, while a larger quantity, not necessarily available, or fully available, for the use of the city, irrigates areas near and within the city boundary.

YIELD AND DEMAND.

Mr. Madeley's report gives the following figures for yield and demand. The estimated population on which the water supply study is based is 660,000, for which, at 25 gallons per head per day, the quantity needed is, in round numbers, 1,000,000,000 cub. ft. per annum, or, for a supply of 75 gallons, 3,000,000,000 cub. ft. The irrigation demand is 1,500,000,000 cub. ft. in the season including and following the north-east monsoon, September to February, and 544,000,000 cub. ft. in the season from March to June, the driest season of the year. Evaporation and percolation are taken as 9 ft. per annum over an average area of 140,000,000 sq. ft. for Red Hills tank, and 42,000,000 sq. ft. for Cholaveram tank, or a total loss of 1,638,000,000 cub. ft. All this information is plotted to curves in the report.

The total estimated yield from the catchment of 977 square miles is based upon an assumed fall of 27 in. in the north-east monsoon. October-November-December, and 14 in. under the influence of the south-east monsoon conditions, which usually begin in June, and may last for one, two, or three months, according to the strength of the monsoon. Taking the yield as from a "a bad catchment," and the figures given in Strange's "Indian Storage Reservoirs," the yield would be 1,194,000,000 cub. ft. If the monsoons were continuous and the yield "average" the quantity would be 3,860,000,000 cub. ft. Mr. Madeley regards the mean of these two quantities as fairly near the truth—that is, in round numbers, 2,500,000,000 cub. ft. a year. Direct measurements at Tamarapakkam anicut have also been used in calculating the yield. The areas of the catchment basins above and below the anicut are 837 and 140 square miles respectively, but the discharge per square mile for the smaller area is taken as 10 to 6, compared with the larger area. The reason for this may best be given in Mr. Madeley's own words: "At first sight this would appear surprising in view of the hilly nature of part of the larger catchment area, for the proportion of run-off to rainfall should be greater in a hilly district than in a flat district. With regard to this point, it may be remarked that though the number of tanks in the larger area is proportionately less than in the smaller area—there are 613 tanks in 837 square miles, as against 141 in 140 square miles—yet, because the former (613) are of greatly larger average capacity than the latter (141), it is found that the storage provided per square mile—and therefore the loss by percolation and evaporation—is decidedly greater in the case of the larger watershed. In addition, the average rainfall at Arkonam, about the middle of the 837 square miles catchment, is only 38 in. per annum, against 49 at Madras. Furthermore, the hills at the source of the Nagari river are in the most rainless part of the basin, so that the rainfall there provides a proportionately small run-off. Finally the discharge per unit area for a given rainfall from a small compact catchment is greater that for a large catchment area where the water flows over a large area, which at the beginning of the rains is dry and parched, and absorbs a large quantity of water. When all these factors are taken into account, it is seen that the estimated yield of the catchment draining directly to Red Hills and Cholaveram is not unreasonably high compared with the measured yield from the catchment above Tamarapakkam anicut."

It may further be pointed out, as showing the necessity for the thorough investigation of the facts undertaken by Mr. Madeley, that the north-east monsoon sometimes consists of a series of weak cyclonic disturbances with only a few falls of heavy rain—and it has been known to fail altogether. Sometimes the rains of the summer months include a number of really heavy falls, but in other years they consist largely of quite small showers, which have no direct run-off value, some of the smaller ones having no value at all.

THE AVAILABLE SUPPLY.

Taking the average of nineteen years, Mr. Madeley finds the annual yield to be 3,700,000 000 cub. ft. The full supply required in the past has been 4,100,000,000 cub. ft., and the shortage has been assigned to "irrigation." After deducting 1,638 000,000 cub. ft. for evaporation and percolation, the amount available would be 2,062,000,000 cub. ft., or 53 gallons per head per day if adequate storage were provided. For a series of three years, such as the worst three recorded, the storage would have to be 5,000,000,000 cub. ft. The actual storage, not allowing for pumping the dregs of the reservoir, is: Cholaveram tank, 500,000,000 cub. ft.; Red Hills tank, 1,712,000,000 cub. ft.; total 2,212,000,000 cub. ft. By raising the level of Red Hills tank by 18 in. this could be increased to 2,795,000,000 cub. ft. A supply of 75 gallons per head per day cannot be provided during dry years.

The following facts are brought out by a study of the curves:—

(1) That with 25 gallons per head per day, and a population of 660,000, there would have to be a shortage of irrigation water in many years, and there would be barely enough for the city in some years.

(2) That the quantity now supplied to Madras is, as it has been in the past, insufficient for both supplies.

(3) The available yield is enough to supply 50 gallons per head per day if all irrigation were stopped.

(4) With the present storage only 35 gallons could be provided, even if irrigation were stopped. A storage of 5,000,000,000 cub. ft. is needed to make available the yield of 3,700,000,000 cub. ft.

(5) The existing storage, 2,212,000,000 cub. ft., should be increased.

(6) The question of restricting Red Hills tank to the supply of Madras City is one which will have to be considered before long.

Mr. Madeley points out that the figures which he gives are based upon hypothesis and estimates, and that it is therefore necessary to begin to make accurate records by measurement as soon as possible.

He then goes into the question of the effects of storage. In the past the pumping has not supplied all the water needed; it has merely lessened the effect of the shortage. The average cost of pumping has been 16,000 rupees (well over £1,000) per annum.

The effect of this pumping from below draw-off level is strikingly shown by one of the curves in the report, from which Fig. 2 has been prepared. The death-rate for cholera goes up suddenly after pumping has been continued for some time, and the nine months of pumping and the low-water level reached in 1905 correspond to the worst cholera epidemic in the period under review.

RAISING THE FULL TANK LEVEL.

The full tank level can probably be raised 18 in., and another 18 in. could be gained by a temporary bund of clay on the top of the weir. It would pay the corporation to do this work, provided the level at which water may be used for irrigation were also raised.

The increase in the storage, if the level were raised 18 in., would be 277,616,300 cub. ft., the total capacity 2,439,670,300 cub. ft. If the lowest level for the taking of irrigation water were raised 18 in. the increased storage reserved to the corporation would be 175,000 000 cub. ft., or, after allowing for percolation and evaporation, enough to supply the population with 25 gallons per head per day for thirty days. In good seasons irrigation would be benefited by these two measures, and hardly any loss would be sustained by irrigation in dry years. The increase in the city's supply would involve an additional payment to Government by the corporation of about Rs.15,000 (£1,000) a year.

PUMPING PLANT AND PUMPING STATIONS.

Assuming an average supply of 25 gallons per head per day, Mr. Madeley concludes that the pumping plant should be capable of supplying water at a rate three times this: "When the pipe system had been worked out on these assumptions it was found that, to insure an adequate pressure all over the city, the top-water level of the elevated tank should be 84 ft. above mean sea level. The pumping plant has been designed on the basis of these data."

The corporation have entered into a contract with Messrs. James Simpson & Co. to supply and erect the plant complete for Rs.3,90,695. These pumps will be of 873 pump-horse power. Taking the population to be supplied at 550,000 during the first ten years, the pump-horse power required will be 231½, and the guaranteed coal consumption of 1·75 lb. per pump-horse power hour, 0·75 lb. for losses, and a margin of 0·5 lb. for lighting and drawing fires, gives a consumption of 3 lb. of Indian coal per pump-horse power hour. To raise 13¾ million gallons per day to a height of 80 ft. 231½ pump-horse power will be needed or, in the year, 2 000,000 pump-horse power hours. The quantity of coal used will therefore be 2,678 tons per annum. Allowing Rs.768 a month for establishment, the estimate becomes:—

	Per annum.
Establishment	Rs.9,216
2,678 tons of coal at Rs.14 per ton ...	37,492
Oil, &c.	3,000
Repairs	3,000
Total	Rs.52,708

The estimated cost in the original scheme was Rs.60,000. In the present estimate the height to which the water will be raised is 50 per cent greater, and the rate allowed for coal is higher. The new plant will comprise three pumping engines, each capable of delivering 12,000 gallons of water per minute against a maximum total head of 80 ft., including suction lift, delivery pressure and friction. The three boilers will each be capable of supplying steam to any two engines working together against the total head of 80 ft. It will be possible to work any two engines from any two boilers, and to clean or repair any engine or boiler without interfering with the other engines or boilers. Any two pumps will be capable of working at the same time and of pumping up into the elevated tank a total of 24,000 gallons of water per minute from the pure-water reservoirs. On leaving the pumps the water will be forced through a 4-ft. diameter main to the distribution system. The engines will be horizontal, direct-acting, compensated, high duty, surface condensing Worthington engines, each having two sets of steam cylinders, and two double-acting main pumps arranged in line with also be provided, to record the height of the suction lift and the head against which the pumps work.

Two designs have been prepared for the pumping station, one being a plain building of "country" bricks and surki mortar, plastered inside and out with lime mortar. Mr. Madeley does not recommend this design, but puts forward another for a building of better appearance, and one in which the machinery is likely to be maintained in better condition. "If," he says, "the building is mean in appearance, hot, badly lighted or ill-ventilated, the machinery is sure to suffer."

THE ELEVATED TANK.

The design recommended for the elevated tank provides for a capacity of 1,500,000 gallons. The diameter is 104 ft., and the depth of water is 28 ft. It has a flat bottom, 37 ft. from the ground, and the roof is 73 ft. above ground. It is to be of steel, with a steel roof, 6 ft. 6 in. above overflow level. Only a small proportion of the water will pass through this balancing tank, and one pipe will serve as inlet and outlet, a 36-in. branch from the 48-in. main.

The surface soil, where the tank will be built, is clay, but at a depth of about 8 ft. there is a sandy loam, on which the foundations will rest, with a pressure of 1½ tons per square foot.

The materials of the tank will conform to the British standard specification for structural steel for shipbuilding. The thickness of the top plates is calculated by allowing a ¼-in. minimum and

Fig. 1.—Madras Water Supply: Catchment and Tanks.

the steam cylinders, and driven direct by prolongations of the piston rods. The main pumps will be Worthington multiple-valve pumps, double acting on both suction and delivery. In each engine the pumps will be duplicate.

An automatic safety attachment will be fixed on the delivery of each main pump, which will stop the engines and immediately warn the attendant should a pipe burst or should the main be closed by the accidental shutting of a valve.

The boilers will be three in number, of the Babcock & Wilcox type. The total heating surface of each boiler will be 1,426 sq. ft., and the grate area 36 sq. ft. The working pressure will be 160 lb. per square inch. Each boiler will be composed of seven sections, and each section will be made up of nine seamless steel tubes, 4 in. in diameter and 18 ft. long, expanded at the ends into staggered "headers." Each boiler will be provided with a chain grate stoker, having an area of 36 sq. ft. The grate will consist of an endless chain of short cast-iron bars, linked together, running on rollers, and driven by a drum at the front end.

Three Babcock & Wilcox superheaters will be provided, each of 248 sq. ft. of heating surface. These will superheat to 150 deg. Fahr. under normal working.

There will be a Venturi meter on the 48-in. pumping main, with a throat ratio of 1 to 6, and a range of registration from 120,000 to 1,800,000 gallons per hour. A water-level and pump-pressure recorder will

another $\frac{1}{16}$ in. for corrosion. The next row will be $\frac{3}{4}$ in. thick, and the increases with depth bring the bottom row to a thickness of $\frac{15}{16}$ in. The vertical joints are to be butt joints, with internal straps, and double riveted except in the top row. The horizontal joints will be single riveted lap joints. The central overflow pipe, 36 in. in diameter, also serves as a support for the steel roof. It is bell-mouthed at the top to a diameter of 7 ft., which allows for the maximum overflow with a depth of 9 in. on the lip. The roof will be chiefly of ¼-in. plates, domed to a radius of 200 ft., carried on twenty-four main and twenty-four intermediate rafters, formed of 5-in. by 4-in. by ½-in. tees, trussed with steel rods and bars. The purlins will be mostly steel angles.

The tank will rest upon an outer ring of piers and arches in brickwork and concrete, and upon ninety-six internal steel stanchions, with centres 11 ft. by 6 ft. 6 in. apart, and arranged in fourteen rows, each row carrying two continuous 15-in. by 6-in. rolled-steel beams, 2 ft. apart, centre to centre, each beam stiffened by a 12-in. by ½-in. plate riveted along its bottom flange.

The stanchions and beams will be encased in concrete. Each stanchion will be 34 ft. 6 in. high, and will consist of two 10-in. by 3½-in. channels, fixed 4½ in. apart by means of ½-in. plates, 12 in. wide. The base of each stanchion will be 3 ft. 6 in. square.

Alternative designs for a steel tank and steel supports may be submitted, and any such design as in

the opinion of the engineer shows a substantial advantage over the proposed design will be carefully considered. The tank itself must be of steel.

THE DISTRIBUTION SYSTEM.

The existing distribution system fails in all the essential features of a good system. It is insufficient for reasonable requirements, and over a considerable area it fails during the part of the day when water is most needed. The pressure is almost everywhere deficient, and there is much waste. One of the objects of Mr. Madeley's investigation was to determine what is required to remedy these faults and to provide for a complete and satisfactory distribution of water, also to estimate the cost. To this end Mr. Madeley made a careful study of population statistics, the rates of increase in different areas, and so on. The pipes are designed to carry a maximum quantity of 75 gallons per head per day for a population of 660,000, with one elevated tank, that at Kilpauk. Should the increase in population be greater than is expected in any district it will only be necessary to erect a small tank sufficient for that district. Thus "the pipes which are designed to serve a population of 660,000 with an average daily supply of 25 gallons per head on the assumption that the whole supply comes directly from the single elevated tank at Kilpauk may, by means of subsidiary tanks, be made to supply a greater population with a larger quantity, say a population of 800,000, with 35 gallons per head per day."

The average supply, 25 gallons, will be exceeded on many days during the hottest part of the year, the excess draught allowed for under this head being 20 per cent. A higher figure is not taken because in the hottest weather many of the largest consumers are away from the city, in hill stations, and in Europe and elsewhere. Next, the allowance for the maximum flow during the day is based on the assumption that the rate during hours of great demand may be double the average for the day. Double 120 per cent of the mean for the *year* gives 2·4 times that mean. Further, allowing for fires and festivals, Mr. Madeley concludes that the pipe system should be designed with a capacity of 75 gallons per head per day.

While the minimum pressure allowed in some of the towns of the Madras Presidency is as low as 10 ft. head, the lowest head in Bombay is 50 ft., and the new works in Calcutta will ensure a head of 40 ft. For Madras, therefore, it is held that the lowest head of water should be 50 ft. "The pressure in some of the distributories will be less than this owing to the head required to force the water through pipes, but the loss of pressure will be reduced to a minimum owing to the interconnection of pipes which has been effected wherever possible."

The smallest new pipe proposed in the report is 4 in. in diameter, but it is proposed to leave in the existing 3-in. pipes where they are not too small to supply domestic requirements. It is believed that the provision of two kinds of house services will tend to reduce waste. The second-class service would be provided by taps, open to inspection without notice. The next few years will probably see a large extension of sanitary fittings in Madras [at present there are hardly any, even in the hotels], and for these lead pipes will be suitable. Experiments point to the probability that the Red Hills water has no solvent action on lead.

PREVENTION OF WASTE AND LEAKAGE.

In Bombay and Calcutta special staffs are engaged in the detection and prevention of waste. In Madras there are few factories, and it is unlikely that the consumption will be as great as in either of those two cities; but no precaution should be omitted to prevent waste. Intermittent supply is an evil, and should be regarded as only a temporary expedient. It leads to storage in vessels in the houses, to the inspiration of impurities, and danger from fire. Other and better means of preventing waste are: Limiting the number of house connections, metering every water service, house-to-house inspection, taking up and replacing all pipes and fittings, and the use of the waste-water meter system. These are dealt with seriatim in the report. As regards house-to-house inspection, it is costly, and depends for its efficiency on the honesty of comparatively low-paid inspectors. In Madras the caste system and gosha habits would seriously interfere with the work of inspection. The waste-water meter system is strongly recommended for Madras, and should be installed when the new pipes are laid. In Calcutta the use of this method of checking waste has led to a saving of nearly 23 per cent of the supply. The arrangement proposed for Madras is explained in the report and by means of a plan. The number of meters recommended is 120, of which 56 would be 4-in. meters, 58 6-in., and 6 8-in.

An important source of waste in Madras is that due to misuse of the public taps, and it is highly desirable that all fountains should be fitted with self-closing taps. Similar taps might be provided in the houses. "The importance of reducing the waste," writes Mr. Madeley, "cannot be exaggerated." There will be enough for every legitimate purpose if it is not wasted.

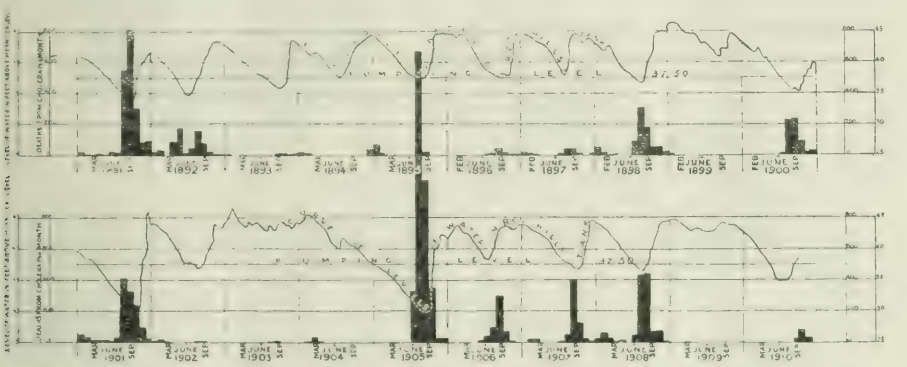


Fig. 2.—Madras Water Supply: Effect of Pumping from Red Hills Tank under Present Conditions.

DETAILS OF THE PROPOSED DISTRIBUTION SYSTEM.

The arrangement of the principal mains is shown in Fig. 3, which is prepared from a plan accompanying the report.

A primary main, 3,000 ft. long and 48 in. in diameter, will carry the water to the existing and new principal mains.

Main No. 1, which begins with a diameter of 42 in., and is reduced to 30 in., and finally to 6 in., is 35,162 ft. long.

Main No. 2, partly new and partly old, begins as an 18-in. branch off main No. 1, and diminishes gradually to 14 in. Its length is 17,692 ft.

Main No. 3 is an existing main, which will be connected with the 48-in. main, and end as a 10-in. pipe. The length is 17,559 ft.

Main No. 4 branches off No. 3, beginning with a diameter of 36 in. and being reduced to 14 in. Length, 14,770 ft.

Main No. 5 starts as a 22-in. pipe off No. 4, and ends as a 12-in. pipe, its total length being 15,688 ft.

Main No. 6, which is a part of the existing main, will branch off the new main No. 7. It is a 14-in. pipe, with a length of 17,250 ft.

Main No. 7 is a new main beginning as a 30-in. pipe, and will supply a large area. Its length will be 27,800 ft. In addition to these there will be ten branch mains, from 18 in. to 6 in. in diameter. Some of the principal quantities may be noted, the lengths of old pipes being the lengths to be retained in the scheme. These are the same as the lengths now in

use, except in the case of the 18-in. pipes. Most of the pipes of smaller sizes will be retained, down to 3-in.; all below 3 in. will be removed.

Diameter: inches.	Existing pipes.	New pipes.
48	—	3,230
42	4,200	13,759
36	3,750	6,110
33	—	300
30	1,300	14,795
27	11,750	11,975
24	4,160	3,700
22	3,700	—
21	8,650	—
20	2,170	5,610
18	18,000	9,495
16	3,295	3,755
15	300	—
14	24,325	3,160
12	23,360	12,750
10	26,280	8,300

Besides considerable lengths of the intervening sizes, the scheme includes the provision of 536,410 ft. of new 4-in. pipe, and 149,800 ft. of old pipes of the same diameter. The total length of old pipes to be removed will be 61 miles, to be retained 111 miles, and to be relaid 4 miles. New pipes to be laid, 132 miles; total length of pipes when the scheme is complete, 247 miles. In this connection the following figures are of interest. Total length of roads in Madras, 270 miles; length of roads where pipes will be laid, 232 miles. These lengths include unmetalled roads.

An important economy will be gained by the use of 24-in. valves on mains of 36 in. to 42 in.; 18-in. valves on mains from 24 in. to 33 in., and 12-in. valves on 12-in. to 22-in. mains. For instance, a 42-in. valve and pit would cost Rs.1,430 (£95), whereas a 24-in. valve and pit will cost Rs.630 (£42), a saving of Rs.800 apiece (£53).

At the head of each of the seven principal mains there will be a Venturi meter, with a counter and diagram recorder. At distances of about half a mile hatch boxes will be placed. As regards the pipe joints, Mr. Madeley has, after careful consideration, concluded that only socket and spigot joints run with lead should be used. The superiority of such joints over turned and bored pipe joints in the case of Madras will be partly on account of the large number of deviations and sharp bends that will be necessary, partly on account of the effects of settlement due to excavations, and partly because the turned and bored joints do not admit so readily of expansion and contraction taking place without injury to the joint.

Many hydrants will be provided, also 100 pillar fountains, 300 single wall tap fountains, and 200 double wall tap fountains.

UNFILTERED WATER.

It has only been possible to make a rough estimate of what the demand for unfiltered water would be. About 500,000 gallons a day might be used for sewer flushing, a somewhat larger quantity for industrial purposes, and about 250,000 gallons for road watering.

This amounts to about one-tenth of a full supply, and hardly justifies the laying of special mains. There are, however, three large consumers whose works are close together—the Buckingham Mill Company, the Carnatic Mill Company, and the Madras and Southern Mahratta Railway Company. As these companies find unfiltered water suitable for most of their purposes, it is proposed to devote an existing 16-in. main to the supply of such water, at any rate for a time.

THE ESTIMATES.

The estimated weight of spigot and socket straight pipes required is 16,747 tons, of which 42-in. pipes account for 3,581 tons, 30-in. for 2,197 tons, and 4-in. for 4,515 tons. The estimated cost, allowing for deviations from 2 to 4 per cent, is Rs.18,93,621 (£126,208). Socket and spigot bends account for Rs.14,903 (£994). Cast-iron tees for mains, Rs.33,592 (£2,239), and the estimates for other connections, taper pipes, and so on, bring up the total for cast-iron pipes and specials to Rs.30,30,000, or £202,000. The estimate for pumping machinery is Rs.3,90,000 (£26,000), for the elevated tank over Rs.3,20,000 (£21,333), and for the pumping station buildings Rs.1,63,350 (£10,890). The total of the estimates is Rs.42,08,960 (£280,597).

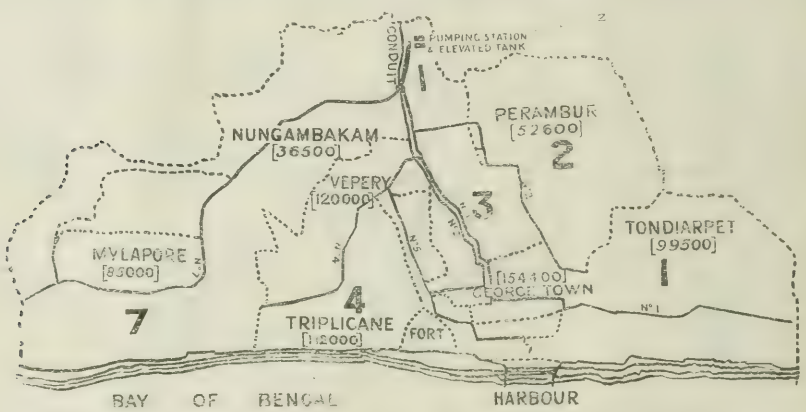


Fig. 3.—Madras Water Supply: Plan of Madras City, showing Leading Mains and the Areas Supplied by Them.

Note.—The boundaries shown are not those of the districts corresponding to the names on the plan, but are those of the areas served by the different mains.

Road Maintenance Charges.—The Finance Committee of Surrey County Council reported at the last meeting that they were of opinion that the only means of securing effective relief to county rate and tax payers from the heavy maintenance expenditure now necessitated by the traffic of road trains, motor wagons, traction engines and motor omnibuses, are a substantially increased revenue from motor owners, and an allocation to the Home Counties of a special share of the revenue derived from all classes of motor and steam vehicles proportionate to the increased cost entailed by this form of road traffic. The committee recommended that the council pass a resolution to the above effect, and that the same be sent to the Chancellor of the Exchequer, the county Members of Parliament, and the County Councils' Association. The motion was adopted.

University of Sheffield: Department of Architecture. We have received a prospectus of the Department of Architecture of the University of Sheffield. The next session will begin on October 2nd. The lecturer, Mr. W. S. Purchon, A.R.I.B.A., will be present at the University on September 30th and October 1st, from 9.30 to 12.30, to see intending students. The department provides: (1) A two years' day course; (2) an advanced course for diploma—part day, part evening; (3) an evening class in architectural drawing; (4) courses in surveying. A preliminary year course has been arranged to meet the requirements of the R.I.B.A. preliminary and the matriculation examinations. Students who obtain the first-class certificate (awarded at the end of the third year) are exempted by the Royal Institute from all but the final examination qualifying for A.R.I.B.A. Students who are unable to take a complete course may, by arrangement, attend any part or parts of the day or evening courses approved by the lecturer.

Institution of Municipal and County Engineers.

ANNUAL GENERAL MEETING IN LONDON.

Among the papers discussed at the recent annual meeting of the Institution of Municipal and County Engineers was the following:—

MAINTENANCE, FLUSHING, AND CLEANSING OF SEWERS IN HAMPSTEAD.

By Oliver E. Winter, assoc.m.inst.c.e., Borough Engineer and Surveyor, Hampstead.

From Photo. by Foster Brothers, Hampstead.

[Mr. Winter has held the appointment of borough engineer and surveyor of Hampstead since June, 1901. He entered the municipal service in his native city of Norwich, and received his professional training under Mr. I. F. Marsham, city engineer. He was afterwards appointed assistant and ultimately chief assistant under Mr. Marshall. He continued in this appointment at Norwich under Mr. John Buchan, assoc.m.inst.c.e., and Mr. Arthur E. Collins, m.inst.c.e. In 1894 he was appointed by the corporation acting city engineer and surveyor, carrying out these duties for several months. During the time Mr. Winter was at Norwich there was a large growth of the city, and he was actively engaged in extensive schemes in every branch of municipal engineering work. Since 1895 he has held chief appointments in London, in that year being selected as engineer and surveyor to the vestry of St. George the Martyr, Southwark. Here he initiated extensive drainage works, an important street improvement scheme around the Church of St. George the Martyr, and Long-lane in the Borough, which was adopted and carried out by the London County Council at a cost of about £200,000, and various building works. In 1898 he was appointed chief surveyor to the Poplar District Board of Works, and was reappointed as borough surveyor on the constitution of the borough councils in 1900. At Poplar he carried out several miles of new paving works; designed and erected the new generating station for the electricity works at a cost of about £20,000, a bridge over North London Railway, and various other extensive works, which were all carried out by direct administration, under his supervision. In 1901 he was appointed borough engineer and surveyor of Hampstead. Since then many important works have been designed and carried out by him. Among these may be mentioned a new works depot (cost £18,000), a housing scheme (£12,000), extensive drainage and paving works, underground conveniences, a branch library, a cemetery extension, improvements to public baths, and street improvements. Mr. Winter is an associate member of the Institution of Civil Engineers, and a member of the Institution of Municipal and County Engineers, of which body he was this year elected to the council as a district representative of the metropolitan area.]

The object of the author in submitting this short paper to the institution is to describe some special features of work recently carried out in the metropolitan borough of Hampstead, under his direction as borough engineer, in connection with the maintenance, cleansing and flushing of the sewers in the borough. Hampstead drains into the metropolitan drainage system, and there are about 4 miles of main trunk sewers under the control of the London County Council in the borough. There are 60 miles of sewers under the control of the borough council, of which 35 miles are brick and 25 miles are pipe sewers. The sewers take both sewage and storm water. The gradients are generally good throughout the borough, the surface varying between 100·1 and 441·3 above ordnance datum.

MAINTENANCE.

Many of the older brick sewers, constructed between forty and fifty years ago, have in recent years become defective, calling for considerable repair or reconstruction. The chief defects are generally in the invert—which has been mostly constructed in brickwork in cement blocks or cases. This has become worn, with settlements in places. The side walls and arch of sewer have been built of good hard bricks, but with wide joints, in lime, and often burnt ballast mortar. The brickwork has consequently become uneven, with rough surface, and impossible to keep in clean condition. The brick sewers are egg-shaped, the usual sizes being 3 ft. 9 in. by 2 ft. 3 in. and 3 ft. by 2 ft. In many cases these sewers are much larger than required, and where extensive repairs are required it is necessary to decide, first, as to the advisability of reducing the size of the sewer and reconstructing in a glazed stoneware pipe sewer of sufficient size so as to be self-cleansing, or of carrying out repairs and renewals to the old sewer, if material reduction in size is impracticable. A good and somewhat unusual example of the first method is a reconstruction which has been carried out to a 3-ft. by 2-ft. brick sewer, passing under the West Heath, including the "Leg of Mutton" pond, and draining the portion of the borough known as "North End." This sewer was constructed forty-seven years ago, and it is stated that considerable difficulties attended its construction, owing to the running sand and water. The side walls and arch in places were being pressed in, and water and sand were being forced through the rough joints of the brickwork by the outer pressure. There appeared to be serious risk of the collapse of the sewer. After careful consideration and experiment the author advised the construction of a 15-in. pipe sewer, within the old 3-ft. by 2-ft. brick sewer, and filling around the new pipe solidly with concrete. Although the space available for working in the old sewer was very confined, the work has been carried out and completed in a sound and watertight manner, working from the existing manholes, and the shafts for the new manholes it was desirable to construct. Otherwise, any further opening in the difficult ground was avoided.

The stoneware pipe adopted for the work was the grouted composite jointed pipe manufactured by Messrs. Doulton & Company. It was necessary that a joint should be used which could be easily and quickly made in running water, and thus avoid any diversion of the running sewage. On inserting the spigot into the socket, the composition rings (which are previously greased) at once form a sound joint. The attached canvas casing (or bag) allows the cement joint to be easily made. When the cement grout is poured into the canvas casing, any water within the casing is driven out through the canvas by the heavier grout, and a perfect cement joint is secured. In laying the new pipes it was desirable they should be laid to a true gradient between manholes. As the old sewer had settlements in places it required considerable care in fixing the new levels. This was done in the following manner: The level of the new invert was fixed at each manhole; 2-in. by ¾-in. wooden battens were fixed on each of the side walls, at the required level, by a boning line from manhole to manhole. Gauge is then worked from the under side of the batten to the invert of the pipe, and the pipe-layers can easily work to a true line, whatever the gradient may be. Periodically, when the flow of sewage was at the minimum, the sewage was dammed back, and a water test of 25 ft. to 35 ft. head was applied to lengths of pipes laid, varying from 20 ft. to 30 ft. These tests showed that the joints were quite watertight, notwithstanding that the pipes were laid in water varying from one-third to three-quarters the diameter of the pipe. After the test mentioned, the whole space between the pipes and the old brickwork was filled in with cement concrete. The length of sewer dealt with in this manner was 2,806 ft. The estimated cost of this work, including new manholes, abolishing two very objectionable stepped ramps, and constructing in iron pipes in the form of tumbling bays, amounted to £2,300. The actual cost of the work carried out by the council's staff has amounted to £2,234. A loan was obtained from the London County Council for this amount, to be repaid in twenty years. An excellent self-cleansing sewer has thus been obtained in substitution for a defective and offensive brick sewer, for about one-fourth the cost of the original sewer. The actual cost of the 15-in. pipe sewer work alone, including filling into the old

3-ft. by 2-ft. sewer, worked out at about 9s. 6d. per foot run, complete. The same method has been adopted with other defective brick sewers, the same jointed pipe being used in each case as last described, but of the diameter to meet the needs of each case. The following particulars may be given of these:—

Size of old sewer.	Diam. of new pipe.	Cost per foot run complete.
3 ft. 9 in. × 2 ft. 6 in.	9 in.	10s. 0d.
3 ft. 6 in. × 2 ft. 3 in.	12 in.	8s. 9d.

The following data may be useful in connection with this work:—

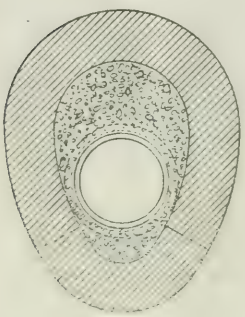
Fifteen-inch stoneware pipe in 3-ft. by 2-ft. sewer; one pipe-layer and three labourers laid and completed, including concrete filling, on an average 5 ft. per day.

Twelve-inch stoneware pipe in 3-ft. 6-in. by 2-ft. 3-in. sewer; one pipe-layer and three labourers laid and completed on an average 9 ft. per day.

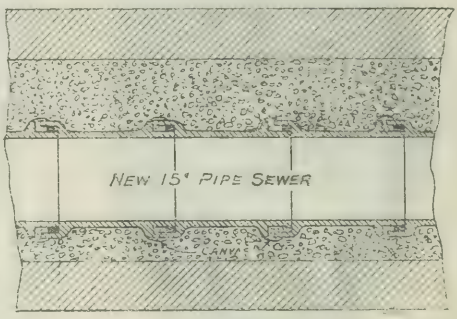
Nine-inch stoneware pipe in 4-ft. by 2-ft. 8-in. sewer; one pipe-layer and three labourers laid and completed on an average 12½ ft. per day.

In cases of old brick sewers, where it has not been practicable to reduce to much extent the size of the sewer as last described, a different method must be adopted. As already stated, the chief defects to be remedied were in the invert. But the brick inverts are not generally so defective as to require entire under-pinning, nor the complete removal of the inner ring. To meet such cases, the author designed a reinforced concrete invert, to fit the existing invert of the sewer. The invert was made to the section shown on the drawing, 2 in. in thickness, and in lengths of 2 ft., with rebated joint. Of this size they could be readily handled and got into the sewer through the existing manholes or side-entrances. The inverts are made by the Imperial Stone Company of Tottenham, and usually stored three or four months to permit them to thoroughly harden before being sent to the works. The concrete inverts were bedded and jointed in cement mortar, and where any depressions existed in the old invert, or more regular falls could be obtained, on fine cement concrete. To firmly secure the inverts in position, over each joint a corbel, 4½ in. by 6 in. by 2¼ in., was pinned into the side walls of the sewer. A cement benching was formed on the top of the invert, enclosing the corbels, and making one finished continuous line. The inverts were lowered into the sewer in a rough frame to prevent damage, and placed on a specially made trolley, and conveyed to the point required. During the time the inverts were being fixed in position the sewer was dammed up, and the flow conducted along the side walls in galvanised iron troughs, arranged sufficiently low to receive the drainage from the house connections. Several thousand feet run of this invert has now been fixed in such old brick sewers as described, with very satisfactory results. The cost of the new invert, including bedding and laying complete, averages from 4s. to 4s. 2d. per foot run. This is a much lower cost than would have been incurred in cutting out 4½ in. of the defective brick invert, and renewing in brickwork. The sides and crown of the sewer were scraped and thoroughly washed, the joints of side walls raked out about 1½ in. deep, and filled in and repointed with cement and sand mortar (1 and 1). In a 3-ft. 9-in. by 2-ft. 3-in. sewer the cost of this work varied from 2s. to 3s. per foot run of sewer, according to the amount of defective brickwork requiring to be cut out and made good. The total cost, therefore, of putting these old sewers into a thoroughly good and sound state of repair did not exceed 6s. to 7s. per foot-run. Good, clean sanitary conditions have thus been obtained at a comparatively small expenditure. After these works have been completed there has been a very marked improvement in the air within the sewers, which cannot fail to have an important beneficial effect on the general sanitary condition of the neighbourhood.

3′ 0″ × 2′ 0″ BRICK SEWER.

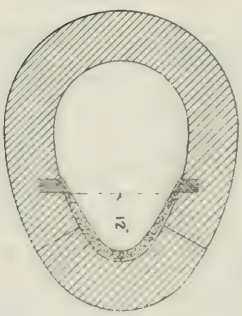


Cross Section.

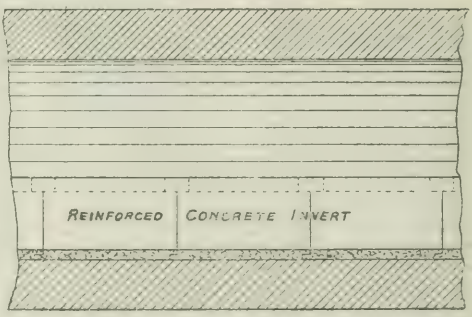


Longitudinal Section.

3 9″ × 2 6″ BRICK SEWER.



Cross Section.



Longitudinal Section.

Hampstead Sewers.

Flushing and Cleansing.

Regular and systematic flushing of sewers is of great importance, and absolutely necessary in keeping the sewers in a clean condition and free from nuisance. For this work in Hampstead the borough is divided into three districts, and six men are regularly engaged—two in each district. There are forty-two flushing tanks constructed underground, with a capacity of about 2,000 gallons, which are discharged at least once a week. Water is supplied through a meter from the Metropolitan Water Board's mains.

These tanks are arranged at such points that they can flush two, three, or more sewers—by means of flaps. The flushers who attend to their working also clean out the surface ventilators, and see that all gully gratings in their respective districts are free from obstruction, and report any defects. Flushing manholes are also arranged at the apices of other lengths of sewers, and are flushed out from time to time as circumstances require by a steam motor watering and flushing van of 1,000 gallons. This van has proved very efficient for the purpose. A gang of not less than three men traverse all the brick sewers for the purpose of removing any deposits. They also see that the flaps to house drains are working freely.

Where large brick sewers exist, and especially where such sewers are only at long intervals fully charged in times of exceptional rainfall, it is desirable that further cleansing should be carried out in addition to the regular flushing. The author's attention was called to this very forcibly in a report on sewer ventilation made to the Hampstead Borough Council in 1905 by Dr. F. W. Andrewes and Dr. W. H. Hurtley, after a careful examination of the older brick sewers. They state:—

"It is probable that much, if not all, of the smell arising from the ventilating grids depends not on emanations from the flowing sewage, but on decomposing organic matter and fungoid growths on the walls of the sewers, which are in some places in an exceedingly filthy condition. We were informed that when the men employed in the sewers had to work for any length of time in one place, they did, of their own accord, wash down the walls for some distance from where they were working, and that this expedient considerably reduced the offensiveness of the air. We therefore recommend that where nuisance arises from the sewer grids the walls of the whole sewer in question should be thoroughly washed and cleaned and finally rinsed over and otherwise treated with a disinfectant. Should it be found, on trial, that the nuisance can thus be abated, the cleansing should be carried out as far as possible throughout the district, attention being especially paid to the older brick sewers."

For the purpose of thoroughly cleansing brick sewers, the author has devised an arrangement of a portable meter with hose pipes. The portable meter is attached to a street hydrant, and a 2½-in. hose pipe is conducted from the meter to a side entrance or manhole. An attachment is fitted at the end of the 2½-in. hose pipe, with two valves and smaller hose pipes, each controlled separately, and arranged so as to work up or down the sewer. Four men are employed in the sewer, two at each end of the smaller hose pipe, one spraying the water on the walls, the other scrubbing with a bass and steel brush. Two men are required on the surface or near the entrances to manipulate or guard the hose pipes. The Water Board insist upon having a waterman in attendance while the meter is working, and a charge of 6d. per hour is made. The cost of such cleansing, including water and labour, works out at about 1½d. per foot-run for a 3-ft. 9-in. by 2-ft. 6-in. brick sewer. There has been a very marked improvement in the air of a sewer after this cleansing has been carried out, and there can be no doubt as to the desirability, from a sanitary point of view, of such cleansing from time to time, as occasion requires.

The work described in this brief paper is not so striking or sensational in character compared with other work carried out by a municipal engineer, and it is almost entirely hidden from the public eye. Such work may add little or nothing, for the moment, to the reputation or credit of the official responsible for advising thereon, and carrying out the work in a sound and satisfactory manner. But in conscientiously and energetically discharging his important duties in connection with the maintenance of the drainage system under his control in a clean and sanitary condition, he very quickly sees substantial beneficial results accruing to the public he serves.

DISCUSSION OF MR. WINTER'S PAPER.

Mr. E. J. Silcock (Westminster and Leeds), in proposing a vote of thanks to Mr. Winter for his paper, called attention to the particular value of the contribution in giving information as to the life of the sewers, a matter which frequently turned up with regard to the length of the term for which loans should be granted for the construction of works. The length of a loan period must naturally be regulated by the life of the works. Thirty years, which was the maximum term allowed by the Local Government Board, seemed all too short for works such as sewers, which undoubtedly, if well constructed, had a much longer life than thirty years. They had in this paper a record of sewers constructed forty or fifty years ago, and reading between the lines they thought they would infer that the sewers, as first constructed, were not made of the highest class of materials, or with the best class of workmanship. Being in the London district, they might assume that the bricks would not be so good as Staffordshire blues, or the bricks which could be obtained in many districts to-day. The joints also were of inferior material to those of to-day. Under these circumstances it would seem that the life of the sewers of Hampstead was considerably over thirty years, and now they had a chance of their life being considerably extended. With regard to the system adopted by Mr. Winter of putting a pipe sewer inside a brick sewer, it could not be adopted often on account of consideration of the size and carrying capacity of the sewer. The sewers in this case were considerably larger when constructed than was necessary, but, even so, the placing of a 15-in. pipe sewer inside a 3-ft. 9-in. brick sewer must have required a special type of man—smaller than the ordinary navvy. This applied particularly to the work of concreting round the pipe. The author told them that the work was done in lengths of 20 ft. or 30 ft.; certainly there could not have been very much room for a man to get in to work. The system of jointing for stoneware pipes was one of which he had had considerable experience, and he wished to confirm the statement that it was a very satisfactory method of jointing pipes when water was running during the time the joint was being made. The test applied to the pipes seemed to be unnecessarily severe, and he doubted whether under ordinary working conditions it would be necessary to put such high pressure on the inside of the pipes.

Mr. E. J. Elford (Southend-on-Sea), seconding the vote of thanks, said he did not quite understand how the concrete inverts were reinforced, nor could he see the value of reinforcement, having regard to the conditions under which they were used. Mr. Winter referred to the tanks for flushing the sewers, and it would be interesting if he could give them some figures as to the cost of these fixed flushing tanks as compared with movable tanks. The capital cost of the fixed tanks must be a considerable item.

Mr. J. S. Brodie (Blackpool) said the paper would have been still more interesting if Mr. Winter had given them in a little more detail the defects he found in these brick sewers. He took it that the chief defects would be the interior mortar joints and brick settlements. It was always interesting when they had to substitute new sewers for old ones to know in what respect the old had failed, and then they could tabulate the information. One peculiar thing was the unusually large size of the old sewers as compared with the new one. There seemed a large reduction in the area, and therefore in the carrying capacity, of the sewer, and either the old sewer must have been too large or the new one must be rather too small. With regard to flushing tanks, he did not think there was much to be said against them; the only question was the quantity of water required to make them really effective. It was not every town that was so well off as Blackpool, for they had both a fair supply of fresh water and an unlimited supply of salt water. The length of time allowed for repayment of loans in regard to sewers had been alluded to. There seemed to be a feeling that sewers once put down were there for ever. But those who were in charge of these matters knew that was not so. The time came when even the best work showed defects and had to be made good. The loan period should not be a very long one—that is to say, it should not be calculated on the probable length of life of the work, but rather on the convenience of the authority with regard to the repayment of the loan. He had known some cases of sewage work where the enormous period of sixty years was granted. He thought that was far too long, and if it were cut down to one-half, or even a shorter period, it would do away with the temptation to local authorities to go in for enormous capital expenditure because the annual payments were so small.

Mr. E. Willis (Chiswick) added his thanks to Mr. Winter for his practical paper. While he was assistant engineer at Willesden there was one case of a similar character. The particular sewer was subjected to heavy pressure from traffic at the time of the Great Exhibition, and did not stand it as it should have done. They found that, instead of

the inverts going, the haunches were pushed in. He went through the sewer, and found it was about 1 ft. 4 in. in width in places, and that in some cases the road was resting on an open cavity owing to the haunch being pushed in. It was cut out in short sections, and, although it was only a 3-ft. by 2-ft. sewer, it was repaired by a man over 6 ft. in height. Fortunately there was not a big flow of sewage along it. The work was perfectly done; the only thing was it took a good deal of time, but he did not think the expense came out quite so much as in Mr. Winter's case. He had just left a similar piece of work where the sewer was constructed prior to 1861. He had had it under observation, and had seen signs of trouble. About a fortnight ago he went there and found a cavity had formed 6 ft. 9 in. by 4ft. 6 in. by 8 ft. deep. He could not get the council to undertake remaking entirely, but by careful observation he was able to prevent any accident. These were difficulties which he feared Mr. Winter's process would not overcome. It occurred to him that, as space was limited, he might have concreted 30-ft. lengths, and he asked Mr. Winter if it was possible for a man to joint up as he carried the pipes along. When he had had somewhat similar works he had always had the jointing done as they progressed, and by that means he had been able to give the men a fair amount of room to work in, and never had any trouble on that score. He had used the same joint as Mr. Winter with marked success. He thought, on the whole, the cost was not excessive, and Mr. Winter was to be complimented on the length he was able to keep going every day.

Mr. S. E. Burgess (Middlesbrough) inquired what provision was made for rainfall in these small sewers. Was it one-third or one-quarter of an inch per hour?

Mr. E. R. Matthews (Bridlington) asked whether in this first section of the brick sewer Mr. Winter did not find great difficulty in connecting the house drains. As regarded the bottom section and the reinforced concrete invert, he did not see the need for reinforced concrete in that position. He thought ordinary cement would have been quite sufficient. With regard to automatic flushing tanks, he had fourteen tanks going at Bridlington, and had experienced no difficulty with them. So far as the Water Committee were concerned, they relied entirely on the figures he gave them of the number of gallons used yearly in the tanks. They paid for the water used 6d. per 1,000 gallons, and the committee encouraged them to use the tanks as much as possible. At the height of the season they let the tanks go off twice a day on three days each week, and they found that very effective.

Mr. W. Harpur (Cardiff) said he had numerous flushing tanks at work—if he said 100 he would not be far wrong. There was a water meter attached to each tank, so there was no difficulty about measuring the quantity of water used. They could turn on the supply at any time it was desirable to do so, as fast as they needed it and as often as he thought necessary, and he found the tanks did an immense amount of good used in that way. They had not experienced the slightest trouble with them.

The President, in closing the discussion, remarked that it was from the results of wear and the actual conditions of old work that they learned very largely what to avoid and what to continue doing. The more they got from experience in actual working the better they would be enabled to carry out work in the future.

The vote of thanks was passed.

Mr. Winter expressed his thanks to those who had taken part in the discussion. As to the precise condition of the old brick sewer, as he had said, the bricks were of fairly good and sound quality. The defects were mainly in the jointing, very inferior mortar having been used. The chief defects were in the invert, where the joints were open, making them receptacles for filth, and they had settled in places, so it was a question of putting in a new invert of blue brick or dealing with it on the lines described in the paper. If he had adopted blue brick the invert would have been improved, but the cost would have been increased, and the general result would not have been so good as that he had obtained. With regard to laying the 15-in. pipe in the sewer, perhaps he had not made it sufficiently clear that two or three pipes were laid at a time and concreted as the testing was carried out. It would, of course, have been impossible to make the concrete good except as the pipes were laid. The reinforcement was of a slight character, stout steel wires placed in sections in the moulds as the concrete was manufactured. He thought the reinforcement was useful. The thickness was only 2 in., and the extra cost was small. He had no exact figures as to the comparative cost of flushing by motor vans and by tanks, but he was pleased with the result obtained from the tanks. The payment for water in London for this purpose was 6d. per 1,000 gallons. The connection of house drains where the pipe sewer was put into the brick sewer added to the cost, but they had no difficulty in the work.

(To be continued.)

ROAD MAINTENANCE IN WARWICKSHIRE.

COUNTY SURVEYOR'S ANNUAL REPORT.

In his report for the year 1911-12, Mr. John Willmot, county surveyor of Warwickshire, states that the total expenditure on roads directly maintained by the county council during that period has been £52,124. The full rate per mile for ordinary expenditure was £111·25, but, deducting the grant of £7,050 received from the Road Board, the figure is reduced to £100·6 per mile.

The length of roads remains at 457½ miles.

The average number of men employed full time on the roads was 202, the highest number employed during any one fortnight being 230, and the lowest 173. These figures have not been equalled in any previous year.

The cost of materials, including stone breaking, was £20,960, which is equal to about 41 per cent of the total cost of ordinary maintenance. The quantity of granite and other hard stone purchased, exclusive of pebbles, was 36,262 tons, the cost of which, including breaking, was £14,608, giving an average price of 8s. 1d. per ton. Slag and rubble, chiefly used for strengthening the foundation of the roads, amounted to 17,488 and 515 tons respectively, the average price of the former being 4s. 9½d., and that of the latter 3s. 5d. per ton. Over 300 tons of tarred material were used for patching purposes.

The quantity of stone and slag consolidated by the council's seven steam rollers was 37,918 tons, giving an average of 23 tons per day for each roller. Some 12,367 tons of material were consolidated by hired rollers, the average reached by each roller per day being the same as with the council's rollers.

A total area of 490,500 sq. yds. of road were remetalled during the year, the length dealt with being nearly 54 miles, and the average thickness of coating applied, including slag and rubble, of an average of 3·4 in. Surface tarring cost £3,926. The Taroads Syndicate covered 606,752 sq. yds., at a cost of £3,722, and the council 35,008 sq. yds., at an outlay of £204.

The work done by the Taroads Syndicate and the council's own men cost 1·47d. and 1·40d. per super. yard respectively. The total number of gallons of tar used was 124,986, and the area treated 641,760 super. yds. This gives an average of 1 gallon of tar to each 5·13 super. yds. of road. The work was principally carried out during May and June, and, for the most part, in very favourable weather. The result has, on the whole, been quite satisfactory, and has undoubtedly prolonged the life of the roads in many cases, and conduced to the comfort of the public.

Modern Traffic Conditions.—In a report presented at the last meeting of the Surrey County Council, the county surveyor, Mr. A. Dryland, reviewing the work of the past year, stated that the nett cost of the main roads would be about £80,410, an increase of only £24 upon the estimate. The annual census of traffic showed an increase of about 11½ per cent in self-propelled vehicles and a decrease of about 4 per cent in horse-drawn vehicles. Mr. Dryland added: "We are all impressed with the large cost of roads at the present day compared with the past, but relative cost can only be judged by a comparison of expenditure in conjunction with the work accomplished, which in the case of roads means traffic carried. It is unfortunate for that purpose that we have no records except in quite recent years. Were statistics available over a long period I think it is quite probable that the cost has only kept pace with increased use, and with the better surfaces of to-day it is quite possible that per ton per mile the traffic is now being carried at a cheaper rate than in the past when the expenditure on maintenance was very much less."

ARTIFICIAL SURF BATHS.

A MINIATURE INDOOR OCEAN.

Probably no feature of the International Hygiene Exposition held in Dresden last year attracted more general attention than the Undosa surf bath. During the five months of its operation it was visited by nearly half a million persons, and earned about £6,000, which more than covered the cost of construction (£4,000) and the operating expenses (about £1,400). Half this construction cost, however, was due to the contribution of many parts of the equipment by exhibitors, and the site cost nothing. The receipts from the sale of bath tickets, and especially of spectators' tickets, amounted sometimes to £90 in a single day, while the cost of operation was only about £8 per day. The additional outlay for the wave-producing apparatus is said not to exceed £1,400.

The mechanical device by which the waves are produced is very simple in principle. It consists essentially of one or more hollow wedge-shaped bodies made of sheet iron, which are rythmically immersed in and drawn out of the water by appropriate machinery. In situations in which the vertical elevation and depression of the wedges present difficulties the waves may be generated by oscillating vanes, but the operation is always so conducted that the water which rushes in to fill the void produced by the elevation of the wedge or the retraction of the vane passes the point of equilibrium and is heaped up by the return swing of the vane or the immersion of the wedge. The wave-forming action, therefore, is identical in principle with that of a stone thrown into a pond. If the stone falls close to the bank, so that the water can escape in only one direction, the height of the resultant waves is increased.

In designing the artificial surf bath at the Dresden Exposition, steam was chosen as the motive power, in order that the water of the bath (which was constructed by Herr Recknagel) and the air of the bath-house might be heated by the exhaust steam, for the purpose a locomotive boiler of 100-horse power being installed in the bath-house.

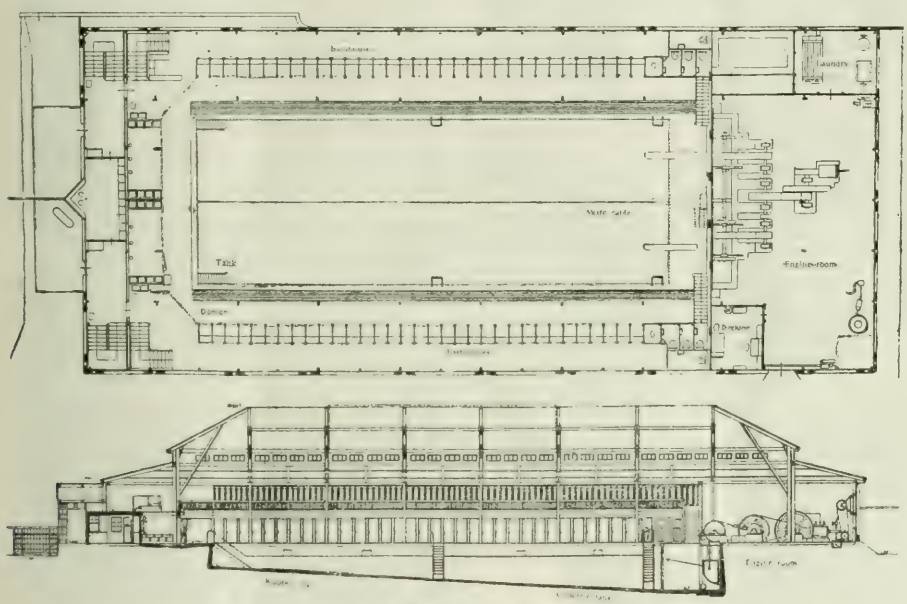
The wave-generating plungers were suspended from cranks attached to a shaft extending across one end of the swimming tank, which was about 40 ft. wide and 115 ft. long. This shaft could be connected by belt wheels and clutches near its ends, with a counter-shaft, at the middle of which was a wheel driven by a belt from the engine shaft. The gearing was constructed to immerse the plungers eighteen times per minute when the engine was running at its normal rate of 125 revolutions per minute. The bottom of the basin was inclined in the usual manner, and the plungers were placed at its lower end, where the depth of water was about 7 ft. The waves generated at this end of the basin were more than 3 ft. in height, and as they moved toward the other end and reached a point where the depth of water was less than their height they began to comb and break, and thus produced a very good imitation of the surf of a natural sea beach.

The arrangement of the plungers or vanes, and the character of the impulse impressed upon the water, can be varied in divers ways. Where space is limited, for example, a plunger could be attached directly to the piston-rod of a vertical engine placed above it, as in one form of steam-hammer. Plungers could be operated in the middle of a long basin so as to send waves towards both ends. The two parts of such a basin, divided by the machinery and a screen, could be used as separate baths for men and for women.

The height of the waves is conditioned by the volume of water displaced, and it can be varied within wide limits by varying either the travel of the plungers or the depth of water. For artificial basins the best practical method consists in varying the travel and distributing several plungers across the deep end of the basin. With three plungers constructed to be operated separately a great diversity of wave motion can be produced by using one plunger, two, or all three. If the three plungers, properly distributed, are operated together and synchronously, the whole basin is filled with regular waves of uniform height; while if even one plunger remains idle, the waves generated by the others spread into the calm water in front of it, and thus lose force and height as they approach the farther end. By accelerating or retarding individual plungers it is possible, as observation has shown, to produce a very complex wave pattern resembling that of the open sea.

Practically all of the conditions presented by a natural beach can be reproduced by doing away with the vertical wall at the shallow end of the basin and extending the inclined floor well beyond the water line. The difficult art of swimming in rough water can be practised at one end of the basin, while at the other end bathers can enjoy the breakers, the outrunners of which furnish safe amusement for small children. All of these persons may derive benefit from the massage effected by the moving water.

The diagram and description (abbreviated) are taken from *Scientific American* of July 27th last.



The Undosa Surf Bath.

(The upper diagram shows the plan of the building, comprising dressing rooms for men and women, bath 40 ft. by 115 ft., laundry, engine room, superintendent's office and wire rope. In the longitudinal section is shown a canvas roof, which is opened by rolling up.)

Royal Sanitary Institute Congress at York.

THE CONFERENCE OF ENGINEERS AND SURVEYORS.

At the conference of municipal engineers and surveyors held in connection with the recent annual congress of the Royal Sanitary Institute at York, the following paper was submitted for consideration:—

HOUSING AND TOWN PLANNING PROGRESS.

By H. Gilbert Whyatt, Assoc.M.Inst.C.E.,
Borough Engineer and Surveyor, Grimsby.

The Housing, Town Planning, &c., Act, 1909, received the Royal Assent on December 3, 1909, and has now been in force 2½ years; but not until the Local Government Board published their code of Regulations under the Act, on May 3, 1910, could any progress be made.

The Regulations at first reading appeared to be unnecessarily complicated, and seemed to require in the earlier stages a large amount of work which might with some advantage be postponed to a later stage; they also made no provision for the case where the local authority prepared the scheme and the landowner was in entire agreement with the proposals and needed no compulsion in the matter. The Regulations, however, included one to the effect that the Local Government Board might suspend any of their requirements, and the test of time has shown that the Regulations are not so unworkable and formidable as they at first sight appeared to be. A White Paper was laid before the House of Commons in November, 1911, showing the then position of town planning in seventy towns, urban or rural districts, and the present writer has been favoured with a letter from the Comptroller of the Housing and Town Planning department of the Local Government Board, showing the further advance from the date of that Memorandum to the end of May. The following shows what further progress has been made:—

	Schemes finally made and submitted.		
	At Nov. 1, 1911.	At May 31, 1912	At July 31, 1912.
Authority given for the preparation of schemes	8 schemes by 7 local authorities	14 schemes by 11 local authorities	14 schemes by 12 local authorities
Applications for authority	2	7 schemes by 6 local authorities	7 schemes by 6 local authorities
Local authorities which have taken the first steps and have served the necessary notices	11	13	13
Authorities which have schemes under consideration	22	31	32
Authorities which are in touch with the Local Government Board in the matter	28	36	44

Since the promulgation of the Regulations under the Act in May, 1910, many conferences have been held and many papers have been read before various learned societies and professional associations; the present writer has been privileged to attend several of them, and the outstanding feature has been the remarkable difference in local circumstances. The area to be dealt with may be purely agricultural land worth £50 or less per acre, or it may be ripe for building purposes and worth £500 per acre before the roads are made, and from £800 to £1 250 per acre afterwards, or at any intervening price. The area may be one where the roads are already arranged or even partly constructed, the scheme being required to preserve the amenities of the district and prevent the erection of factories alongside already occupied villas; or it may be one where the roads are not constructed nor even set out, and the landowner unable to deal with the financial part of the work without outside assistance. The area may be one where the landowner is willing to have the number of houses limited to eight, or ten, or twelve per acre; or it may be one where the lower working class is to be housed at a rental of 4s. or 5s. per week, and the number of houses per acre has to be fixed by considering the builder, his outlay, and leave the margin required by the landlord to cover ground rent and road making. It is seldom that small houses must be allowed, otherwise two or three families will inevitably arrange to occupy one house, and the interior of the house will be a slum, while the exterior is everything that could be desired in a garden city.)

From the point of view of a local authority (which includes the departments of the medical officer of health and the surveyor), as well as that of the ratepayer, town planning is in theory the only thing; there is no alternative. But if, after laying down a scheme, the land is not taken by builders and covered with model houses the landowner is injured, and houses are erected on other estates with less salubrious surroundings, all the labour expended in preparing the scheme being thrown away. From the point of view of the builder, the investor, and the landowner, the whole question is one of finance, and for any great progress to be made the question of finance must be carefully considered.

Where land is worth £50 per acre, a ground rent of less than 1d. per yard per annum will cover both the value of the land and the cost of street making; and at this there is no difficulty either in keeping the number of houses per acre down to ten or twelve, or in providing a decent sized piece of land even for the smallest type of house. Where land is worth £500 or more per acre the ground rent will need to exceed 2d. per yard per annum to cover both the value of the land and the cost of street making on Model By-law lines. Therefore, to bring the estate within reach of the working man, either a larger number of houses per acre must be allowed or there must be some relaxation of the Model By-laws as to streets and buildings, a power which is specially provided by sec. 55 in conjunction with the fourth schedule of the Act. At any intermediate price between £50 and £500 per acre, the problem varies in ratio to the price plus the cost of street-making. It is for local authorities, when preparing town planning schemes, to consider what relaxations they can consent to in return for healthier surroundings and amenities.

First, then, with regard to streets. The Model By-laws generally prescribe that a street shall be 33 ft., 36 ft., 40 ft., or even 50 ft. in width under certain conditions, that the streets shall be properly sewered, made, kerbed, channelled, and flagged; the cost of which works out at from £2 to £3 per foot run, according to width and nature of materials. It was suggested at the Town Planning Conference held in London on April 24th last to divide the streets into two classes, according to traffic: (*a*) to construct main roads from 70 to 100 ft. in width, arranged and constructed to take all the traffic ever likely to come over them; and (*b*) to arrange the secondary roads so as to discourage or prohibit "through" traffic, to be only available for access to houses, and to be constructed accordingly very much narrower in width, less substantial in construction, and possibly not provided with either kerbs or channels, the footpaths being provided with only one row of flags instead of being flagged the whole of their width. In the discussion which follows this paper it is desired to elicit opinions on the foregoing suggestion, and as to what is the minimum construction that should be allowed; also the liabilities that may devolve upon future generations of ratepayers if any portions of the street (kerbs, channels, or footpaths) are not now constructed.

Secondly, with regard to buildings. The Model By-laws with regard to buildings are not very onerous, except with regard to brickwork; and this is not so much in London as it is in the Northern and Midland counties, where bricks are so much better in quality than in the Metropolis. The carrying of party walls through the roof is quite unnecessary for two-storeyed houses; a 9-in. wall might be allowed 30 ft. or 32 ft. high instead of only 25 ft.; the 18-in. open channel between the slopstone pipe and the gulley might be dispensed with; but with the exception of these there is not much to complain of, and it is difficult to see what relaxations can be allowed in the Model code. It is certain that the erection of small houses as detached or semi-detached villas adds to the cost in many ways, there is an extra gable wall,

with its foundations and slating; an extra footpath alongside the gable; an extra length of front and back and party fence, and other items. On this point it is desired also to elicit opinions as to what economies in building may be made and what relaxation of by-laws should be allowed.

It may be pointed out that if there are no relaxations of by-laws, and if landowners will agree to lay out their estates on town planning lines, providing wider streets for "through" traffic, and allocating a portion of the estate for park or recreation ground purposes (either by gift or sale to the local authority), there will be no need to lay the scheme before the Local Government Board, and many valuable months will be saved, in addition to an enormous amount of office work.

Finally, it must be remembered that the dreams of the idealist must be transmuted by the alchemy of common sense into something practical before they can serve as a basis for town planning and the laying out of garden cities.

DISCUSSION OF MR. WHYATT'S PAPER.

Mr. F. W. Spurr (York), in a communication on the subject of the paper, said he had found that Mr. Whyatt had touched on a subject which must concern every surveyor and municipal authority exercising the powers of the Town Planning Act. For that reason the paper before the conference must be very valuable. He felt quite sure that economies could be brought about in street construction, varying in amount with the particular form of construction now adopted. In York the method of private street construction consisted of laying the footways with 3-in. Yorkshire flags, 12-in. by 8-in. kerb-paved channels, 14 in. wide, while the carriageway was constructed of either 9-in. stone pitching or 6-in. concrete finished with 3-in. tar-macadam the full width between channels. By adopting the following method of construction a saving of about 30 per cent could be made, and he might say the corporation agreed to that amended method of construction, provided the width of the street was not less than 42 ft. and the distance between the houses themselves 62 ft. Footways were constructed of tar paving composed of limestone chippings in place of 3-in. Yorkshire flags, 10-in. by 3-in. kerb in place of 12-in. by 8-in., channels 8 in. wide in place of 14-in. channels. With regard to the carriageways in residential streets, he did not advocate any alteration in the form of construction beyond reducing their width to about 16 ft., the remaining width being grassed and planted. With regard to economies in cottage construction, he did not think much could be done in York unless some other form of construction were adopted, but there could be no doubt that to build at the least possible cost, cottages must be erected in blocks of not less than six. Some saving in cost could be effected where by-laws provided for carrying the party walls through the roof, a precaution which he thought was unnecessary, and something might also be saved by an alteration in the thickness of walls for two-storey cottages, as suggested by the author.

Mr. T. Moulding (Exeter) said that, generally, he quite agreed with Mr. Spurr's observations. The standard in Exeter was not as high as that of York in the matter of building construction. In certain streets where there was not much traffic they allowed gravel footpaths. They were rolled and tar painted, and lasted a considerable time, besides which they were cheap to renovate. In the carriageway it would be a good thing if they could get landowners to put 6 in. of concrete, having regard to future upkeep, but it was rather a great deal to expect. They accepted the roads with the ordinary foundations. He thought that the cost of houses could be cheapened if the outbuildings could be built as suggested by Mr. Whyatt, and in Exeter the by-laws with regard to that matter were modified.

Mr. E. R. Matthews (Bridlington) said he quite agreed with Mr. Whyatt that local circumstances differed so considerably that what might be effectual in one would be impossible in another district. His own district was a residential one, and he had been contemplating how it differed from, say, a manufacturing city, where the town planning area was a purely industrial one. Therefore it was incumbent on surveyors to make the best of the district each had to deal with, and not be guided too much by what was being done in other towns. He did not agree that because a house was occupied by two or three families the interior was a slum. At Doncaster quite recently a housing scheme was submitted to the Local Government Board, and at the inquiry it was elicited that the tenants for whom the houses were intended had previously been paying 3s. and 3s. 6d. weekly. On it being stated that the rents which it was proposed to charge for the new buildings was 5s., the inspector said he could not recommend the board to approve that, and that fresh plans must be drawn up for houses to be let in tenements to two families at rents of 3s. a week. He saw no reason why persons inhabiting half a house should not be inclined to keep it in as sanitary a condition as if he occupied the whole house. He certainly thought that in town planning schemes any roads which were not "through" roads might be of somewhat less width than others—say, 30 ft. He did not agree with a suggestion made at the Manchester town planning conference that such thoroughfares might be of light construction, for there was always the risk of heavy traffic going on to them.

Mr. J. S. Munce (Belfast) said at every congress of the Royal Sanitary Institute that he had attended he tried to convince English engineers of the superiority of Irish practice in regard to the acquisition of land for building purposes. In Ireland they took the land on lease, and did not buy it outright, the period of the lease being up to as long as 9,999 years, less one day. (Laughter.) Land was taken over and laid out, and afterwards leased at a rent varying from 3s. to 4s. per foot frontage to the street, and as the houses were from about 13-ft. frontage the ground rent varied from 39s. to 52s. per annum. When the land was covered with houses the ground rents were sold at from 14 or 15 to as many as 20 years' purchase. Instead of grass plots along a street, it was, in his opinion, far better to provide open spaces. He was more convinced the longer he lived that the best thing to do was to spread out a town and bring the people into the centre to the factories by tramcars, even if they were obliged to run the tramcars free.

Mr. R. W. Cass (Farnham) said he considered there were many illusions with regard to housing, and one of these was that houses, great or small, should always front on a street. He did not think that was essential, particularly in the case of cottages, for it resulted in houses being placed back to back, and enormously increased the cost of roads. He had a plan for the erection of twenty houses on two acres of ground, and he found by making a very short street and a little square the cost would be greatly reduced. It was a mistake to crowd houses on a frontage; rather scatter them about and turn them to the sun as much as possible, and the result, he was certain, would be a much more economical and healthy plan. With regard to roads, he admitted that the carriageways should be decently made, but he had been impressed with the waste in the matter of kerbs. He knew of streets in suburban districts where nothing heavier than a furniture van went down in which 10-in. by 12-in. kerbs were laid, and, taken from an æsthetic or municipal engineering point of view, he contended that this was altogether uncalled for.

Mr. Munce said he would like to add that his view was that £150 for a working man's house was absurd. They could build a first-class house for £100 if they went the right way to work.

Mr. Whyatt, in replying upon the discussion, said it might be possible to build a house for £100 in Ireland, but not in England. The smallest house of which he knew—with two rooms up and two rooms down—could not be built for much under £140 here, and if they arranged for three rooms upstairs, as was certainly necessary, the cost would be between £160 and £170 at least. Personally, he was rather inclined to think that a 3-ft. strip between the road paving and the footpath was a mistake, as coal and milk carts would draw on to it, and in the course of a few years it would become an ugly, grassless strip, and a nuisance to everyone; moreover, it would have to be made up at the expense of the ratepayers instead of the estate owner. He agreed with Mr. Cass that it was not necessary for every cottage to face a street, but if they were going to build cottages in pairs, or singly, the cost of the gable walls and the extra fencing had to be added, and the capital cost was increased. With regard to Mr. Matthews' remarks, it was true that in theory the occupation of a single house by two or three families did not make it a slum, but he knew that in practice the tendency was in that direction.

ENGINEERING AND ARCHITECTURE SECTION.

Mr. J. Walker Smith, M.Inst.C.E., chief engineering inspector, Local Government Board, Scotland, occupied the chair in the Engineering and Architecture Section of the congress, and at the opening sitting delivered the following

PRESIDENTIAL ADDRESS.

In many of their works the respective provinces of the engineer and the architect are clearly defined and well separated; in many respects they are tangential and in some they overlap, or at least have their interests so interwoven that it becomes highly desirable that they should co-operate upon lines and in circumstances of mutual agreement and understanding. In affairs of the last class there falls one of the greatest importance in the work that arises from the operation of the Housing and Town Planning Act of 1909. I do not know of any sphere where co-operation of the two great professions can be more profitably effected, and where the results of such co-operation will yield greater beneficial results.

It must have been a source of satisfaction to all who have at heart the advancement of the science and art of city development that the British Government should have appointed a commission of engineers and architects to co-operate and collaborate in planning the city of Delhi. This is an example which I feel may, with very great profit and advantage, form a precedent for the future.

This work of town planning, of which we have such excellent examples in our country, and the absence of which, too, is exemplified in many deplorable instances, will need and will receive careful consideration from those of the engineering and architectural professions who feel drawn to specialise upon it.

THE WORK OF MUNICIPAL ENGINEERS.

In many cases the lines of town development will, as has been the practice in the past, rest with the estate owners and the municipal engineer and surveyor. No one has a greater appreciation than I of the qualifications, the assiduity and the earnestness of the municipal engineer. He has, with the limited powers and resources at his disposal, done most excellent work, and striven strenuously in the past in the interests of satisfactory and creditable town development. No one appreciates better than I the enormous scope of his duties, and the great amount of routine and administrative work which falls to his lot. The municipal engineer will continue his good work, and will ever remain an active figure in determining the lines of development of his district; but I feel satisfied that no engineers and architects need thereby be deterred from specialising in this work, for if they, untrammelled by much important routine and administrative work, are capable of assisting in the great work of town development upon lines of amenity, convenience, and improvement in the sanitary conditions, the broad-mindedness and public spirit of the municipal engineer will lead him to gladly accept and welcome such co-operation. I therefore look forward to considerable development in this direction, wherein the engineer and architect will play an important part.

There is already great public interest in the question of housing and town planning, and it is a little surprising that it is not even greater, for it should form common ground and a common interest for so many. . . . Better housing conditions, which will bring in its train a brighter home life and a better standard of life, is a step in the direction in which all desire to move who have at heart the improvement in the condition of mankind.

The movement beneficially affects both the well-to-do and those less favoured by fortune. The well-to-do are perhaps sufficiently housed themselves, but town planning will affect them, as it will provide for a town development upon lines that make for improved sanitary conditions and amenity, and will induce the wealthy and prosperous citizen to reside in his town, to take his share in the assessments, in the management, charities, social work, and administration of his town. A community often suffers much from the exodus of its prosperous and capable citizens, of whose assistance and support it is thus in great measure bereft. The thrifty and fairly paid workman in regular employment will appreciate better housing and a better standard of life. The thriftless, but well-paid (and there are many such), who does not appreciate the idea of improved housing and of a higher standard of life must be educated to appreciate and *demand* the better housing and better conditions of life for which he can already afford to pay. Then follows the class, all too large, whom it is difficult efficiently to house. It includes those whose employment is casual, whose wages are small, whose physique is indifferent or bad, whose mental and moral condition leaves much to be desired.

This class may need careful selecting and segregation, as one solution will not be found for conditions which are so complex and so difficult to fully appreciate as those which govern this problem. It is possible that some may be trained and fitted for some other sphere of life, where better opportunities await them; others, again, on account of some mental or physical defect, may never be able to fight their own battle in life, and will need consideration upon special lines. But most of them will be required, and must remain where they are, in the centres of industry, and should therefore be provided with better housing conditions (and be educated to an appreciation of them), where they may lead a brighter life, and where they may bring up happier and healthier children. So far—and it is considerable—as engineers and architects are able to assist in the solution of this great and complex problem, they will use their skill in a good cause and earn the gratitude of all right thinking men.

I am a little afraid that in discussing, even so generally as I have, this question of housing and town planning, I may have encroached upon the province of some other section of this conference. But I am satisfied that in this work there is room for the manifest and active interest of all; all may take a hand in this great movement; and to none can we look for greater assistance in the satisfactory town planning of cities and the efficient housing of all classes than to those who are drawn to this section of the conference.

RURAL HOUSING.

We shall come face to face with the housing aspect of this problem in the set subject for discussion of our section—*viz.*, "Modification of the Model By-laws from the Rural Point of View," which will be opened by Mr. Halsey Ricardo, whose knowledge of this subject is well known.

There is no doubt that the problem of rural housing is becoming particularly acute, and that all unnecessary restrictions must be removed, and all possible facilities rendered to enable efficient and sanitary housing conditions to be provided in our rural districts. New legislation is also thought to be called for by the importance of housing conditions upon the industrial unrest. It is urged, as I understand it, that by-laws operating in England framed under sec. 157, Public Health Act, 1875, are too stringent and too rigid. It is quite probable that this may be the case, for while too easy departure from carefully conceived by-laws is to be deprecated, it is obvious that by-laws which may be quite justifiable and desirable in a manufacturing burgh, where there is a great intensity of building of the tenement type, may be unreasonable and unnecessary in a residential or agricultural village, sparsely populated with cottages detached or arranged in short blocks.

There is already power given under sec. 44 of the Housing and Town Planning Act of 1909 to revoke unreasonable by-laws in connection with the erection of dwellings for the working classes. There is also given to local authorities under sec. 55 (2) of the same Act somewhat drastic suspensory powers in connection with by-laws where the local authority prepares or adopts a town planning scheme. This power may be of very great use, but in order that it may be made available it is necessary that a town planning scheme be prepared and approved, when the suspension of by-laws would form part, and would be shown to be in the circumstances, and having regard to the general scheme, reasonable and desirable.

In circumstances such as these there is permitted the full consideration of special conditions and local circumstances which would be denied with by-laws of rigid application.

SCOTTISH POWERS.

Some might think that suspensory powers might be granted without the necessity of preparing a town planning scheme, while others would apprehend thereby confusion and resulting detriment to the public health and safety. In Scotland, between densely crowded cities and vast uncultivated tracts of deer

The Surveyor

And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
Appointments Vacant	251
Artificial Surf Baths	237
Assistants' and Students' Section	242
Belper Rural District	243
Breaking Tests of Concrete Slabs for Road Bridge Floors under Rolling Load	245
Clarification of Sewage	249
Conversion of Old Sewers into New	225, 233
Correspondence	245
Housing and By-Laws	227
Housing and Town Planning Progress	227, 238
Institution of Municipal and County Engineers.—	
Annual General Meeting in London	233
Notices	251
Institution of Municipal Engineers	251
Local Government Board Inquiries	244
Maintenance, Flushing and Cleansing of Sewers	225, 233
Meetings	254
Municipal Competitions Open	252
Municipal Contracts Open	252
Municipal Tramways Association	250
Municipal Work in Progress and Projected	246
Municipal Work in the City of London	243
Personal	248
Road Maintenance in Warwickshire	236
Road Reform	225
Royal Sanitary Institute Congress at York.—	
Conference of Engineers and Surveyors	227, 238
Engineering and Architecture Section	227, 240
Sanitation in Small Urban Districts	227
Sewage Pollution of River Mud	241
Stockport Sewage Works	242
Tenders for Municipal Works or Supplies	254
Third International Road Congress	245
Water Supply of Madras City	226, 238

forest and grouse moor, there is a large range of conditions which would obviously render one, or even two, sets of by-laws insufficient. The larger cities in Scotland, as a matter of fact, operate under powers obtained in special Acts of Parliament.

The Scottish counties, in most cases divided for public health purposes into districts, are empowered under the Public Health (Scotland) Act, 1897, to make by-laws, subject to confirmation by the Local Government Board (Scotland). These are, where existing, less detailed in character than the building rules relating to burghs. In certain respects, the powers of the District Committee in relation to streets and buildings might, with advantage, be extended. The burghs of Scotland are regulated as for streets and buildings by the Burgh Police Acts, 1902 and 1903. Most of the burghs have no by-laws, but rely upon the building rules contained in Schedule IV. of the 1892 Act, and upon secs. 146 1 3 (subject to such modifications thereof as may be introduced by the 1903 Acts).

The Act of 1903, under Part II., which is adoptive, gives powers to burghs to make by-laws in considerable extension of the powers contained under the 1892 Act, but only about two burghs in Scotland have availed themselves of this provision. Under sec. 30 of the Burgh Police Act, 1903, which is of general application, and not adoptive, the Dean of Guild Court is empowered, with the approval of town councils, and upon report by the medical officer of health and the burgh surveyor that adequate provision is made for light and ventilation, "relax or modify all or any of the provisions of the Burgh Police Act with regard to laying out of streets, erection or alteration of buildings, open spaces adjoining buildings, &c. . . . if the Court are satisfied that there are exceptional circumstances justifying such relaxation or modification."

It may perhaps be explained that a Dean of Guild Court is the authority in Scotland for dealing with building plans, very much as they are dealt with by the competent committee of an English town council. To burghs which had no Dean of Guild Courts at the time of the passing of the Burgh Police Act, 1892, power is given by that Act to set up such courts, which shall then consist of the Dean of Guild and two other members of the town council. The composition of the Court varies somewhat in other burghs, but in Edinburgh it consists of the Dean of Guild, appointed by the Guildry, and ten members appointed yearly by the magistrates and council, five of the members being councillors, and the other five registered electors of the city other than town councillors, of whom three must be civil engineers, architects, surveyors, or master builders. Their functions exceed those of an English committee, principally inasmuch as they deal, not only with practical questions such as relate to engineering, architectural, and building operations, which involve questions of fact, but to some extent also deal with questions of law, which relate to possessionary rights.

I merely mention the composition of this Court and their functions in connection with the power under the Burgh Police Act to relax or modify building rules, as it may be considered that some such composition as that of the Edinburgh Court would find general acceptance for the body in England that might be charged with the power and duty of suspending or modifying by-laws upon good cause being shown therefor.

(To be continued.)

SEWAGE POLLUTION OF RIVER MUD.*

By E. L. Dove, M.B., D.P.H.

It has come to my knowledge that in several cases before the Courts the results of the chemical and bacteriological examinations of mud taken from a watercourse have been adduced as evidence in support of the pollution of the stream by sewage. As it is therefore suggested that it is of practical value to make such examinations, I have recently made efforts to ascertain to what extent this evidence is useful and reliable. With this object in view I have examined many samples of mud, collected from sources where human sewage contamination was out of the question, both before and after sewage matter had been allowed to stand upon the mud for several days.

The results warrant the conclusion that chemical and bacteriological examinations conducted on the lines followed in water examinations both fail to furnish any reliable evidence of contamination even after the mud has been exposed to considerable sewage pollution; and unless the pollution is gross, the only reliable evidence of such contamination appears to be the discovery, where possible, by a microscopic examination of certain objects which are significant of sewage contamination. Indeed, my experiments corroborate the following statement which appears in Kenwood's "Public Health Laboratory Work":—

"An examination of the bed of a waterway or pond may serve to furnish corroborative evidence of the sewage contamination of the water. Of such contamination there is little or no reliable indication by chemical analyses, but a low-power microscopical examination and a bacteriological examination may furnish a clue to a gross contamination. If any parts of the bed are covered with gravel or large stones which are not clean, and especially if the greyish flocculent growths characteristic of certain sewage fungi are found to be attached to them or to any other parts of the bed, and if the mud is of a dark colour and emits gas bubbles and offensive odour on being disturbed, then there are good reasons for suspecting gross sewage contamination. It is common in these circumstances to find some opalescent floating bubbles, which have but little tendency to burst, on parts of the overlying water. Although the organic matter in pond and river mud will be found on an ordinary microscopical examination to be largely in the form of unrecognisable *débris*, with only a relatively small (but variable) quantity of the vegetable structure of plant life distinguishable, such objects as a textile fibre or animal hair, &c., would indicate animal contamination."

Road Board Finance.—The abstract of the accounts of the Road Improvement Fund for the year ending March 31st was issued on Wednesday. It shows that during the year £1,209,859 was received from the Consolidated Fund in respect of the proceeds of motor spirit duties and carriage licences. The principal items on the expenditure side are: £244,038 in grants for improvements of roads, £24,823 in loans for improvements of roads, £1,800 in grants for construction of new roads, and £6,663 for salaries and allowances. The fund has no less than £3,202,523 invested. Its loans for improvements of roads, as distinct from grants, amounted to £24,823.

* Extracts from article in Journal of the Royal Sanitary Institute for August.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

264. Concrete Beam.—A concrete beam reinforced with steel rods is to be designed to carry a distributed load of 20 tons. The span is 15 ft. Show by calculations what size of beam you would use—the method and formulæ to be as simple and short as possible. ("Greenland Farm.")

266. Surveying.—Describe in detail the operation of measuring a horizontal angle with a theodolite. ("Surveyor.")

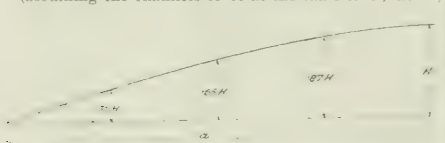
267. Road Making.—Will some reader kindly give the heads of a specification for the conversion of a macadamised into a wood paved road? ("Inquirer.")

268. Text-books.—In what text-books can information be found in regard to (1) Theory of earth pressure suitable for reinforced concrete design; (2) Theory of elastic bridges; (3) Methods of taking float observations to ascertain the probable effect of tides on sewage discharged at different positions along shore? (R. W. T., *Gosport.*)

REPLIES TO QUESTIONS.

262. Wood Paving.—What contour should be given to a wood-paved (soft wood) road 60 ft. in width? Describe the best method to adopt in fixing the screeds. (A. B.)

Undoubtedly the best cross section to adopt for a wood-paved road is the one recommended by Mr. G. F. Deacon in a paper read before the Institution of Civil Engineers, session 1878-9. This section is now in very general use, and is as shown on the sketch appended. Taking the height at the mid width (assuming the channels to be at the same level) as H,



the heights above the channel at the $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ of the half-section are .65H, .65H and .87H.

The H for wood-paved streets is usually taken as $\frac{a}{30}$ to $\frac{a}{15}$ according to circumstances, the former being adopted when little longitudinal fall can be obtained.

The best method of laying down the screeds is to divide the half-section into four equal divisions, drive in steel pins at these points and mark on them the contour heights. Battens about 3 in. by $\frac{1}{4}$ in. are then embedded in cement mortar to these levels, care being taken that the curve is neatly maintained between the pins. After the screeds have become set the floating is proceeded with, the wood battens subsequently removed and the floating made good. (H. F. W., *Tottenham.*)

265. Strength of Shafting.—A 10-in. shaft has a 4-in. hole run through it. what fraction of its weight is removed? To what extent is its strength in resisting torsion affected?

Weight of hollow shaft as compared with solid shaft of same diameter.

Weight of 10 in. diameter solid shaft $= \pi r^2 lw$

Weight of 10 in. diameter hollow shaft with 4 in. diameter hole $= \pi r^2 lw - \pi r_1^2 lw$

Where r = radius of outside in inches

r_1 = radius of hole in inches

w = weight per cubic inches

Now as all of the formula with the exception of r are constant, the weight varies as the square of the radius—*i.e.*, as $5 \times 5 : 2 \times 2$, 25 to 4, or 16 per cent.

Therefore weight of a hollow shaft 10 in. diameter with 4 in. hole is only 84 per cent of the weight of a solid 10 in. diameter shaft.

The strength of shafting varies as the cubes of the diameters (for solid shafts.)

Hence strength of 10 in. diameter solid shaft is $10 \times 10 \times 10 = 1{,}000$.

Strength of hollow shaft.

$$d_1^3 = \frac{D^4 - d^4}{D}.$$ where D = 9's diameter, d = diameter of hole, and d_1 = diameter of solid shaft of equal strength

$$= \frac{10^4 - 4^4}{10} = \frac{10{,}000 - 256}{10} = \frac{9{,}744}{10} = 9744$$

$$d_1 = \sqrt[3]{9744} = 9{\cdot}91 \text{ inches.}$$

Now as strength varies as the cubes of the diameter our hollow shaft is $\frac{9{,}744}{10{,}000}$ as strong as a solid one, or is 97·44 per cent as strong as solid one.

A hollow shaft with a hole $\frac{4}{10}$ of its diameter and equal in strength to a 10 in. diameter solid shaft would be

$$d_1 = \sqrt[3]{\frac{10^3}{1 - \cdot 4^4}} = 10{\cdot}09 \text{ in. diameter.}$$

(E. W., *Gilwern.*)

STOCKPORT SEWAGE WORKS.

PROPOSED EXTENSIONS.

A scheme for the extension of the Stockport sewage works is being considered by the Corporation Sewage Outfall Committee.

In a report issued by Mr. A. W. Ward, the deputy borough surveyor, it is stated that the daily dry-weather flow of sewage reaching the outfall works is 5,000,000 gallons, as against 2¾ millions in 1902, the increase in a large measure being due to the extension of the borough. Of the 5,000,000 gallons, about 1,500,000 consist of trade waste. The following is the estimated cost of the new works and materials: Separating chamber on high-level sewer, £420; detritus, equalising and precipitation tanks in reinforced concrete, £12,000; 30-in. duplicate feed pipes to filters, £2,475; percolating filters (including £16,625 for new clinkers), £39,800; humus tanks, £3,955; sludge main, &c., from humus tanks, £510; storm-water tanks (additional works) and feed from separating chamber, £1,440; sheet piling the river bank at Butty Warth for tipping purposes, say, £400; total, £61,000.

At a meeting of the town council Alderman Sharples, the chairman of the committee, referring to Mr. Ward's engagement as engineer of the scheme, said the committee had come to the conclusion that Mr. Ward was sound in his advice, practical in the application of it, and was careful as to the expenditure. The services he had rendered to the committee were of an exceptional character, and would be advantageous to the corporation. Alderman Sharples added that he did not think they could do better by seeking outside advice, and the committee were quite satisfied that nothing they had seen or knew of could be an improvement on the scheme proposed.

London County Council Finances.—An abstract of the receipts and expenditure of the London County Council for the ten years ended March 31, 1911, has been issued at the price of 6d. Condensation and rearrangement have resulted in considerably diminishing the size of the publication, but will, no doubt, add materially to its usefulness.

MUNICIPAL WORK IN THE CITY OF LONDON.

CHIEF ENGINEER'S REPORT.

In his report for the year 1911, Mr. Frank Summer, M.Inst.C.E., chief engineer to the Corporation of the City of London, mentions that, with a view to minimising as far as possible any inconvenience that may be caused by carrying out maintenance repairs to pavements in important thoroughfares, instructions were given for experiments to be made by commencing such works at night and continuing them until completed, and for the purpose of ascertaining the actual additional cost incurred, the carriageways of Fleet-street, Ludgate-circus and Ludgate-hill were selected for the trials, which will extend over a period of two years. The various contractors were approached with a view to ascertaining what additional cost this would entail, and the prices they submitted varied from 30 per cent to 50 per cent upon those at present obtaining, which, in the case of main streets, will mean an expenditure of about £6,000 per annum.

EXPERIMENTAL PAVEMENT.

The British Cork Asphalt, Limited, were permitted during the year to lay a specimen of "Corkite" in the footway on the east side of Wood-street (between Love-lane and Little Love-lane) to the extent of about 50 yds. super., on the usual terms and conditions relating to experimental pavements, but it has not been down long enough for the city engineer to speak as to its wearing or other qualities.

STREET LIGHTING.

The lighting of most of the main thoroughfares by arc lamps was continued throughout the year. The number of the original type "open" electric lamps in lighting at the end of the year, at a cost of £26 each, was 332, being a decrease of two. In addition to this number there were 92 "Oliver" and "Excello" flame arcs and 46 metallic filament lamps in lighting during the year. The number of defective electric lamps reported was 81. In addition, there were 21 experimental arc lamps and 46 experimental metallic filament lamps, making a total of 470 electric lamps.

The number of gas lamps (including experimental lamps) paid for by the public health department of the corporation at the end of the year was 2,648, being a decrease of 11 on the previous year. High-pressure gas lighting in Fleet-street was satisfactorily maintained throughout the year. No stoppages occurred, and only a few defective lights were observed. There are (including experimental lighting) 113 other high-pressure "Keith" gas lamps in the City thoroughfares, making 130 in all. The number of low-pressure gas lamps at the end of the year was 2,518, principally consuming 4½ cub. ft. of gas per hour each, the illuminating power being from 60 to 70 candles. When possible, the lamps are fixed on brackets, about 60 ft. to 70 ft. apart on the diagonal, at a height of about 12 ft. from the pavement level to the burner, the cost of each lamp with gas at 2s. 2d. being £3 5s. 7d. per annum, including maintenance of mantles, &c., but not capital charges.

The present cost of lighting the streets of the City with gas is £10,099, and by electricity £10,774, making together an annual charge of £20,873. The corporation, however, have recently made an arrangement with the Gas Light and Coke Company and the City of London Electric Lighting Company for lighting the principal streets with centrally hung lamps in equal proportions, and this will effect an annual saving of £6,830, while an increase in illuminating power of about 600,000 candles will be obtained. In the case of the electric lighting company the corporation will have the option of purchasing the lamp standards, brackets, suspension gear and lamps at the price of £2,000 at the expiration of ten years, but in the case of the gas company the fittings will become the property of the corporation.

STREET CLEANSING AND REFUSE REMOVAL.

The quantity of water used during the year for washing and watering streets and courts was 73,761,668 gallons, the number of nights when it was used being 307. From June to September inclusive the gullies were disinfected at least once a week, and in many places a daily disinfection was carried out, while in the streets adjoining Billingsgate Market the gullies were usualy disinfected three times a day during the summer months.

The quantity of refuse removed during the year amounted to 50,470 cart-loads taken from premises, and 28,113 loads of sweepings and slop from the public ways, making a total of 78,583 loads, or about 262½ per working day during the six days of the week, there being no removal of dust or sweeping of the thoroughfares on Sundays or Bank Holidays.

UNDERGROUND CONVENIENCES.

No record is kept of the number of people using the City conveniences, but some idea of their utility may be gathered from the fact that £8,517 was received during the year under review for the use of the water-closets and lavatories. Free accommodation is provided at all the conveniences for women, and the question of increasing this is now under consideration. The total cost of the upkeep of the structures during the year was £9,910.

BELPER RURAL DISTRICT.

SURVEYOR'S ANNUAL REPORT.

The total cost of maintenance and improvements in connection with the 162 miles of highways in the Belper rural district amounted during the year ended March 31st last to £5,142, or £31 14s. 10¾d. per mile. The payments made from various sources to the credit of highways is £149, reducing the cost to £4,993 nett, or practically £30 16s. 6d. per mile. The estimated expenditure was £4,893, an excess of expenditure over estimate of £100. Included in the above, improvements to the value of £252 were carried out.

The following analysis of expenditure is given in the annual report of the surveyor, Mr. Robert C. Cordon: Manual labour, £1,633 10s. 8d. (31·764 per cent); team labour, £1,040 12s. 9d. (20·235 per cent); materials, £1,548 0s. 2d. (30·100 per cent); miscellaneous accounts, £564 1s. (10·968 per cent); salaries, £338 (6·572 per cent); establishment charges, £18 11s. 3d (·361 per cent); total, £5,142 15s. 10d. (100·000 per cent). The miscellaneous accounts include, among other things, for asphalting, surface-water culverts, drains, and repairs to steam roller.

The council's steam roller consolidated during the year 5,548 tons of stone, covering an area of 70,476 super. yds. of roadway, a daily average of 367 yds. rolled, with 29 tons of stone, each ton covering 12·70 super. yds. of road. The expenditure with the roller was £252, the cost per ton consolidated being 10·87d.

Mr. Cordon mentions in his report that serious consideration will require to be given to the question of a bridge over the river Derwent at Ford-lane, Allestree. At this point the river is nearly 100 ft. wide, and a bridge to carry ordinary traffic will cost approximately £2,000.

The special expenditure on various works of sewage disposal and other engineering works during the year amounted to £506. The scheme of drainage for Crich township, prepared by Mr. Cordon, and estimated to cost £10,250, has received the approval of the Local Government Board, and it is expected that the works will shortly be put in hand.

Enforcing Building By-Laws at Doncaster.—At Doncaster on Monday a property owner was summoned for two breaches of the corporation building by-laws. In the first case, the town clerk said the defendant had constructed a projection from an existing building without submitting plans. The corporation deemed the projection a new building. Defendant contended that all that had been done was to raise a boundary wall, and that was not a new building. The bench decided against the defendant, and inflicted a fine of £5 and costs. In the second case, the summons was for making an addition beyond the front main wall of a house, and the bench imposed a penalty of 5s. a day from August 5th so long as the erection remained.

A South Lincolnshire Water Supply Scheme.—The Local Government Board have sanctioned the purchase by Spalding Rural District Council of that portion of the undertaking of the South Lincolnshire Water Company within the Spalding Union. The works had been carried out by the South Lincolnshire Water Company as part of their scheme to supply the district from Spalding to Sutton Bridge, a distance of 17 miles, but they failed to complete the undertaking, and the matter came into the hands of a Receiver, who agreed to sell a portion of the works to the Spalding Rural District Council for £2,500. In sanctioning the purchase the Local Government Board make it a condition that the council will carry out an offer originally made to supply any surplus water in bulk at a fair price to the other authorities in the district.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Barnard Castle U.D.C. (July 30th. Mr. H. R. Hooper).—£2,971 for (*a*) works of sewerage in the Bridgegate and Thorngate districts, (*b*) works of street improvement in upper and lower Galgate, (*c*) works of water supply in Bridgegate, and (*d*) the provision of an underground sanitary convenience in the Market-place.—The clerk, Mr. J. Ingram Dawson, stated that nothing in the way of improving Galgate had been done for twenty-five years, and the cattle market had been closed, owing to the fact that the regulations of the Board of Agriculture had not been complied with in the matter of the provision of an impervious surface and the enclosing of the cattle. After considering various plans and suggestions, a terraced road was the only one which seemed to meet all the requirements. Evidence with respect to the other matters was tendered.

Cambridge T.C. (August 6th. Mr. M. K. North).—£3,960 for the improvement and widening of the streets surrounding the Market Hill.—The town clerk, Mr. J. E. Whitehead, stated that the scheme included the repaving of the existing market and of Peas Hill and St. Mary's-street; also the reducing of the size of the market, so as to widen the streets all round. The inspector: You know that the board have expressed an opinion that half this sum ought to be charged for market purposes? The town clerk: Yes; and, as I pointed out in my letter, it will benefit the streets rather than the markets. The assistant surveyor mentioned that some of the setts which it was proposed to relay had been down since 1850. The inspector: Isn't that a very long time?—Yes, but they appear to be in good order. We shall, of course, replace those that are worn out.

East and West Molesey U.D.C. (August 9th. Mr. W. O. E. Meade-King).—£1,019 for the improvement of Nightingale-road, Hansler-grove, Matham-road, Feltham-avenue, New-road and Hurst-road.—The surveyor, Mr. J. Stevenson, stated that there was no debt outstanding with regard to any of the footpaths. All the streets complied with the by-laws as to width, except New-road and Hurst-road, which were old public highways.

East Riding C.C. (August 13th. Mr. F. O. Stanford).—This was an inquiry regarding an application for a loan for the reconstruction of Hull Bridge, which spans the river Hull in the townships of Storkhill, Sandholme and Tickton, and which is part of the high road from Beverley to Hornsea, and other parts of Holderness.—Mr. J. Bickersteth, clerk to the county council, said the present old brick bridge had a steep gradient which made it extremely dangerous for vehicular traffic. Towards the cost of the new structure the Road Board had promised £4,000, the Beverley Corporation £500, the Beverley Rural District Council £1,000, and the Skirlaugh Rural District Council £300. It was proposed to raise the rest (£6,700) in one loan, the repayment to extend over thirty years.

Mansfield T.C. (August 6th. Mr. Edgar Dudley).—£5,450 to enable the corporation to carry out improvements in Leeming-street.—The town clerk, Mr. J. H. White, explained that the corporation had entered into provisional agreements to purchase 120 sq. yds. of land from the Kimberley Brewery Company for £3,500, including £500 tenants' compensation. This worked out at £29 per square yard. They had also agreed to purchase 49 sq. yds. from the Mansfield Brewery Company for £1,850, which averaged £38 a yard. Two licensed premises occupied the sites, and the taking of the frontage for this street widening would necessitate rebuilding the houses. The inspector asked for evidence of the price paid for land in the neighbourhood, and the borough surveyor, Mr. T. P. Collinge, said the town council resold land in the same street for prices varying from £7 to £22 10s. a yard.

Petersfield U.D.C. (July 23rd. Mr. P. M. Crosthwaite).—£2,000 for extending the water mains into the rural district, and the provision of hydraulic motor and steam pumping plant, and the construction of a ferro-concrete reservoir of 95,000 gallons capacity. Messrs. Taylor & Wallin (Mr. Harry W. Taylor, Assoc.M. Inst.C.E., of Newcastle-upon-Tyne and Birmingham, are the engineers. There was no opposition.

APPLICATIONS FOR LOANS.

Antrim R.D.C.—£500 for a new burial ground.

Barrow-in-Furness T.C.—£16,400 for public baths, and £5,500 for laying out the public park.

Blyth U.D.C.—£13,830 for an elementary school.

Chesterfield T.C.—£697 for road widening and fencing.

Dartmouth T.C.—£1,050 for the purchase of land for an open space.

Derby T.C.—£3,000 for sewerage works.

Durham T.C.—£1,020 for workmen's dwellings.

East Dereham U.D.C.—£450 for gas supply extensions.

Harrogate T.C.—£1,687 for private street improvements.

Nantwich R.D.C.—£1,350 for works of sewerage.

Nelson T.C.—£1,000 for municipal offices and workshop, and £3,300 for public parks and pleasure grounds.

St. Thomas (Devon) R.D.C.—£600 for three cottages.

Scarborough T.C.—£2,600 for an open-air swimming bath, and £2,250 for cliff protection works.

Sheffield T.C.—£9,000 for a building scheme.

Southgate U.D.C.—£2,350 for an open-air swimming bath.

Torquay T.C.—£6,300 for a 1,000 k.w. turbo-alternator.

Walsall T.C.—£1,000 for alterations and additions to Croft-street schools.

Wilts C.C.—£1,200 for a new school at Idmiston.

Wimbledon T.C.—£10,000 in aid of the Wimbledon and Putney Commons extension scheme.

LOANS SANCTIONED.

Ardsley U.D.C.—£500 for extensions to the cemetery.

Bognor U.D.C.—£2,660 for the provision of workmen's cottages.

Bray U.D.C.—£1,000 for an improved water supply.

Bromley T.C.—£4,247 for street improvement works.

Cookstown U.D.C.—£2,000 for artisans' dwellings.

Dewsbury T.C.—£1,750 for extensions to a school.

Eastbourne T.C.—£2,325 for works of sewerage.

Felixstowe U.D.C.—£243 for extensions to a public convenience.

Grantham T.C.—£1,200 for laying down tar-macadam.

Hendon U.D.C.—£2,562 for street improvement works.

Hereford T.C.—£2,100 for electricity undertaking.

Kensington B.C.—£1,760 towards the cost of a street improvement.

Kirkby-in-Ashfield U.D.C.—£12,000 for the construction of sewage disposal works.

Laurencekirk T.C.—£1,500 for sewage disposal works.

Malden R.D.C.—£600 for water supply works.

Nantwich R.D.C.—£12,500 for the sewerage of Haslington.

Nelson T.C.—£18,904 for works of sewage disposal.

Okehampton R.D.C.—£1,893 for water supply works.

Southport T.C.—£10,683 for a new school.

Stoke-on-Trent T.C.—£16,000 for a school of science and technology.

Wilts C.C.—£3,800 for a new school at Rodbourne Cheney.

FORTHCOMING INQUIRIES.

AUGUST.

		£
19.	**Billericay.** For works of water supply (Mr. W. O. E. Meade-King)	350
19.—	**Yeovil.** For the provision of working-class dwellings (Mr. Edward Leonard) ...	2,806
20.—	**Birmingham.** For law courts, recreation ground, fire station, and road purposes (Mr. M. K. North)	10,711
20.—	**Burnley.** For street widening purposes (Mr. W. H. Collin)	1,400
20	**Feltham.** For cemetery and other purposes (Mr. F. H. Tulloch)	1,250
20.	**Great Yarmouth.** For extension of police and fire brigade stations (Mr. W. O. E. Meade-King)	4,990
20	**Warrington.** For street improvement purposes (Mr. Edgar Dudley)	13,000
21.—	**Bembridge.** For works of sewerage (Mr. H. Shelford Bidwell)	1,047
21.—	**Chadderton.** For street and open space purposes (Mr. Edgar Dudley)	1,860

		£
21.—**Oldbury.**	For the provision of a gas holder (Mr. A. G. Drury)	6,200
22.—**Stone.**	For road widening works (Mr. Edgar Dudley)	592
23.—**Headington.**	For private street works (Mr. W. O. E. Meade-King)	2,362
23.—**Newport Pagnell.**	For the provision of public offices (Mr. Edgar Dudley) ...	£1,000
24.—**West Ham.**	For public baths and office purposes (Mr. W. O. E. Meade-King) ...	13,460

CORRESPONDENCE.

"Be calm in arguing; for fierceness makes
Error a fault and truth discourtesie."
— Geo. Herbert, "*The Temple.*"

BREAKING TESTS OF CONCRETE SLABS FOR ROAD BRIDGE FLOORS UNDER ROLLING LOAD.

To the Editor of The Surveyor.

Sir,—I have not come across any breaking tests of concrete slabs for a heavy rolling load such as on bridge floors, when the stone is the 2-in. size of ordinary concrete work. The following may be of interest—the work was deliberately done under what may be termed the ordinary conditions of a small rural contract job:

A slab of concrete 24 ft. long was laid over rails 2 ft. 9½ in. apart, lying on sleepers. It diminished from 12 in. thick at one end to 4¼ in. at the other. The concrete was composed of 4 parts by measure of middling limestone, hand broken to a 2-in. ring, 2 of good sand, 1 of cement. Another exactly similar slab was made, but with 4 parts of machine-broken limestone, unscreened, maximum stones about 2½ in., and 1 of cement; no sand.

The sandless slab used 9 per cent more cement than the other. It got an unexpected light frost, which, however, did not seem to harm it. It was forty-five days old when tested. The sand one was thirty-nine days.

A heavily loaded cart wheel was first run down the centres of the slabs without effect; then a 10-ton roller (wheels unworn) was run with a driving wheel down the centre of the slabs, a ridge of gravel being first laid down the centre line so that the weight bore fairly in the centre and was not distributed.

The slab of machine-broken stone without sand did not give way at any point, even when bumped over pieces of wood. The slab of 4, 2, 1 did not give way immediately on the first run through, but after a moment or two gave way at 3 ft. 3 in. from the thin end (about 5¼ in. thick), and the engine being slowly backed broke before it to 10 ft. from that end (about 7¼ in. thick), but no further. The broken concrete dropped about 3 in. in the centre. The thick ends were supported right across, but not the thin ends.

Duplicate slabs of both the preceding had been made. These were also tested three days later. The sandless one was now forty-eight days, and was again unaffected throughout. The 4, 2, 1 slab was now a forty-two-day test instead of thirty-nine. It did not give way at the first or second run, but then broke 2 ft. from the thin end (4⅛ in. thick), and remounted at 4 ft. 6 in. from that end (5¾ in. thick).

A fresh experiment was then made. A pair of rails were laid 9 ft. 8 in. apart at one end and 3 ft. 10½ in. at the other, and a slab of uniform 7 in. thickness and 25 ft. 6 in. long was laid over all, composed of the 4, 2, 1 mixture. But the half from the wide end for 13 ft. had one transverse row of ⅜-in. square steel rods at 12-in. centres, turned down 1 in. at ends, and bellied to ¾ in. from under surface of slab in centre, and rising to ¾ in. from upper surface at sides.

A similar test to above was made at forty-seven days. The slab gave way near the narrow end after a moment or two pause, and the engine was driven slowly ahead, breaking before it till within 6 in. of the first reinforcing rod, when it mounted. No effect could be taken on the remainder right on to the 9-ft. 8-in. end, and not even when the wheel was bumped first over small obstacles and finally over a 3-in. piece of iron at good speed. The non-reinforced half of this slab was intended to be considerably thicker, but was made 7 in. in error, and broke, as might have been expected.

I have to thank the generosity and wisdom of my county council for this, to me, very useful experiment.—Yours, &c.,

Jas. P. Burkitt,
Enniskillen. County Surveyor, Fermanagh.
August 12, 1912.

THIRD INTERNATIONAL ROAD CONGRESS.

PAPERS FROM THE UNITED STATES.

During Mr. Rees Jeffreys' visit to the United States of America, a Committee of Selection was formed for the purpose of assisting Mr. Logan Waller Page to nominate the writers of the papers to be contributed by the United States to the International Road Congress, London, 1913. That committee has completed its labours, and the results attained are embodied in the following letter from Mr. Nelson P. Lewis to Mr. Rees Jeffreys. The list of writers is a very strong one, and some valuable papers may be expected from those interested in road problems on the other side of the Atlantic.

[COPY.]

BOARD OF ESTIMATE AND APPORTIONMENT.
City of New York.

August 2, 1912.

W. Rees Jeffreys, Esq.,
General Secretary, London Road Congress,
Broadway, Westminster, England.

Dear Mr. Jeffreys,—On July 5, 1912, I addressed to you a progress report upon the writers of papers for the London Road Congress who had been recommended to Mr. Page. While this list was fairly complete, there were some omissions, and I am reporting now a complete list of authors recommended, all of whom have indicated their willingness to accept invitations to prepare papers.

Question No. 1.—Nelson P. Lewis, chief engineer, Board of Estimate and Apportionment, New York City.
Question No. 2.—Henry B. Browne, Columbia University, New York City.
Question No. 3 Arthur H. Blanchard, professor of highway engineering, Columbia University, New York City; W. W. Crosby, consulting engineer, Baltimore, Md.; Provost Hubbard, Washington, D.C.
Question No. 4.—George W. Tillson, consulting engineer, Borough of Brooklyn, New York City.
Question No. 5.—Dr. Clayton H. Sharp, New York City.
Question No. 6.—W. H. Connell, chief of the Bureau of Highways and Street Cleaning, Philadelphia, Pa.; — Hewes, Office of Public Roads, Washington.
Question No. 7.—William Phelps Eno, Washington, D.C.
Question No. 8.—Paul D. Sargent, Office of Public Roads, Washington; J. C. Travilla, commissioner of streets, St. Louis, Mo.
Question No. 9.—Clifford Richardson, consulting engineer, New York City.
Communication No. 1.—A. W. Dean, chief engineer, Mass. Highway Commission, Boston, Mass.
Communication No. 2.—L. W. Page, director of public roads, Washington, D.C.
Communication No. 3.—A. B. Fletcher, state highway engineer, Sacramento, Cal.; A. M. Johnson, State highway engineer, Springfield, Ill.
Communication No. 4.—John R. Rablin, chief engineer, Metropolitan Park Commission, Boston, Mass.
Communication No. 5.—Morris R. Sherrerd, city engineer, Newark, N.J.
Communication No. 6.—A. G. Batchelder, American Automobile Association; Powell Evans, president, Philadelphia Automobile Club.
Communication No. 7.—Horace M. Swetland, New York City.
Communication No. 8.—Harold Parker, vice-president, Hassam Paving Company, Worcester, Mass.; Prof. Jos. Hyde Pratt, Chapel Hill, N.C.
Communication No. 9.—Arthur Lewis, chief engineer, Lincoln Park Commission, Chicago, Ill.
Communication No. 10.—The Committees on Terminology of the American Society of Civil Engineers and the American Society for Testing Materials.

Where two names are given under any subject it means that the authors are to collaborate either in the preparation of the entire paper, or that each of them will treat of one or more phases of the problem. I hope that you had a pleasant voyage home, and that your impressions of this country have been such that you will want to come again.

Very cordially yours,
(Signed) Nelson P. Lewis.

"Ceresit."—The variety of uses to which this material can be applied in building operations is clearly demonstrated in a booklet which the British Ceresit Waterproofing Company, Limited, of Princes Mansions, 68 Victoria-street, London, S.W., have just issued. Reference to the several sections of the pamphlet is facilitated by means of a thumb-index, and the reader is enabled to turn at once to the information he requires. The value of "Ceresit" as a waterproofing medium for weatherside walls, roofs, cellars, and so forth has long been established, and its efficiency in other directions is equally well known to surveyors and architects.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below. Buildings—Dartford £13,000, East Riding £9,140, Stockport £15,000, Wallasey; housing and town planning—Richmond (Yorks); roads and materials—Nelson, Warwickshire; sewerage and sewage disposal—Derby £3,000, Droitwich £12,603; water, gas and electricity—Elgin, St. Columb, Sheerness £16,950, Widnes £8,500.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

ADMINISTRATION.

Cwyrfai (Carnarvon) R.D.C.—At a recent meeting of the council a complaint was made by the surveyor, Mr. J. Thomas, that certain members of the council persisted in urging him to employ men in whom they were interested either as friends or relatives. Mr. J. Lloyd Williams regarded the practice as most reprehensive, and he moved that the surveyor be instructed not to pay any notice to the requests made to him. The council unanimously endorsed this.

BUILDINGS.

Blackburn T.C.—A recommendation of the Tramways Committee advising the erection of six shelters has been approved.

Chelmsford T.C.—Upon the recommendation of the borough surveyor, Mr. P. T. Harrison, it has been agreed to construct additional cattle pens in the market at an estimated cost of £340.

Chesham T.C.—The tender of Messrs. Rust & Ratcliffe, of Chesham, at £465, has been accepted for the construction of an open-air swimming bath.

Dartford U.D.C.—Designs are being invited for a public hall and free library, to be built on council property. The cost of the former building is not to exceed £8,000, and that of the latter £5,000, and premiums of £75, £50, and £25 are offered.

East Riding C.C.—The tender of Messrs. Braithwaite & Kirk, of West Bromwich, at £9,140, has been accepted for the reconstruction of Hull Bridge, near Beverley. The engineers are Sir John Wolfe Barry and Partners.

Haddingtonshire C.C.—The Western District Committee have accepted the tender of Mr. W. Cuthbert, of Aberlady, at £1,340, for the provision of houses at Gullane, for police and roadmen.

Hartlepool T.C.—A new school is to be erected at Throston to replace existing buildings.

Hereford T.C.—The roof of the butter market is to be reconstructed at a cost of £690.

Hove T.C.—A public lavatory is to be constructed underneath the southern part of the footway leading from Kingsway to Western Esplanade, at an estimated cost of £1,080.

Lindsey (Lincs) C.C.—It is proposed to build a new bridge at Hoddah, on the Lincoln and Saxilby main road, at an estimated cost of £730.

Northallerton R.D.C.—The surveyor, Mr. G. Easdale, has been asked to prepare an estimate of a bridge to obviate the inconvenience caused at times of flood.

Northampton T.C.—The tender of Mr. W. Higgins, at £6,948, has been accepted for the widening of South Bridge.

Pontefract T.C.—Consideration is being given to tenders for the erection of new public baths and [illegible] Mr J. G. Lyon has offered to assist the scheme by defraying the cost of the children's baths, estimated at £600.

Salford T.C.—Plans are being prepared for a new electricity sub-station.—Alterations and additions to the town hall are to be carried out at a cost of £2,042.

Scarborough T.C.—An open-air swimming bath is to be erected in front of Belvedere Gardens, at an estimated cost of £2,600, and protective works are to be carried out on the face of the cliff from the Chil[illegible] Chapel to Black Rock.

Southport T.C.—A lodge is to be built in the Bedford-road cemetery grounds at a cost of £650, and a greenhouse in Victoria Park at a cost of £245.

Stockport T.C.—Extensions to the police buildings are to be carried out at an estimated cost of £15,000.

Wallasey T.C.—The council have called for an amended scheme for the proposed new town hall. The plans prepared show a building estimated to cost £102,000, and the architects have been requested to effect a 15 per cent reduction.

Willesden U.D.C.—The tender of Messrs. Alan Fairhead & Sons, at £1,875, has been accepted for the erection on the Carlton Vale site of a school for ninety defective children.

HOUSING AND TOWN PLANNING.

Bognor U.D.C.—The tender of Messrs. H. W. Newell & Son, at £2,660, has been accepted for building thirteen cottages.

Eastry R.D.C.—Four cottages are to be erected by the council at a cost of £200 each.

Fife C.C.—It is proposed to engage the services of an expert to prepare a planning scheme for North Queensferry, and in view of further developments in the Limekilns and Crombie areas, the master of works for the Dunfermline District Committee has been instructed to prepare tracings showing the boundaries of the areas which are likely to develop and to submit them to an early meeting.

Forehoe R.D.C.—The tender of Mr. H. G. Tofts, of Hingham, at £1,054, has been accepted for the erection of six double cottages at Hingham.

Richmond (Yorks) T.C.—A committee has been appointed to consider the question of building houses for the working classes.

Stockport T.C.—It is proposed to apply to the Local Government Board for authority to prepare a town planning scheme in the urban districts of Cheadle and Gatley, and Hazel Grove and Bramhall.

PARKS AND OPEN SPACES.

Ashington U.D.C.—A scheme has been prepared for laying out Hirst Park at an estimated cost of £4,000.

Broadstairs U.D.C.—A plot of land at Pierremont Park is to be purchased for £2,000 for the purpose of a park and pleasure ground.

Hartlepool T.C.—Half an acre of land fronting Cliff-terrace has been purchased for £500 for the purpose of a park.

ROADS AND MATERIALS.

Antrim C.C.—A letter has been received from the Road Board to the effect that, though recent grants made by the board to the county council in respect of improvements to roads had been very liberal, the board would be prepared to make grants up to £3,000 to the council this year on works of which they were able to approve.

Barnsley T.C.—Several properties have been purchased with a view to the widening of Church-street.

Brighouse T.C.—An important street improvement is to be effected at the Briggate end of Bethel-street by the demolition of a block of buildings and the widening of the thoroughfare.

Camborne U.D.C.—The surveyor, Mr. C. D. Bell, has been instructed to prepare an estimate of making up Highville-street.

Cannock U.D.C.—Street improvement works, [illegible] £1,039, have been approved.

Chorley T.C.—A scheme of road improvement, to cost £6,689, is to be carried out.

Dawlish U.D.C.—The High-street is to be widened, at an estimated cost of £300.

East Grinstead R.D.C.—The surveyor, Mr. C. Turton, has presented estimates and plans and specifications (which have been approved) for making up, under the Private Street Works Act, the following roads: Beeches-road, Crowborough, £1,841; Avicen-road, Crowborough, £1,249; Beacon-road West, Crowborough, £225; Warren-road, Crowborough, £468; Melfort-road, Crowborough, £462; Old-lane, Crowborough, £547; Hamsey-road, West Hoathly, £934.

Gainsborough R.D.C.—A new road is to be constructed from Pilham to Bonsdale-lane, at a cost of £300.

Grantham T.C.—The Road Board have granted a loan of £1,200, free of interest for five years, for improvements on the Great North-road in the borough, and as the Local Government Board have sanctioned the arrangement, the council have given instructions for the reconstruction in tarred macadam of High-street, St. Peter's-hill, and a portion of London-road, to be proceeded with as soon as possible.

Greenwich B.C.—That portion of Bramshot-avenue which extends from Wyndcliff-road to Eastcombe-avenue is to be formed and paved, at an estimated cost of £985.

Hastings T.C.—The tender of Bristowe & Co., Limited, of Westminster, at £1,663, has been accepted for laying tar-macadam.

Hendon U.D.C.—A tender has been accepted, at £9,318, for widening and improving the main road from the "Bull and Bush" at Hampstead to Brent-street, Hendon, work rendered necessary by the large increase of traffic.

Kesteven (Lincs) C.C.—As a result of a deputation to the Road Board, that body has agreed to increase the grant of £1,000 for the current year to £1,250.

Nelson T.C.—The borough surveyor, Mr. W. Shackleton, has been requested to prepare plans and estimates for the execution of private street works in several thoroughfares.

Scarborough T.C.—The promenade in the North Bay is to be extended, at a cost of £600.

Settle R.D.C.—Kerbing and channelling works are to be carried out, at a cost of £185.

Shepton Mallet U.D.C.—What would appear to be a policy of extra caution with respect to tar-spraying was disclosed at a recent meeting, when the Highway Committee reported that they had gone fully into the differences between the council and the county council, as to the cost of tar-spraying and had instructed the clerk to forward a statement to the county. Colonel Clerk understood the surveyor was given instructions at a previous meeting to ascertain from various contractors whether if they used their material and did the work of tar-spraying in a proper manner they would guarantee the council against any risk of an action brought against the council for polluting the stream. Had the surveyor made any inquiries? The surveyor, Mr. D. Hinchcliffe, said there had been a lot of correspondence, and a number of interviews with the contractors, but no one came anywhere near thinking they would take the responsibility off the council. A number of letters were read, and the result of interviews relative to the matter were stated by the clerk and the surveyor. Colonel Clerk said he had journeyed all over the county, and found the roads tar-sprayed nearly everywhere but in Shepton Mallet. The policy of not tar-spraying the roads was a benighted one, and they ought to perform their duty as a council and protect the property of the people whose houses adjoined the roads. If the council were afraid to undertake the responsibilities of tar-spraying they ought to see that the roads were properly watered. Mr. Halstead said the county council would not take any responsibility when tar-spraying was carried out within half a mile of a stream, and said unfortunately in Shepton Mallet the roads in the majority of cases ran parallel with the stream, or near it. Mr. Allen said if they did anything which might be suspected of polluting the stream they would find themselves in "queer street." It was ultimately left to the Highway Committee to investigate and report whether there had been any pollution of the stream from tar-spraying.

Tottenham U.D.C.—The engineer and surveyor, Mr. W. H. Prescott, has submitted a report in connection with the consideration of the improvement of the main roads within the area of Greater London. One of these proposed roads is designed to relieve the rapidly growing traffic along the two existing roads from Finsbury Park to Enfield, and from Tottenham through Edmonton and Cheshunt to Ware and Cambridge. It had been provisionally styled the proposed new Cambridge-road. The other proposed road affecting Tottenham, he said, was known as the North Circular-road, and this had been suggested with a view to enabling traffic to pass round London and to avoid congested streets in the central area. It commences at Chiswick, and passes Brentford, Ealing and Acton, through Ballard's-lane, Finchley, and Colney Hatch, along Bowes-road, New Southgate, through Edmonton, to Higham's Hill, Epping, and New Wanstead. The proposed width of both roads was 100 ft. each, but nothing could be ascertained as to the financial aspect of the question.

Warwickshire C.C.—The council have agreed to apply to the Road Board for grants in support of the following schemes: Sutton Coldfield widening and strengthening of the Tamworth main road, estimated cost £1,500; Coventry and London main road from Northamptonshire boundary to Dunchurch—strengthening foundations and tarmacing, estimated cost £7,250; Watling-street, from Quarry Hill, Wilnecote, to Birch Coppice, and again from Mancetter House to the end of the Warwickshire length by Lindley Park—strengthening and tarmacing, estimated cost £6,569; also an application by the Atherstone Rural District Council for a grant towards the cost of tarring 12,000 sq. yds. of highway from Chapel Hill through the village of Hartshill.

Wembley U.D.C.—The Road Board have agreed to lend £2,900 free of interest for four years towards the improvement of Pinner-road, the main road between Wembley and Harrow.

West Sussex C.C.—The county surveyor, Mr. H. W. Bowen, has reported on the unsatisfactory way in which the district foremen recently appointed had discharged their duties, and it has been decided to abolish the appointments of district foremen, and that the county surveyor be authorised to appoint in their place district surveyors to work under his direct control. This arrangement would mean an expenditure of £9 10s. per week in place of £10 as at present, but it was recommended that the salaries of each of the officials appointed be raised by annual increments of £5 for the next five years.

SEWERAGE AND SEWAGE DISPOSAL.

Brierley Hill U.D.C.—The tender of Messrs. J. Guest & Son, at £3,115, has been accepted for making house connections to main sewers.

Derby T.C.—The sewers in the Ormaston district are to be improved at an estimated cost of £3,000.

Droitwich R.D.C.—Mr. Fiddian's plans have been approved for the construction of sewage disposal works for North Claines, at an estimated cost of £12 603.

East Grinstead R.D.C.—The surveyor, Mr. C. Turton, estimates the cost of surface-water drainage works in the Crowborough roads at £979.

Godalming T.C.—It was reported at the council meeting recently that all the crops on the sewage farm were looking wonderfully well, the only shortage being in oats. In regard to stock, the Sanitary Committee received £100 from the council in the first instance, and on a rough estimate their stock was now worth £250, and they had £40 cash in hand.

Hove T.C.—In consequence of the withdrawal of a tender for the construction of new sewers in Queen's-gardens, Grand-avenue The Drive, Holland-road, and Davigdor-road, the Works Committee recommend the acceptance of the next lowest tender, that of Messrs. George Bell & Son, Limited, Bruce Grove-road, Tottenham, London, for £7,344. The council are also recommended to construct an underground lavatory for both sexes underneath the southern part of the footpath leading from Kingsway to the Western Esplanade and opposite the south end of Carlisle-road, in accordance with a scheme submitted by the borough surveyor, Mr. H. H. Scott. This will cost approximately £1,080, and provides for the lighting of the lavatory being obtained entirely from prismatic lights in the roof, and the ventilation secured by ventilators placed among the shrubs in the adjoining bank.

Winchcombe R.D.C.—The tender of Messrs. Johnson Brothers, of Hereford, at £2,937, has been accepted for the carrying out of the sewerage works at Bishop's Cleeve, near Cheltenham.

Worthing T.C.—With respect to the provision of an additional outfall for surface water, and the construction of new surface drains in various roads at the west of the town, to discharge into the West Worthing outfall, the Sanitary Committee recommend that the surveyor, Mr. F. Roberts, be instructed by the council to prepare the necessary plans and estimate for submission to the council. A scheme

has also been considered from the committee for the provision of additional pumping plant and new outfall in connection with the sewage works, and the council are recommended to give provisional approval, and instructions to the surveyor to prepare the necessary plans, estimate, &c., to enable application to be made to the Local Government Board for a loan.

WATER, GAS, AND ELECTRICITY.

Elgin T.C.—An improved water supply is contemplated, including the construction of a new reservoir, at an estimated cost of £8,000.

Gainsborough U.D.C.—The services of a consulting engineer are to be retained for the purpose of considering an improvement in the water supply.

Godalming T.C.—A sum of £978 has been allocated from the profits of the water undertaking in aid of the rates.

Lanarkshire C.C.—Additions have just been made by the council to the electric supply station at Cambuslang. The capacity of the station has been doubled, and its arrangements modernised. The feeder cables supplying the district have also been doubled, and already the increased demand for current has justified the outlay.

St. Columb T.C. The provision of an additional water supply is to be considered by the council.

Sheerness U.D.C.—Mr. F. W. G. Stanton has prepared plans for a constant water supply, estimated to cost, inclusive of machinery, £16,950, and they have been forwarded to the Local Government Board.

Sheffield T.C.—There was a surplus of £9,969 upon the working of the water undertaking last year.

Widnes T.C.—To cope with the increasing population at Sutton Manor and Bold it is proposed to construct a new water tower on Pex Hill at an estimated cost of £8,500. The tower will have a capacity of 500,000 gallons. An extension of the gas supply is also proposed.

MISCELLANEOUS.

West Hartlepool T.C.—It has been decided to purchase the remaining tramway routes not already acquired by the corporation, and to appoint a general manager of tramways at a salary of £200 a year.

PERSONAL.

Mr. Peter Sinclair, burgh surveyor of Carnoustie, has been voted an increase of salary.

Mr. F. A. Delamotte, borough surveyor of Conway, has had his salary increased by £25 per annum.

Mr. J. F. Hawkins, county surveyor of Berkshire, has had his salary increased to £750 per annum.

Mr. H. C. Crummack, borough surveyor of Hartlepool, has had his salary increased by £30 per annum.

Mr. W. Shackleton, borough engineer and surveyor of Nelson, has had his salary increased by £50 a year.

Dr. Gilbert J. Fowler has removed from Broad Oak, Urmston, to Rufford, Dickenson-road, Rusholme, Manchester.

Mr. James Hammond, surveyor to the Bedale Rural District Council, has had his salary increased by £25 per annum.

Mr. E. J. Saunders, surveyor to the Leighton Buzzard Urban District Council, has been voted an increase of salary.

Mr. T. Moss, surveyor and gas manager to the Withnell Urban District Council, has had his salary increased by £33 per annum.

Mr. W. Epton, surveyor to the Welton (Lincs) Rural District Council, has been voted an extra £20 a year for the employment of a clerk.

Mr. Fred. Wilkinson, surveyor to the Prestatyn Urban District Council, has, we are pleased to state, recovered from his recent illness.

Mr. J. S. Hurst, assistant surveyor of Bridlington, has been appointed borough surveyor and inspector of nuisances at Southwold at a salary of £130.

Mr. B. Comb, of Chesterfield, has been appointed surveyor to the Whittington and Newbold (Derbyshire) Urban District Council, at a salary of £150 a year.

Mr. S. Dean, assistant surveyor to the Greetland (Yorks) Urban District Council, has obtained an appointment in the surveyor's department at Barnoldswick.

Mr. F. Kirby, of Bishop Auckland, assistant in the Auckland surveyor's department, has been appointed assistant surveyor to the Sedgefield Rural District Council.

Mr. William Moser, of Nelson, has been appointed engineering assistant in the borough surveyor's department of the Nelson Corporation, at a salary of £85 per annum.

Mr. E. Cuthbert, surveyor to the Bulkington (Nuneaton) Urban District Council, has resigned after nearly forty years' service. Mr. Cuthbert is seventy-nine years of age.

Mr. George Sutcliffe, of Halifax Corporation waterworks, has been appointed chief water inspector to the Loughborough Corporation out of eighty-six applicants, and Mr. Thomas Tyler, of Loughborough, has been appointed assistant water inspector out of 105 applicants.

Mr. H. J. Bennett, for many years surveyor and inspector to the Northwich Rural District Council, died, we regret to state, somewhat suddenly on the 1st inst., in his seventy-fourth year. Since his retirement from active service Mr. Bennett had been consulting engineer to the council.

Mr. H. E. Goldsmith, of the Public Works Department, Hong Kong, whose transfer to membership of the Institution of Municipal and County Engineers was recently noted in our columns, should have been described as chief assistant to the executive engineer in charge of municipal work generally, Public Works Department, Hong Kong.

Folkestone Town Council have made the following appointments in the borough engineer's office, consequent on the resignation of Mr. L. Luck, who has received an appointment at Walsall: Mr. H. F. Jackson, third assistant, to be second assistant, at a salary of £117 per annum; Mr. W. S. Pain, fourth assistant, to be third assistant, at £78 per annum; Mr. H. St. G. Tolputt, temporary assistant, to be fourth assistant, at £65 per annum; Mr. H. Dunglinson to be tracing clerk at £52 per annum.

Mr. W. E. Blizard, STUD.INST.C.E., B.SC. (Engineering, London), the younger son of Mr. John H. Blizard (Sir James Lemon and Blizard, MM.INST.C.E.), has been appointed assistant civil engineer in the Indian Public Works Department. He has been posted to the United Provinces on irrigation work, and will sail for India in the P. and O. steamer "Maloja" on September 27th next to take up his appointment. His brother, Mr. J. Mortimer Blizard, ASSOC.M.INST.C.E., is the assistant sanitation engineer of Colombo, Ceylon.

Dr. Galbraith, Dean of the Faculty of Applied Science of the University of Toronto, has been elected as chairman of a Canadian Committee which has been formed to undertake the necessary organisation work for the forthcoming International Road Congress. Mr. W. A. McLean, provincial highways engineer, is the hon. secretary, and the other members are Major T. L. Kennedy, president of the Ontario Good Roads Association; Mr. W. G. Trethewey, chairman of the York County Highways Commission; Mr. Hiram Donkin, Commissioner of Highways for Nova Scotia; Mr. C. H. McLeod, of Montreal, secretary of the Canadian Society of Civil Engineers; and Mr. W. J. Kerr, of New Westminster, B.C., president of the Canadian Highways Association. The Right Hon. R. L. Borden has been offered the honorary chairmanship of the committee, the formation of which is the result of the visit to Canada of Mr. W. Rees Jeffreys, the secretary to H.M. Road Board.

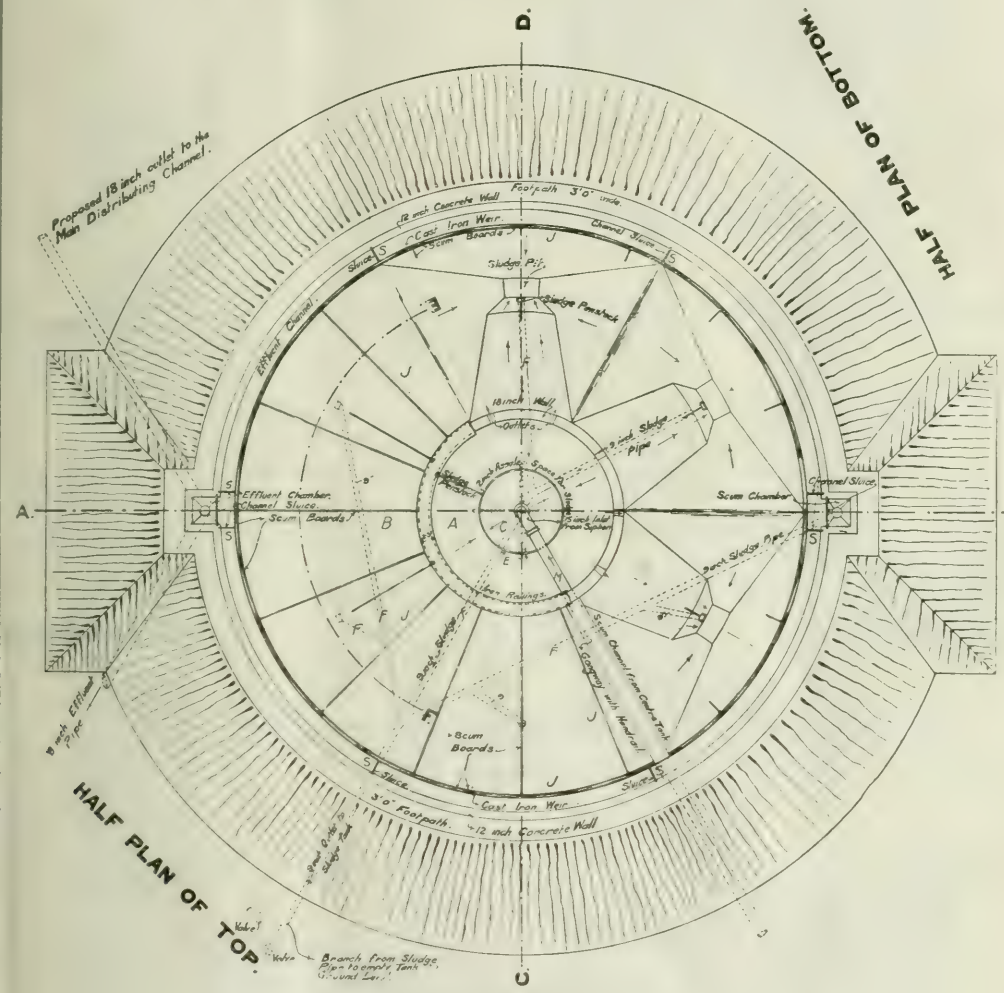
In the list of successful candidates at the recent final examination for the degree of Bachelor of Science (Engineering), London University, appears the name of Mr. H. M. Webb, a pupil of Mr. Thomas Caink, ASSOC.M.INST.C.E., city engineer, Worcester. Mr. H. E. Lunn, of the borough engineer's department, Islington, N., a former pupil of Mr. Caink, was also successful at the same examination.

Saddleworth Housing Scheme.—The erection of fifty-five cottages, estimated to cost £16,000, is proposed by the Saddleworth (Yorks) Urban District Council.

THE CLARIFICATION OF SEWAGE.

THE "FIELDHOUSE" TANK.

In our issue of October 21, 1910, in connection with a meeting of the Institution of Municipal and County Engineers, reference was made to the construction at Guildford of a "Fieldhouse" sewage tank, the advantages of which, as compared with square or rectangular tanks, were set out by the borough engineer, Mr. C. G. Mason, ASSOC.M.INST.C.E. The Ames Crosta Sanitary Engineering Company, Limited, 12 Victoria-street, Nottingham, the sole agents, have now issued a pamphlet in which a detailed description, accompanied by diagrams, is given of the tank.



THE "FIELDHOUSE" TANK.

It is realised by the patentees that the construction of tanks for continuous running, in order to give the necessary facilities for the removal of the deposit and scum and for producing an equalised effluent with the greatest freedom from suspended solids, must of necessity increase the capital cost compared with the ordinary type, capacity for capacity, but they point out that this is only first cost, while the advantages due to the saving in labour in tank manipulation, attention to distributing apparatus, and the extended life of filtering area, together with more uniformly satisfactory results obtained with less worry and expense, far more than compensate for the extra cost. It is stated that the original cost of the "Fieldhouse" tank may be reduced by constructing this form of tank 25 per cent to 50 per cent less in capacity than tanks of the ordinary type, the ground for this assertion being that the latter do not give the same facilities for producing a uniform highly clarified tank effluent, are incapable of dealing with large, increased flows, and do not possess proper means for the removal of deposit or scum without emptying the tank. Moreover, it is pointed out, the perfect displacement and reduced stagnation allows of a fresher sewage and a more clarified tank liquor being secured in a much shorter period of time.

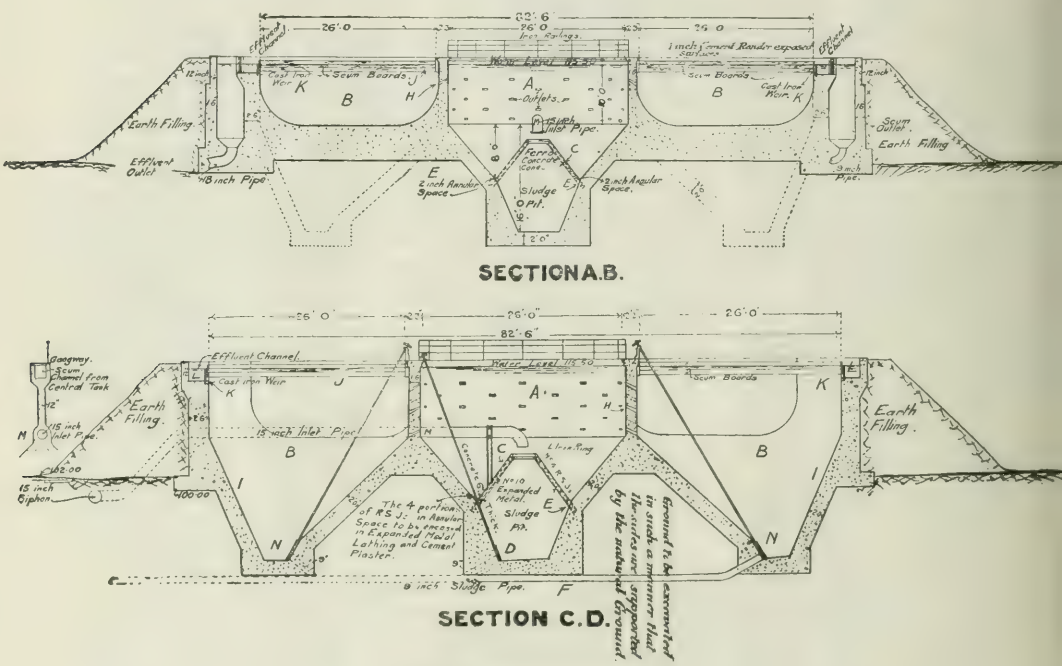
OPERATION OF TANK.

The sewage enters along pipe "M" and passes to inner or roughing chamber "A," where the bulk of the heavier solids are deposited, passing by gravitation to underside the inverted cone "C." The object of the cone "C" is to prevent the deposit being churned up and to form an annular space "E" to allow depositing solids to settle, to be afterwards removed through the valve "D."

The liquid, after depositing its heavier solids in tank "A," passes through pigeon holes or passages "H" to outer tank "B," these passages "H" being constructed so as to cause even displacement and to deflect the finer depositing solids which have a downward tendency towards the collecting chambers containing penstocks "N" in the deposit chambers before passing under slide or scum boards "J" and over sill or weir "K" into channel "L." The scum boards "J" are made to dip below the surface according to the process adopted. From the point of entrance to the point of exit the liquid is constantly spreading

outward, covering a larger area, and consequently reducing its velocity as it approaches the weir "K," and by this means the most clarified and oxidised effluents are obtained.

On opening the valve "D" the deposit is forced by the head of water down the sludge pipe "F." The inverted cone "C" tends to prevent a column of liquor flowing down the pipe, and also deflects the liquor on to the sloping sides of the sludge well, cleansing them from deposited solids as the sludge is forced out. The outer tank is divided into sections, according to the size of the tank; at the bottom of each section is constructed a chamber with a valve "N" to sludge pipe "F." The bottom of each section is formed with inclined faces to allow the solids to be deposited near the valve "N" ready for withdrawal on the opening of the valve. The outer inclined face "I" is formed at a sufficient inclination as to prevent accumulations of solids, thereby preventing any decomposing deposits being again thrown into suspension near the weir "K." The outer tank "B" is divided into sections by radial scum boards "T," and end slides or scum boards "J" which form traps and prevent the wind from breaking up any scum and causing the liquor to be weired over unequally. To remove the scum from the tank. The latter is, of course, of the greatest importance in any continuous sewage tank, as if not regularly carried out septic action and aërial nuisance rapidly occur.



The "Fieldhouse" Tank.

scum, the end slides "J" or slides "S" are closed down and the tank allowed to head up, when, on removing one or more end slides "J" and a slide "S," the increased head causes the scum to be readily floated into channel "L" to be conveyed to sludge tank or on to the land.

Generally, it is claimed that a more uniform effluent is obtained in this form of tank, as the incoming sewage is forced to mix with the liquor already in the tank by spreading outward as it goes forward towards the sill or weir "K" into channel "L." Thus when the trade wastes are entering tank "A" it is impossible for them to leave the outer tank without first undergoing a thorough mixing with the other sewage, much more so than is possible in straight or upward flow tanks of the usual construction. The effluent is much freer from suspended solids, owing to the reduction of velocity and the very large weiring surface, which allows the flow to pass away in a thin film at the greatest distance from the inlet, thus avoiding currents which carry out solids that may be in motion due to gases or from other causes. In addition to the large weiring surface, there is also the possibility of keeping the tank at its maximum capacity on account of the easy means of periodically withdrawing the deposit or

MUNICIPAL TRAMWAYS ASSOCIATION.

ANNUAL CONFERENCE, WEST HAM: PRELIMINARY NOTICE.

The annual conference of the Municipal Tramways Association (Incorporated) will be held in West Ham on September 25th, 26th and 27th next. De Keyser's Hotel, Victoria Embankment, E.C., has been selected as headquarters for delegates, and the following programme has been arranged: —

September 25th.

10.15 a.m.—Reception by the Mayor and West Ham Council.

10.30 a.m.—Presidential address by Mr. H. E. Blain, tramways manager, West Ham.

Paper: "Tramways Administration by Municipalities: A Retrospect and a Forecast," by Mr. Councillor S. C. T. Neumann, deputy-chairman Bradford Tramways Committee.

1 p.m.—Luncheon.

2 p.m. Proceed to Tramways Depot, Greengate-street, Plaistow, by special cars.

2.15 p.m. Discussion on the interim report of the Corrugation Committee.

3.30 p.m.—Inspection of depot and of the Exhibition of Tramway Appliances, &c.

7.30 p.m.—Corporation reception at the town hall.

September 26th.

10 a.m. Paper: "Tramway Fares and their Basis," by Mr. W. J. McCombe, tramways manager, Hull.

12.15 p.m. Luncheon.

1.15 p.m. Proceed by special cars to tramway depot.

1.30 p.m.—Meeting of managers' section.

1.30 to 3 p.m.—Inspection of depot and Exhibition of Tramway Appliances.

3 to 5 p.m. Garden party in West Ham Park.

7 for 7.30 p.m.—Association dinner at the Liverpool-street, Hotel, E.C.

September 27th.

9.45 a.m. Annual business meeting at De Keyser's Hotel.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. Thomas, M.Inst.C.E., County Surveyor, Buckinghamshire.

EXAMINATION.

The October, 1912, examination will be held in Birmingham on the 10th, 11th and 12th of that month.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

ANNUAL DISTRICT MEETINGS.

The annual district meetings of the South-Eastern and Southern Districts of the Institution of Municipal Engineers were held in the Council Chamber, at 39 Victoria-street, on August 7th. The following reports were presented by the honorary secretaries of the respective districts.

SOUTH-EASTERN DISTRICT.

I beg to submit the third annual report of the South-Eastern District Committee of the Institution of Municipal Engineers.

The second annual general meeting was held at the offices of the Institution, 39 Victoria-street, Westminster, on July 3, 1911, when Mr. Henry C. Adams was again re-elected chairman and Mr. Bernard Partridge honorary secretary. During the past year the following district meetings have been held:—

October 11, 1911, at Brentwood, when a visit was paid to the new sewage works and a paper upon their construction was read by Mr. J. Edward Willcox, of Messrs. Willcox, Raikes & Read, the engineers. There were 65 present.

March 6, 1912, at 39 Victoria-street, when a discussion was opened by the chairman (Mr. H. C. Adams) on "The Methods of Inviting Public Tenders."

May 22, 1912, at 4 Southampton-row, when a paper was read by Dr. John F. Meyer, entitled "Notes on Water Softening" and afterwards was very fully discussed. There were over 40 present.

In addition to the above there were four general meetings of the Institution held in the district during the year as follows:—Windsor, October 21, 1911; London, December 16, 1911; London, February 24, 1912; Hendon, June 12, 1912.

The district committee has during the past year been represented on the council by the following gentlemen: Messrs. W. Louis Carr, C. H. Eyles, A. J. Meeson, H. C. H. Shenton, with Mr. H. C. Adams as vice-president.

The number of members and students of the Institution in the district at present is 67.

It is with regret I have to report the resignation of Mr. Bernard Partridge, the honorary district secretary, who has left the district.

J. Woolford Brook,
Acting Hon. District Secretary.

SOUTHERN DISTRICT.

I have to submit a short *résumé* of the work done by the district committee during the past year, together with notes of meetings held in or near the district, although not actually district committee meetings.

As will be seen by the "Minutes," four district meetings have been held, namely:—

1. Annual meeting (July).
2. Meeting at Lewes and Seaford (September).
3. Meeting at London. Mr. Palmer's paper (May).
4. Meeting at London. Superannuation and Security of Tenure (June).

Other (general) meetings of the Institution in or near the district have been:—

1. Annual general meeting, Windsor (October).
2. General meeting, London (December), for Mr. Horace Boot's paper on "The Electric Trolley Omnibus System and Railless Traction."
3. General meeting, London (February), for Mr. Winter Gray's paper on "Superannuation and Security of Tenure."
4. Visit to Messrs. Doulton's, Lambeth (June).
5. General meeting at Hendon (June).

It is interesting to note that in connection with the latter three of the meetings held were at the initiation of members of our own district: Mr. E. A. Stickland, our president; Mr. Horace Boot, our chairman; and Mr. Winter Gray, member of council.

There has thus been no paucity of opportunity for members to inspect works and join in discussion of papers which have been of undoubted value and assistance, the subjects embracing all of greatest moment to surveyors generally, including sanitation, workmen's dwellings, railless traction, aviation, and superannuation.

I should like, however, to see more meetings held in the outlying portions of the district, and it only needs the co-operation of members resident therein to ensure this. The interest thus obtained means a larger membership of the Institution, and benefits individual members by the intercommunication of ideas and experience of varying methods of practice.

In conclusion, I have to acknowledge my grateful thanks to our chairman, Mr. Horace Boot, for the great assistance he has always rendered me, to Mr. Taylor for his work in connection with the meeting at Lewes and Seaford, to the gentlemen who have read papers, and last but not least, to the secretary, Mr. Wyand, who is ever ready to help on the fortunes of the Institution.

Ernest W. Veale,
Hon. District Secretary.

The only remaining business of the meetings was the election of officers for the year 1912-13. For the South-Eastern District Mr. Henry C. Adams, vice-president of the Institution, was re-elected district chairman, and Mr. J. Woolford Brook was elected honorary district secretary. For the Southern District Mr. Horace Boot, vice-president, was re-elected district chairman, and Mr. Arthur Palmer was elected honorary district secretary. Votes of thanks for their long services were passed to Messrs. Bernard Partridge and E. W. Veale, the retiring officers.

APPOINTMENTS VACANT.

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ELECTRICITY WORKS SUPERINTENDENT.—August 17th.—Corporation of Whitehaven. £2 2s. per week.—Mr. B. Sankey, borough electrical engineer.

ASSISTANT INSPECTOR OF NUISANCES.—August 17th.—Chorley Town Council. £100 per annum.—Mr. J. Mills, town clerk.

INSPECTOR OF NUISANCES.—August 19th.—Bourne Rural District Council. £125 per annum.—Mr. C. W. Bell, clerk.

JUNIOR ASSISTANT.—August 19th.—South of England county surveyor's office. £109 £130. Box 1,176, The Surveyor, 24 Bride-lane, Fleet-street, E.C.

INSPECTOR OF NUISANCES.—August 20th.—Leigh-on-Sea Urban District Council. £78 per annum.—Mr. F. P. Wheatley Down, clerk.

ASSISTANT IN SURVEYOR'S OFFICE.—August 20th.—Hindley Urban District Council. £78 per annum.—Mr. Thomas Robey, clerk.

GENERAL FOREMAN.—August 21st.—Teddington Urban District Council. £104—£120.—Mr. G. H. Salmons, clerk.

SURVEYOR'S ACCOUNTS CLERK.—August 22nd.—East Suffolk County Council. £90—£120.—Mr. A. Townshend Cobbold, clerk.

JUNIOR ASSISTANT.—August 23rd.—Corporation of Smethwick. £65 per annum.—Mr. Alex. Hosken, borough surveyor.

TEMPORARY TOWN PLANNING ASSISTANT.—August 23rd.—Corporation of Northampton. £2 per week.—Mr. Alfred Fidler, borough engineer.

ASSISTANT.—August 23rd.—Temporary town planning assistant in Northampton borough engineer's office. £2 per week.—Mr. A. Fidler, borough engineer, Guildhall, Northampton.

HIGHWAY SURVEYOR.—August 24th.—Watford Urban District Council. £150—£180.—Mr. W. Hudson, clerk.

ASSISTANT SURVEYOR.—August 26th.—Ilkley Urban District Council. £70 per annum.—Mr. F. S. Eckersley, clerk.

GENERAL WORKING FOREMAN.—August 26th.—Milton Regis Urban District Council. 27s. per week.—Mr. J. Dixon, junr., clerk.

ROAD FOREMAN.—August 29th.—Barnstaple Rural District Council. 25s. per week.—Mr. R. E. C. Balsdon, clerk, 109 Boutport-street, Barnstaple.

INSPECTOR OF NUISANCES.—August 29th.—Barnstaple Rural District Council. £100 per annum.—Mr. R. E. C. Balsdon, clerk.

ASSISTANT WATERWORKS ENGINEER.—August 31st.—Corporation of Madras. £26 13s. 4d. per mensem, and allowance for motor bicycle.—Messrs. James Mansergh & Sons, agents, 5 Victoria-street, Westminster, London, S.W. Envelopes to be superscribed "Waterworks Assistant."

SURVEYOR AND INSPECTOR.—August 31st.—Barton-on-Humber Urban District Council. £90—£100.—Mr. G. H. Nowell, clerk. Envelope to be endorsed "Inspector and Surveyor."

JUNIOR ASSISTANT.—August 31st.—Corporation of Bolton. £70 per annum.—Mr. Samuel Parker, town clerk.

ASSISTANT ENGINEER.—August 31st.—Darjeeling Municipality, India. 150 rupees monthly.—The Chairman.

ARCHITECTURAL ASSISTANT.—September 2nd.—Hereford County Council. £150 a year.—Mr. G. H. Jack, county surveyor.

CHIEF ENGINEER AND COUNTY SURVEYOR.—October 7th.—London County Council. £2,000.—Sir Laurence Gomme, clerk.

ASSISTANT SURVEYOR.—In public department, North of England. £75 per annum.—Box 1,178, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

ASSISTANT SURVEYOR OF ROADS.—No date.—For the Public Works Department of the Gold Coast Government. £300—£350, and allowances.—Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W. Quote M 5497 on left-hand top corner of application.

MUNICIPAL COMPETITIONS OPEN.

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ST. AUSTELL.—August 22nd.—For plans and maps of all sewers and connections, together with water main and branch pipes and connections in the district, for the rural district council.—Mr. J. Stephens, clerk.

GOOLE.—September 1st.—Competitive designs and estimates for municipal offices, for the urban district council. Two premiums (£30 and £15).—Mr. R. Tyson, clerk.

CHORLEY.—September 9th.—Designs for a school, for the corporation.—Mr. J. Mills, town clerk.

LLANELLY.—September 30th.—Competitive designs and estimates for school buildings for over 1,000 children, also domestic subjects centre, for the Education Committee.—Mr. G. E. Halliday, F.S.A., F.R.I.B.A., Castle-street, Cardiff, will act as assessor and award premium.—Mr. I. W. Watkins, clerk, Education Offices, Coleshill-terrace, Llanelly.

WANDSWORTH.—October 14th.—Competitive designs for public swimming bath at Balham.—Mr. P. Dodd, borough engineer, 215 Balham High-road, S.W.

GLASGOW.—October 29th.—Preliminary sketch designs are invited by the corporation for the extension of the municipal buildings. Honorariums of 100 guineas to five selected designs.—Mr. John J. Burnet, A.R.S.A., 239 St. Vincent-street, Glasgow, is assessor.—Applications to the clerk, Mr. J. Lindsay, town clerk.

HUDDERSFIELD.—October 31st.—Designs for laying out certain areas as a town planning scheme, for the corporation. Premiums of 100, 50, and 25 guineas.—Mr. J. Henry Field, town clerk.

MUNICIPAL CONTRACTS OPEN.

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Buildings.

SOUTHEND.—August 17th.—For the erection of a lodge and refreshment-room, for the corporation.—Mr. E. J. Elford, borough engineer and surveyor.

BANDON.—August 17th.—For building seventeen cottages, for the rural district council.—Mr. A. Hynes, clerk.

MONMOUTH.—August 19th.—For the erection of a school, arts centre, and extensions, for the Education Committee.—Mr. J. Bain, F.R.I.B.A., county council offices, Newport.

KENT.—August 19th.—For extensions to school building, for the Education Committee.—Mr. A. Seymour Baskett, 46 High-street, Sheerness.

HANTS.—August 19th.—For the erection of a classroom, for the county council.—Mr. A. L. Roberts, architect to the Education Committee, The Castle, Winchester.

KINSALE.—August 21st.—For building cottages and other works, for the rural district council.—Mr. J. Murphy, clerk.

HANTS.—August 21st.—For repairs, decoration, redrainage and conversion works, for the county council.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

RAWTENSTALL.—August 22nd.—For the erection of cottages, for the corporation.—Mr. J. Johnson, borough surveyor.

WHITBY.—August 23rd.—For building a stone bridge, for the rural district council.—Mr. A. E. Young, architect and surveyor, 77 Baxtergate, Whitby.

KINGLASSIE.—August 23rd.—For the erection of a school, for the School Board.—Mr. R. Small, clerk, Town House, Lochgelly.

MANCHESTER.—August 24th.—For repairs to various bridges, for the corporation.—Mr. Thomas Hudson, town clerk.

DUBLIN.—August 26th.—For the erection of stables, for the corporation.—City Architect.

GATESHEAD.—August 26th.—For the erection of entrance lodge at cemetery, for the corporation.—Mr. N. P. Pattinson, borough engineer.

BUILTH WELLS.—August 28th.—For the erection of a fire station, for the urban district council.—Mr. T. Smith, town surveyor.

ESSEX.—August 28th.—For widening St. Stephen's Bridge, at Coggeshall, for the county council.—Mr. Percy J. Sheldon, county surveyor.

ESSEX.—August 28th.—For widening Springfield Bridge, at Chelmsford, for the county council.—Mr. Percy J. Sheldon, county surveyor.

CHELMSFORD.—August 28th.—For the extension of the fire engine station, for the corporation.—Mr. W. Smith, town clerk.

HERTS.—August 29th.—For alterations and additions at a public school, for the Education Committee.—Mr. Urban A. Smith, county surveyor.

NORTHWICH.—August 29th.—For the erection of baths and wash-houses, for the urban district council.—Mr. J. A. Cowley, clerk.

PORTLAND.—August 29th.—For the erection of a pumping station and cottage, for the urban district council.—The Clerk.

TIPTON.—August 31st.—For building engine and boiler house, for the urban district council.—Mr. S. O. Stephenson, engineer, Gasworks.

HYDE.—August 31st.—For building public hall and police courts, for the corporation.—Mr. J. Diggle, borough surveyor.

MINEHEAD.—September 1st.—For building a convenience and cloak-room, for the urban district council.—Mr. L. C. Webber-Incledon, clerk.

HACKNEY.—September 2nd.—For extension to electricity works, for the borough council.—Mr. W. A. Williams, town clerk.

WEST RIDING.—September 6th.—For the erection of two new schools, for the Education Committee.—Mr. Francis Alvey Darwin, clerk, County Hall, Wakefield.

OLDHAM.—No date.—For the erection of a brick boundary wall, and other works, for the corporation. —Mr. J. H. Hallsworth, town clerk.

Iron and Steel.

KEIGHLEY.—August 17th.—For the supply of 645 tons of cast-iron pipes and special castings, for the town council.—Mr. M. R. Barnett, engineer.

GLASGOW.—August 17th.—For providing and erecting the steel plate girders, foot or cover plates, and cross-girders required for two bridges to carry the new mains from Craigmaddie to the city over the Kelvin Valley Railway and over the river Kelvin, for the corporation.—Mr. J. Lindsay, town clerk.

COPENHAGEN.—August 20th.—For the supply of cast-iron piping, for the waterworks authorities.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

HOVE.—August 21st.—For constructing dwarf wall piers and cast-iron railing, for the corporation.—Mr. H. Endacott, town clerk.

AXBRIDGE.—August 22nd.—For laying cast-iron water pipes, for the rural district council. — Mr. William Reece, clerk.

BLACKBURN.—August 24th.—For the supply of castings and valves, for the corporation.—Mr. W. Stubbs, borough engineer.

MANCHESTER.—August 24th.—For the supply of one Lancashire boiler, with superheater, mechanical stoker, fuel economiser, and steam and feed pipes, and two sets of vertical steam pumping engines, for the corporation.—Mr. Thomas Hudson, town clerk.

SWINDON. — August 24th. — For the supply of wrought-iron fence, gate and posts, for the corporation.—Mr. R. Hilton, town clerk.

Roads.

BIRMINGHAM.—August 19th.—For laying wood and granite paving, for the corporation.—City Engineer.

GLASGOW.—August 19th.—For paving works with compressed rock asphalt, for the corporation.—Mr. J. Lindsay, town clerk.

ISLE OF WIGHT.—August 21st.—For the supply of 2,300 tons of quartzites, basalts, syenites or granites, for the rural district council.—Mr. H. Eldridge Stratton, clerk.

NEWPORT (Isle of Wight).—August 21st.—For the supply of quartzites, basalts, syenites or granite, for the rural district council.—The Clerk.

DROYLSDEN.—August 21st.—For private street works, for the urban district council.—Mr. Charles Hall, surveyor.

HERNE BAY.—August 21st.—For making up and paving, for the urban district council.—Mr. F. W. J. Palmer, surveyor.

STOCKPORT.—August 22nd.—For making up works, for the corporation.—Mr. J. Atkinson, borough surveyor.

BURNLEY.—August 24th.—For paving and making up, for the rural district council.—Mr. H. Prichard, surveyor.

HARROGATE.—August 26th.—For drainage and road-making works at the cemetery, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor.

ALTOFTS.—August 26th.—For the construction of a new footpath, for the urban district council.—Mr. A. E. Greaves, clerk.

SOUTH SHIELDS.—August 28th.—For repaving certain streets with granite setts, for the corporation.—Mr. Leslie Roseveare, borough engineer and surveyor.

BASINGSTOKE.—August 28th.—For work of steam road-rolling, for the rural district council.—Mr. H. Wills Chandler, clerk.

NEWHAVEN.—August 29th.—For the supply of flake granite or broken Kentish ragstone, for the rural district council.—Mr. H. W. Coupe, clerk.

CHICHESTER.—August 29th.—For making up with granite macadam about 10,000 super. yds. of London-Portsmouth road, for the corporation.—Mr. J. W. Loader Cooper, town clerk.

CASABLANCA.—August 29th.—For the improvement of several roads, for the Special Committee of Public Works.—The President, Comité Special des Travaux Publics, Dar En Niaba.

SALTASH.—August 29th.—For works of making up and widening, for the urban district council.—Mr. F. E. Cleverton, town clerk.

EAST BARNET.—August 29th.—For the supply of broken granite, gravel, hoggin, Portland cement, stoneware pipes, tar-paving materials, oats, hay, straw, horse hire and cartage, for the urban district council.—Mr. T. A. Buckley, clerk.

CLAYTON-LE-MOORS.—August 31st.—For granite kerbing and paving, for the urban district council.—Mr. A. Dodgeon, surveyor.

DORKING.—August 31st.—For surfacing with slag tar-macadam, for the urban district council.—Mr. W. A. Clegg, borough surveyor.

CASABLANCA.—August 31st.—For the construction of public roads, for the Moroccan Adjudications Commission.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

SAFFRON WALDEN.—August 31st.—For the supply of granite macadam, for the corporation.—Mr. A. H. Forbes, borough surveyor.

LOUGHTON.—August 31st.—For the supply of granite, gravel and hire of steam roller, for the urban district council.—Mr. H. White, surveyor.

SANDWICH.—September 2nd.—For the supply of granite, granite chippings and channelling, for the corporation.—Town Clerk.

SUNBURY-ON-THAMES. — September 2nd. — For steam rolling and scarifying, for the urban district council.—Mr. H. F. Coales, surveyor.

BROMLEY.—September 2nd.—For the hire of a steam roller, for the rural district council. — Mr. Edward Haslehurst, clerk.

BROMLEY.—September 2nd.—For the supply of road materials, carting and team labour, for the rural district council.—Mr. Edward Haslehurst, clerk.

SOUTHEND-ON-SEA.—September 6th.—For road and formation works in connection with the construction of a boulevard 1¾ miles in length and 100 ft. wide, for the corporation.—Mr. H. J. Worwood, town clerk.

HANWELL.—September 7th.—For wood paving a portion of Boston-road, for the urban district council. —Mr. Percy Scott, clerk.

RABAT (Tangier).—September 10th.—For the construction of two roads, for the Special Committee of Public Works.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

Sanitary.

DISLEY.—August 17th.—For the construction of sewers, for the rural district council.—Mr. E. N. Davenport, clerk, Park Chambers, Vernon-street, Stockport.

GOOLE.—August 17th.—For scavenging work, for the rural district council.—Mr. G. England, clerk.

YEARDSLEY-CUM-WHALEY.—August 17th.—For the construction of sewers, for the urban district council.—Mr. S. Taylor, clerk, 9 Terrace-road, Buxton.

MACCLESFIELD.—August 17th.—For the construction of sewers, for the rural district council.—Mr. F. May, clerk.

HALIFAX.—August 17th.—For the construction of cast-iron pipe sewer and appurtenances, for the Highways Committee.—Mr. J. Lord, borough engineer.

ROMFORD.—August 19th.—For the construction of surface-water drains and sewers, for the rural district council.—Mr. W. J. Grant, surveyor.

BRADFIELD.—August 19th.—For the supply of air-compressing machinery in connection with the main sewerage works of Pangbourne, for the rural district council.—Mr. R. E. Rawstorne, clerk.

BLEAN.—August 19th.—For the removal of house refuse, for the rural district council.—Mr. J. E. Burch, clerk, 39 Castle-street, Canterbury.

CLAYTON.—August 19th.—For the construction of 288 yds. of 9-in. sewers, for the urban district council. —Mr. Benjamin Ashton, clerk.

CHAPEL-EN-LE-FRITH.—August 20th.—For the construction of new sewers, for the rural district council.—The Clerk.

ISLE OF WIGHT.—August 21st.—For laying pipe sewer and construction of sedimentation tanks, for the rural district council.—The Clerk.

ASHINGTON.—August 22nd.—For cleansing ash-pits and privies, for the urban district council.—Mr. C. Alderson, clerk, Morpeth.

WROTHAM.—August 24th.—For emptying cesspools, for the urban district council.—Mr. H. E. Ryle, clerk.

CHORLEY.—August 24th.—For emptying privies and cesspools, for the rural district council.—Mr. R. E. Aspden, clerk.

RAWMARSH.—August 26th.—For laying stoneware pipes and constructing manholes, for the urban district council.—Mr. J. W. Bellamy, clerk.

TENDRING.—August 26th.—For the removal of refuse, for the rural district council.—Mr. A. J. H. Ward, clerk.

SANDOWN.—August 30th.—For laying a stoneware-pipe sewer, for the urban district council.—Mr. R. Jones, clerk.

CHELTENHAM.—August 31st.—For the construction of nine combined circular sewage tanks in three sets, and eight percolating filters 101 ft. in diameter, with roads, drains, and conduits, for the corporation. —Mr. J. S. Pickering, borough engineer.

ST. COLUMB MAJOR.—August 31st.—For constructing sewers and underdrains, and laying out irrigation ground, for the rural district council.—Mr. Chas. E. Whitford, clerk.

BRADFORD.—September 3rd.—For the erection of twenty-eight sludge filter presses at Esholt, for the corporation.—Mr. Frederick Stevens, town clerk.

FAREHAM.—September 3rd.—For scavenging work, for the rural district council.—Mr. A. Laker, clerk.

WALMER.—September 4th.—For the construction of concrete tube and stoneware sewers and surface-water drains, for the urban district council.—Mr. F. W. Hardman, clerk.

TREDEGAR.—September 9th.—For the construction of subsidiary sewers, comprising about 23¾ miles, of 6-in., 9-in., 12-in., and 18-in. pipe sewers, with 800 manholes, for the urban district council.—Mr. H. J. C. Shepard, clerk.

ANDOVER.—September 21st.—For the construction of screen chamber, engine house, suction tank, 9-in. rising main, circular bacteria beds, and erection of cottage, for the corporation.—Mr. T. E. Longman, town clerk.

LEWES.—September 24th.—For the construction of main intercepting sewers and sewage disposal works, comprising screen chambers, buildings, settlement and storm tanks, tidal storage tanks, sludge drying beds, and low-level pumping station, for the corporation.—Mr. Montague S. Blaker, town clerk.

BRADFORD.—October 9th.—For the construction of circular outfall sewer in tunnel, and two shafts, for the corporation.—Mr. Frederick Stevens, town clerk.

Northumberland Roads.—The county surveyor, Mr. J. A. Bean, in his annual report, states that the expenditure for the year ended March 31st last, in the maintenance of 616¾ miles of main and subsidised roads in Northumberland, was £57,097, against £57,057 in the previous year. The cost per mile during the past five years has been as follows: Year ended March 31, 1908, £85 9s. 2d.; 1909, £81 6s. 4d.; 1910, £92 13s. 5d.; 1911, £92 10s. 8d.; 1912, £92 11s. 11d. The year ended March 31, 1912, was the first year in which the council had received a grant from the Road Board towards the main roads of the county. The amount received was £8,500, of which sum £6,925 was spent, the balance of £1,575 being brought forward to the current year. The council had ascertained from the Road Board their precise specification for road making, and the principle was precisely similar to the one adopted by the council with the exception that sand was added for the purpose of preventing the tar coming to the surface in hot weather. This had been adopted, and it was hoped would be effective. The report added that the year had been a good one for tar-grouting roads.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ATCHAM.—For the construction of 5,100 yds. of sewer, for the rural district council.—Mr. H. Asher, surveyor:—

P. & W. Edwards, Shrewsbury	£2,640
W. Higley, Selsop	2,163
G. P. Treatbass, Birmingham	2,119
J. Price, Shrewsbury*	1,940

Surveyor's estimate, £1,859.

BROADSTAIRS.—For granite kerbing and channelling, for the urban district council:—

W. Griffiths & Co., London	£313
Brooks, Limited	309
A. B. Manuel, London	301
Wettern Brothers	297
United Stone Firms	291
Tilbury Contracting Company	281
J. Gordon & Sons	271
J. R. White & Co.	268
Cooper & Co., London	264
G. W. Wood, Dover	264

BYSHOTTES.—For laying sanitary pipes and manholes, for the urban district council.—Mr. A. A. Luxmore:—

J. Carrick, Durham	£100
J. Robson & Son, Esh Winning	100
Wood Brothers, Brandon Colliery	81
G. A. Reevell, Stockton-on-Tees	80
Walton Brothers, Crook	73
J. W. Henderson, Newcastle-on-Tyne	71
R. Parkinson, Waterhouses*	68

CHESTER-LE-STREET.—For making-up certain streets at Fatfield, for the rural district council:—

H. Ellison, Limited, Redcar	£1,320
Rule, Hadfield & Co., Limited, Sunderland	1,082
J. Robson, Heaton	1,071
H. Meredith, Durham	1,104
Clery & Charlton, Sunderland	999
J. McLaren, junr., Gosforth	982
J. W. Henderson, South Gosforth	973
G. Armstrong, Whitley Bay	949
J. Clark & Son, New Seaham	936
G. Dyson, Pelton Lane Ends*	933

EASTBOURNE.—For carrying out improvement works, for the corporation.—Mr. A. E. Prescott, borough surveyor:—

A. J. Bessant, Eastbourne	£366
C. P. Dennis & Co., Eastbourne	357
J. M. Vine, Eastbourne*	302

HOVE.—For paving and other works, for the corporation.—Mr. H. H. Scott, borough surveyor:—

Modena-road.—McKellar & Westerman, Hove, £173.
Lyndhurst-road. J. Parsons & Sons, Hove, £173.
For painting the external wood and ironwork of the Public Library.—McKellar & Westerman, Hove, £21.

HOVE.—For constructing new sewer, for the corporation.—Mr. H. H. Scott, borough surveyor:—

G. Bell & Son, Limited, Tottenham, £7,344.

LLEYN.—For the construction of a bridge, for the rural district council:—

E. Williams, Pwllheli, £254.

SKIPTON.—For making-up several streets, for the urban district council.—Mr. A. E. W. Aldridge, surveyor:—

Morley & Sons, Keighley.
Ward Brothers, Skipton.

ST. ANNES-ON-THE-SEA.—For making up certain streets, for the urban district council.—Mr. H. Gregson, surveyor:—

Knowles-road, Links Gate and St. Thomas'-road.—M. Atkin, Lytham.*
Eden-street, Darwen-street and Avon-street.—J. Heap, Great Harwood.*
H. Worthington, Limited, Manchester.
F. Hayes, Liverpool.
E. Taylor, Blackpool.
F. Harrop, St. Annes-on-the-Sea.
J. Farrell, Blackpool.
W. Snape & Sons, Manchester.

STAMFORD.—For the erection of a swimming bath, for the corporation.—Mr. F. R. Ryman, engineer:—

Roberts Brothers, Stamford	£1,050
Hinson & Co., Stamford	985
J. W. Rouse, Stamford	974
J. Peasgood, Stamford	950
E. E. Howes, Stamford*	830
E. Nelson, Stamford	818

STOCKPORT.—For street-making work, for the corporation.—Mr. J. Atkinson, borough surveyor:—

Broadstone-road.—P. D. Hayes & Sons, Stockport, £2,144.
Athens-street group.—J. Briscoe, Stockport, £2,268.

SUNBURY-ON-THAMES.—Accepted for the supply of granite, for the urban district council.—Mr. H. F. Coales, surveyor:—

Granite.—Rowe & Mitchell, London, 14s. per ton.
Tar-macadam.—J. Oakes & Co., Alfreton, 17s. 10d. and 18s. 4d. per ton.
Flints.—Cremer, Goodenough & Co., Limited, Faversham, 5s. 8d. per yard.

WILTS.—For the reconstruction of North Tidworth Bridge, Salisbury Plain, for the county council.—Mr. J. G. Powell, county surveyor:—

	Brickwork.	Reinforced concrete.
Bourne & Jenkinson, Andover	£607	£620
F. Burton, Durrington	515	530
W. Harris, Bulford	539	500
Grace & Sons, Ludgershall	441	459
Sturgess Brothers, Appleshaw	455	450
Isley & Co., Trowbridge	402	438†

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

SEPTEMBER.

18-21.—Annual Congress of the Sanitary Association of Scotland, at Montrose.

25-27.—Municipal Tramways Association: Annual Conference at West Ham.

APPOINTMENTS OPEN.

WATFORD URBAN DISTRICT COUNCIL.
HIGHWAY SURVEYOR.

The Council is prepared to consider applications for the position of Highway Surveyor to act under the instructions of the Engineer and Surveyor to the Council, at a salary of £150 per annum, rising by annual increments of £10 to a maximum of £180.

Forms of application, and the terms and conditions attaching to the appointment, may be had of the undersigned, to whom applications, with copies of three testimonials, must be sent in not later than 12 noon on **Saturday, 24th August, 1912.**

Canvassing any member of the Council, either directly or indirectly, will disqualify.

W. HUDSON,
Clerk and Solicitor.

Council Offices,
14 High-street,
Watford, Herts.
August 6, 1912.

MADRAS CORPORATION, INDIA.
WANTED: ASSISTANT WATERWORKS ENGINEER.

The President, Corporation of Madras, invites applications for the Appointment of a Waterworks Assistant to the Special Engineer (J. W. Madeley, Esq., M.A., M.INST.C.E., M.AM.SOC.C.E., &c.).

The duties will be to assist the Special Engineer in the design, construction and maintenance of works connected with the Water Supply Distribution System of the City of Madras, especially cast-iron main laying and the installation and working of waste-water meters.

The salary will be Rs.400 (£26 13s. 4d.) per mensem. An allowance of Rs.30 (£2) per mensem will be paid to the Officer appointed so long as he maintains and uses on the work a first-class motor bicycle in good running order. No other allowance of any kind will be made.

Before sailing for Madras, the successful candidate will be required to sign a three years' agreement to be prepared by the Corporation. By mutual consent the appointment may be extended for a further period.

The Corporation reserves the right to determine the appointment at any time by three months' notice in writing or by payment of one month's salary.

The Officer appointed will be allowed ordinary first-class railway fares and second-class steamship passage to Madras, *viâ* Marseilles and Bombay, by P. and O. steamer. A like class return free passage will be granted on the termination of the appointment, subject to satisfactory service according to the conditions of the agreement. Half-pay will be granted on the voyage out from the date of leaving England.

Leave will be granted on full pay to the extent of one month for every eleven months of active service, but for not more than three months at a time.

Preference will be given to candidates who have had experience in the design and maintenance of water-pipe distribution systems, including detection and prevention of waste by waste-water prevention meters, stethoscopes and other means.

Applicants must not be more than 35 years old, and copies of certificates of age, testimonials and medical certificate of fitness for service in India must be enclosed with the applications, which must reach the undersigned *not later than* 31st August, 1912.

The applications will be sent out to Madras, where the selection will be made by the President of the Corporation.

The President reserves the right of rejecting all applications without giving reasons.

The Officer appointed will be required to commence his duties in Madras not later than eight weeks after he has received notification of the acceptance of his application.

Applications must be in writing, and should be sent to the undersigned in envelopes superscribed "Waterworks Assistant."

JAMES MANSERGH & SONS.
Agents to the Corporation of Madras.

5 Victoria-street,
Westminster,
London, S.W.
August 7, 1912.

ILKLEY URBAN DISTRICT COUNCIL.
APPOINTMENT OF ASSISTANT SURVEYOR.

The Council invite applications for the appointment of an Assistant to act under the direction and supervision of their Surveyor.

Applicants should possess a thorough knowledge of building construction, and be able to accurately level and survey.

Preference will be given to those candidates who have had previous experience in the Surveyor's Department of a local authority.

Salary £70 per annum, payable monthly.

Applications, in Candidate's own handwriting, stating age, qualifications and experience, and accompanied by copies of three testimonials of recent date, to be sent so as to reach the undersigned not later than 12 o'clock noon on Monday, the 26th August instant, endorsed "Assistant Surveyor."

Canvassing, directly or indirectly, will positively disqualify.

(By order)
F. S. ECKERSLEY,
Clerk of the Council.

Town Hall, Ilkley.
August 7, 1912.

COUNTY OF HEREFORD.
ARCHITECTURAL ASSISTANT.

Applications are invited for the post of Chief Architectural Assistant in the County Surveyor's Offices at Hereford.

Applications, marked "Assistant," together with three original testimonials (which will be returned), to be addressed to J. R. Symonds, Esq., County Clerk, Shirehall, Hereford, and delivered not later than noon on Monday, September 2nd, 1912.

Candidates must not be more than 30 years of age, and must give evidence of training and experience in Architects' Offices.

The person appointed must have had experience in the design and construction of Secondary and Elementary Schools, and be well versed in—

1. The preparation of working drawings and details.
2. Specifications and estimates for builder's work.
3. Surveying and levelling.
4. Measuring completed work.

Salary £150 per annum, with travelling expenses.

The appointment to be determined by one month's notice on either side.

Preference will be given to Candidates who have gained experience in County Architects' Offices.

(By order)
G. H. JACK,
County Surveyor.

Shirehall, Hereford.
August 10, 1912.

MILTON REGIS URBAN DISTRICT COUNCIL.

The above Council invite applications for the Appointment of General Working Foreman, who must devote all his time to the duties of the office. Commencing wage 27s. per week. Practical experience in the Construction, Maintenance and Cleansing of Roads and Sewers, and Supervision of Labour is essential.

Applications, in candidate's own handwriting, stating age, accompanied by copies of three testimonials, and endorsed "General Foreman," to be delivered to the undersigned on or before Monday, the 26th August, 1912.

Canvassing will disqualify.

JOHN DIXON, JUNR.,
Clerk to the Council.

Town Hall, Milton Regis, Kent.
August 13, 1912.

COUNTY BOROUGH OF NORTHAMPTON.

Applications are invited for the post of Temporary Town Planning Assistant in the Borough Engineer's Department. Salary £2 per week.

Applications, endorsed "Temporary Assistant," stating age, qualifications and experience, accompanied by copies of three recent testimonials, to be delivered to the undersigned not later than Friday, August 23rd, 1912.

ALFRED FIDLER, M.INST.C.E.,
Borough Engineer.

Borough Engineer and Surveyor's Office,
Guildhall,
Northampton.
August 3, 1912.

ASSISTANT SURVEYOR OF ROADS required by the Gold Coast Government for the Public Works Department for two tours, each of 12 months' residential service, with possible extension. Age between 25 and 40, preferably unmarried. Strict medical examination and vaccination if necessary.

Salary £300 a year, rising to £350 by annual increments of £10. Whilst actually performing the duties of the office in the Colony a commuted allowance of £7 10s. a month will be paid in lieu of travelling, lodging, and all other allowances.

Free first-class passage out and home again on satisfactory termination of engagement. Half salary on voyage out, full salary from date of arrival in the Colony.

Two months' leave on full pay after 12 months' tour, increased to 4 months if returning to the Colony, with full pay during voyage or voyages and free passages.

Candidates should have received a good technical education, and have had experience similar to that obtained in a large Municipal Engineer's Office, or in the Office of an Engineer in good general practice. They should have had experience in road surveying in a tropical country, or on railway surveying in this country, and be experienced in the design and construction of large engineering works, including concrete, preferably reinforced, and steel construction, in the preparation of plans, specifications, bills of quantities and estimates, and be proficient in the use of surveying instruments, including the mining dial.

They should also be well up in building construction.

Application by letter (no special form required), stating age, whether married or single, giving full particulars of experience, accompanied by copies of testimonials (not originals), with names and addresses of referees of whom enquiries can be made as to capabilities and character, should be sent as soon as possible to the Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W.

Quote M 5497 on left-hand top corner of application.

COUNTY BOROUGH OF BOLTON.

The Corporation are prepared to receive applications for the position of a Junior Assistant with Municipal experience in the Borough Engineer and Surveyor's Department.

Salary commencing at £70 per annum.

Applications, in candidate's own handwriting (endorsed "Junior Assistant"), stating age, qualifications, and experience, together with copies of three testimonials of recent date, which will not be returned, to be delivered to the undersigned not later than the 31st August, 1912.

Canvassing, directly or indirectly, will be considered a disqualification.

SAMUEL PARKER,
Town Clerk.

Town Hall, Bolton.
August 14, 1912.

EAST SUFFOLK COUNTY COUNCIL.

Wanted, in the Office of the County Road Surveyor, a Surveyor's Account Clerk. Salary £90 per annum, rising for approved service to £120 per annum.

Applicants must have a good knowledge of book-keeping and be quick and accurate at figures.

Applications, stating age and experience, and accompanied by copies of not more than three recent testimonials, to reach me here on or before the 22nd August, 1912.

A. TOWNSHEND COBBOLD,
Clerk of the County Council.

County Hall, Ipswich.
August 9, 1912.

ASSISTANT required, temporary; experience in Sewerage and Tidal work essential; A.M.I.C.E.—Apply, stating salary required, J. P. Wilkinson & Son, 301 Cathedral-street, Manchester.

MISCELLANEOUS.

FOR SALE.—Bound Volumes, 17 to 30 inclusive, of The Surveyor.—Cash offers to Box 1,179, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

(Continued on p. xxii.)

EX-PUPILS AND ASSISTANTS.

BACHELOR IN ENGINEERING of Dublin University, 3½ years' experience of design and construction of buildings, and sewerage and water schemes, good testimonials, desires situation in municipal or private office.—Alpha, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

(Continued on p. xxvi.)

TENDERS WANTED.

BROMLEY RURAL DISTRICT COUNCIL.

MATERIALS FOR ROADS.

TEAM LABOUR.

The Bromley Rural District Council invite Tenders for the Supply of Road Materials required during the year ending the 30th September, 1913, and for Carting of Materials and Team Labour during the same period, in respect of the under-mentioned Parishes:—

Chelsfield,	Mottingham,
Cudham,	North Cray,
Downe,	Orpington,
Farnborough,	St. Mary Cray.
Hayes,	St. Paul's Cray,
Keston,	West Wickham.
Knockholt,	

Separate Tenders must be made in respect of each item as separately numbered on the Form of Tender relating to each Parish.

Tenders to be delivered to me, prepaid, not later than twelve noon on Monday, the 2nd September, 1912.

Forms of Tender may be obtained at the Offices of the Council as stated below, and no other Forms will be accepted. Tenders received after 12 noon on the 2nd day of September, 1912, will not be entertained.

The lowest or any Tender will not necessarily be accepted.

(By order)
EDWARD HASLEHURST,
Clerk to the Council.

Council Offices,
Park House,
Bromley, Kent.
August 12, 1912.

BROMLEY RURAL DISTRICT COUNCIL, KENT.

HIRE OF STEAM ROLLER.

Tenders are invited for the Supply of a Steam Roller on Hire.

Forms of Tender may be obtained from the undersigned, and should be returned to me, duly completed, and endorsed "Steam Roller," not later than Monday, the 2nd September, 1912.

(By order)
EDWARD HASLEHURST,
Clerk to the Council.

Council Offices,
Park House,
Beckenham-lane,
Bromley, Kent.
August 12, 1912.

HAMPTON URBAN DISTRICT COUNCIL.

STEAM COAL.

The above Council invite Tenders for the Supply of Best Welsh Double-screened Steam Coal, as may be required for the ensuing year, in trucks at Hampton Station (L. and S.W. Railway).

Forms of Tender, Conditions, and all particulars can be obtained of the undersigned, at the offices of the Council, where the Tenders, duly filled up, must be delivered, sealed and endorsed "Tender for Steam Coal," not later than 4 p.m. on Monday, the 2nd September, 1912.

Dated this 10th day of August, 1912.

(By order)
SIDNEY H. CHAMBERS,
Surveyor.

Public Offices,
Hampton, Middlesex.

The Surveyor

And Municipal and County Engineer.

Vol. XLII. AUGUST 23, 1912. No. 1,075.

Minutes of Proceedings.

Specifications for Carriageways.

Whatever opinions different engineers may hold as to the form which a specification should take for any particular kind of work, nearly all will agree that in the case of a road it is very difficult to make a covering specification without liberal use of such expressions as "to the satisfaction of the engineer," while, on the other hand, it is seldom that a specification of a full and detailed character can be drawn up so that with little variation it may be applicable to a considerable number of works in any area of moderate size, or coming within the experience of any individual. It is therefore with much pleasure that we draw the attention of road engineers to the "Suggested Clauses to be included in a Specification for a Bituminous Bound Carriageway," drawn up by Mr. J. S. Brodie, M.INST.C.E., and presented at the recent annual general meeting of the Institution of Municipal and County Engineers. Every engineer engaged in road construction or road reformation must draw up his own specification for each particular piece of work, but in the paper referred to Mr. Brodie supplies road engineers with a valuable guide as the *manner* in which the specification should be drawn up, as well as with definite suggestions as to the *matter* of each clause. As regards the method of expressing traffic intensity, it will be noted that Mr. Brodie favours the measure "tons per annum per lineal yard of width." This measure, it may be suggested, is less satisfactory on a country road than in a city street. On some country roads the traffic is well distributed over the width of the carriageway, while on others a large proportion of the traffic is concentrated near the middle, even when the carriageway, taking everything into consideration, is no wider than it ought to be. Assuming, however, that the width is about right, the traffic may be fairly measured in tons per annum, though the further suggestion may be made—and we make it now—that in either case the crude measure of traffic may be reckoned as affected by an intensity factor based partly on the extent to which traffic is concentrated on certain days, partly on the extent to which it is concentrated on the middle of the carriageway, and partly upon its destructive or its harmless character. If, for instance, we use a qualifying factor of ⅔ because the road is much used by traction engines, no one can deny that, whether this factor is right or whether it is wrong, we are nearer the truth than we should be if we took no account at all of this item of traffic except in tons per annum: a course, be it noted, which amounts to a definite statement that this traffic is not more destructive than other traffic to an extent that matters.

The road crust and foundation described in Mr. Brodie's clauses consist, it will be observed, of two separate layers, the lower one not less than 7 in. thick, and the upper of bituminous bound material 4 in. thick, the top of the foundation course being finished off in such a way that the other course rests upon it as a separate slab. While there are doubtless circumstances under which this type and these thicknesses are suitable, we are inclined to believe that practice will on the whole tend away from this particular type in two directions—that is, the upper layer will either be bonded into the foundation course so that the strength of the crust is that of a single crust of the full depth, or it will be somewhat reduced in thickness, becoming essentially a carpet layer on a sub-crust sufficiently thick and strong in itself to carry the loads imposed by the traffic. What is, however, at the moment a more important matter is the good example which Mr. Brodie sets in specifying a sub-crust of such a thoroughly sound character. As regards the upper crust, opinions differ not only with respect to the sizes of the metal which may be employed, but also as regards the extent to which these sizes should be mixed. As, however, Mr. Brodie specifies that the stone shall be spread immediately after mixing—the stone at 220 deg. Fahr. and the tar between 260 deg. and 280 deg. Fahr.—it is clear that the different sizes of stone will be fairly well jammed together in a crust built up in the way he describes, each of the upper crusts being partly within the voids of the course below it. We congratulate Mr. Brodie upon his "Suggested Clauses" and upon the judgment which he has shown in the remarks with which they are introduced to the notice of surveyors.

* * *

Wiltshire Roads.

As may be gathered from a perusal of the extracts which will be found on another page, there are some noteworthy passages in the annual report of Mr. J. George Powell, county surveyor of Wiltshire, who, like others of his profession, is wrestling with the problems presented by the increasing amount and severity of traffic on roads which were

developed to suit quite different conditions. Usually regarded as a part of Wessex, the county of Wiltshire merges, without any general or sudden change of character, into Hampshire on the south-east and Dorset on the south-west. Lying clear of the geologically patchy country to the west, it is shut off by the Mendips and the Cotswolds from the Severn estuary and the Bristol Channel; but if approached from the north-east it is found to be the last of a series of counties which are all traversed by a narrow belt of lower cretaceous strata, dividing each county into two parts, so that, like the counties of Cambridge, Bedford, Oxford and Berkshire, Wiltshire is divided by this narrow belt into an oölitic area to the north-west, and an upper cretaceous area to the south-east, the latter including Cranborne Chase, Salisbury Plain, and Savernake Forest. The character of the county is agricultural and pastoral, with no industrial areas within it or near it, and it is by no means a specially fertile country. It was not to be expected that such an area should have been found prepared for the new traffic conditions, for which the roads of some counties were less unfitted owing to the necessity for providing for traffic between manufacturing towns or that radiating from thickly-peopled and flourishing areas. It is also to be remarked that where large areas were almost wholly under pasture or were untilled land, all except a few of the main roads were sufficient for their purpose, even when of a very light character indeed, under conditions such as those of the 'seventies of last century; and it is not a matter for surprise that in Wiltshire, with its three acres per head of population, about 70 per cent of the roads were, up to 1877, made by annual additions of stone to ruts formed originally in the natural soil. Such roads, of course, were, and are, unsuitable for the reception of road crusts appropriate for the traffic of to-day, and while we hope that the resources of the Road Board during the next few years, and the relief afforded by each instalment of reconstruction, may go far to solve the more pressing problems which confront surveyors, we fully realise that it is by no means generally admitted that there is any solution in sight.

The fact that a considerable mileage of the Wiltshire roads is an oölitic limestone or chalk suggests that the county may offer a favourable field for the exercise of the policy of temporary starvation of roads, especially if carried out in some such manner as that which we suggested last week in reference to a similar problem in Herefordshire (see p. 225). The climate presents no special obstacles to maintenance by small constant repair, and the rainfall is moderate, being about 30 in., or a little more, over the greater part of the county. It is a little less than 30 in. over Salisbury Plain, and reaches about 35 in. near the Western border. Mean falls for twenty-nine years were: at an elevation of 319 ft. on Salisbury Plain, 28·56 in.; at Landford (167 ft.), 30·16 in., and at Ludgershall (422 ft.), 31·31 in.

* * *

A Proposed London Improvement.

A proposal for the construction of an important new street in the City of London has recently been put forward by Mr. Arthur Crow, one of the London district surveyors. Probably every one of our readers has some acquaintance with London, and those who have the bump of locality reasonably well developed will remember that there are two main west-to-east traffic arteries through central London: one the chain of streets termed Oxford-street, Holborn, Newgate-street, and Cheapside; and the other consisting of the Strand, Fleet-street, Ludgate-hill, and a portion of Cannon-street and Queen Victoria-street. These two arteries meet at the Bank, where several other important main streets serving the eastern part of London also converge. The result, of course, is a very great congestion of traffic at the Bank, which, if it were not for the wonderful system of control exercised by the City Police, would be a byword throughout Europe. The Government have recently erected new General Post Office buildings, and they now propose to pull down the old Post Office buildings in St. Martin-le-Grand, near the junction of Newgate-street with Cheapside, and to erect buildings for other Government purposes. The proposal now put forward is that the responsible authority, which is here the City Corporation, should, possibly with the financial aid of the London County Council, come to terms with the Government, by which a strip of the old Post Office site is given up to form the entrance to a proposed new street from Newgate-street to London-wall. If such a street were formed it would be possible for the whole of the traffic from the Oxford-street-Holborn route to go direct to Liverpool-street Station without having to pass through the congested traffic at the Bank, for the new street would strike the ordinary omnibus route at London-wall, some little to the north of the Bank. A further point in favour of the scheme is that about a quarter of a mile would be saved in the distance from Newgate-street to Liverpool-street.

The cost of an improvement of this nature would obviously be very large, and it is one of the anomalies of London government that here, in a matter which concerns all London, the authority with whom the initiative lies is a body having control of 1 square mile only of the 117 square miles that constitute the county area. But traffic improvements in the centre of London are very much needed, and it is essential that before very long some measures should be taken to reduce the ever-increasing volume of traffic at the Bank. It is to be hoped that, before new buildings are erected on the old Post Office site, the desirability of commencing to form a new street in the position proposed will be very seriously considered by the City Corporation.

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By-laws in Rural Districts.

The operating of building by-laws in rural districts is a question which has been attracting considerable attention of late; and the problem of building houses which can be erected at a reasonable and remunerative cost and which are at the same time fit for habitation in every respect and in accordance with the by-laws in force is one which experts have not found easy of solution. The subject is one which bristles with difficulties, and the paper by Mr. Halsey Ricardo, F.R.I.B.A., and the discussion which followed its reading at the York Congress of the Royal Sanitary Institute were of special value in drawing attention to certain questions of policy in regard to the modification of a model code. As Mr. Ricardo observed at the outset, the function of by-laws is not to check building operations, but to secure good building and to protect the public from the dangers to which they would be subjected if the jerry-builder were free to pursue his operations without supervision or restriction. It will be freely admitted that existing by-laws have in many cases produced a type of building which is far from ideal, but, on the other hand it must be borne in mind that they have checked an enormous quantity of radically bad work.

The chief argument which Mr. Ricardo advanced in favour of "treating each case on its merits under a set of general regulations" was that the enforcing of regulations to their logical extremities regardless of the local conditions and requirements results in harshness and absurdities. Inasmuch, however, as the model by-laws for rural districts only deal with the structure of buildings from the point of view of health and sanitation, this argument would not appear to be entirely applicable. It may be urged against the adoption of a rigid code that present-day knowledge in regard to sanitation—and particularly bacteriology is by no means complete, but this contention raises a point which is entirely different

in principle from that which is involved in the argument for elasticity or the exercise of a dispensing power in individual cases. If the advance of scientific knowledge and achievement justifies such a course, there would be no difficulty in recasting the by-laws to meet new circumstances of general application. On the whole, while fully appreciating the many points of interest raised by Mr. Ricardo, we hold to the view that the best interests of our rural populations are served by the enforcement of a rigid code of by-laws in regard to sanitation and construction so far as it relates to hygiene.

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Insects and Disease.

Following upon our recent observations in this column with regard to bacteria in refuse heaps and road dust, we give on another page extracts from an article by an American scientist upon the dissemination of disease by insects. From these it will be seen how closely the two subjects are connected and how necessary it is for the officials of sanitary authorities to recognise this fact and to act upon it. The description of the peculiar habits of flies and fleas is very interesting and may afford clues which would assist in solving some of the problems of the occurrence of typhoid in this country. We are personally acquainted with cases of typhoid where single members of two or three families in one road have had serious attacks of this disease, while none of the other members of the families were attacked, although they all lived under exactly the same conditions and consumed the same food and water. The medical authorities were unable to ascertain the exact source of infection, but, as a matter of course, the drains were taken up and reconstructed at considerable expense to the owners and much inconvenience to the occupiers. The drains were old, but not in a bad condition, and as in one instance only one member of a family of six was affected it is very much open to doubt whether the drains were responsible for the illness, even to a small degree.

It may be argued, on the lines recently suggested by Mr. E. Willis, engineer and surveyor to the Chiswick Urban District Council, that all were equally infected, but that the white corpuscles of five were in a healthy, efficient condition, while those in the one member of the family were weak and unable effectively to resist the inroads of the typhoid germs. Such a state of affairs is possible, but rarely likely to occur in a family of six persons all living under exactly similar conditions, and even less probable in several families living in the same neighbourhood. In our opinion there is much to be said in this instance for the theory of transmission by flies as described by Dr. Rucker, and, if it could have been proved that the illness was due to flies, then the expense and inconvenience of reconstructing the drains might have been avoided. In any case, in the absence of any serious defect in the drains, it might have been worth while to investigate the possibility of dissemination by flies before pulling up the drains.

Condition of Roads in Ireland.

The report of the Local Government Board for Ireland for the year ended March 31st last was submitted recently to the House of Commons. From this it appears that during that period thirty-six loans of a total amount of £61,459 were sanctioned to twelve county councils for the improvement of roads by steam-rolled coatings and seven loans of a total amount of £10,016 to seven county councils for steam-rollers and other modern appliances for road work. The system of maintenance of public roads by direct labour has been continued and extended by ten new schemes approved by the Board. In most of the counties which have adopted this system it is working well; but an inquiry held regarding the administration of direct labour in one county demonstrated that in order to secure satisfactory results supervision must be thorough and continuous, and that unless that is secured grave risk of loss arises in connection with the supply of materials. The new system necessarily increases the responsibilities of the county surveyor's staff, and it is regarded as most desirable that their whole time should, where possible, be secured for the public service. The Public Roads (Ireland) Act, 1911, received the Royal Assent during the year under review, and the Board issued a circular to road authorities drawing attention to its provisions. The Act contains new detailed provisions as to the construction and use of locomotives on highways; but its main provision, which is substantially the same as the corresponding English enactment, confers on a road authority power to recover from any person causing damage to a road by excessive weight of vehicles or extraordinary traffic the cost of making good such damage. Under the Act the Board are required to make regulations for certain purposes, and these are in course of preparation.

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Public Health in Johannesburg.

The biennial report of Dr. Charles Porter, the medical officer of health of Johannesburg, some account of which will be found in another column, is a document of surpassing interest inasmuch as it forms a record of the sanitary progress of a city whose growth and prosperity are one of the romances of British colonial enterprise. The supervision of the public health of a city whose population approaches 250,000 is, in any circumstances, a task of considerable magnitude, but it becomes quite exceptional in the case of a city like Johannesburg with the peculiar problems of a mixed population and a growth of feverish rapidity. The progress which is revealed by Dr. Porter's report is truly remarkable, and we may take the statistics in regard to typhoid and enteric fevers as an indication of what has been accomplished. The figures as to the former disease show a decrease in mortality of about 40 per cent, and a steady decline in the number of cases. As regards enteric, too, it is very satisfactory to observe that the prevalence of this disease during the period 1906–9 was 50 per cent less than in 1903–6, while the triennium 1909–11 showed a further decline of 41 per cent. Dr. Porter fairly points out that there is still considerable room for improvement, but, having regard to the peculiar local circumstances, the results are very encouraging and reflect great credit upon all who are immediately responsible for the public health of the city.

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Yeadon's Municipal Bazaar.

In these days when mankind is so alert to the main chance it occasions no surprise when a new method is invented for the purpose of raising the wind. Thus we read without strong emotion that the urban district council of Yeadon have decided to hold a municipal bazaar to further the movement for a much-needed street improvement. Such a project opens up quite an interesting vista of activity and enterprise to the municipal world, and not improbably to the municipal surveyor and his family circle. It lends a hitherto unsought objective to the familiar amusements and side-shows of the bazaar—to the lucky tub of dubious ethics, the deceptive collection of curiosities, the eccentric artistry of the gentlemen's bonnet-trimming competition, and last, but not least, to the heroic efforts of the ladies to accomplish the operation of fabricating a soap-dish. All this and much more of a merry and entertaining description will doubtless add to the gaiety of Yeadon, and the financial proceeds of its bazaar. The object is certainly a praiseworthy one, with nothing of narrowness of sectarianism in it, and, as the local rates are already 8s. in the £, it ought to appeal forcibly to the imagination of the ratepayers of every degree and class.

Institution of Municipal and County Engineers.

ANNUAL GENERAL MEETING IN LONDON.

Following the proceedings reported in last week's issue the subjoined paper was considered at the recent annual meeting of the Institution of Municipal and County Engineers.

SUGGESTIONS TOWARDS A STANDARD SPECIFICATION FOR BITUMINOUS-BOUND CARRIAGEWAYS.

By John S. Brodie M.Inst.C.E.
Borough Surveyor, Blackpool

Two most successful papers were read and discussed in another place a year ago by two of our esteemed members—*viz.*, Mr. J. Walker Smith and Mr. Henry Percy Maybury, M.M.Inst.C.E.—on highway construction and maintenance. At the same time the Road Board issued general directions and specifications (Nos. 1 to 6) relating to the tar treatment of roads. Both of these events were of the utmost importance to all who are engaged in the responsible duties of road surveyors, and the author was one of those who gladly availed himself of the information contained in the papers, and of the directions and specifications contained in the Road Board's issue, in revising his specifications both for new roads as well as for reconstructing and resurfacing existing roads in his district.

The following clauses and suggestions are submitted as a basis of discussion, in the hope that they may be found useful to surveyors having the responsibility for similar works, until a more complete experimental knowledge of the properties of materials suitable for road making is available, as it must be obvious to all that we are really at the beginning only of a sound and reliable appreciation of the various materials which should be used in road construction and maintenance so as to obtain the best economical results. In this connection it is with very great pleasure that we note the steps which it is understood are now being taken by the Road Board to accurately test, classify, and standardise materials and processes which may be found successful in road construction. It is the author's practice to carry out road construction both departmentally and also by expert road constructors working under contracts to construct certain lengths of roads to a specification, and to subsequently maintain the same for a certain number of years (usually five years) under financial guarantees.

Further, the author does not confine his invitations for tenders for work in accordance with his own specification only, but he also invites skilled and experienced road constructors to submit alternative general specifications prepared by themselves, including any proprietary articles, or special or patented processes with which their methods of construction may be associated, subject, of course, to guarantees for successful completion and maintenance for a period of years, the object being to secure the best possible results obtainable for a given financial expenditure.

It is, of course, obvious that, however desirable it may be to standardise our road specifications, regard must always be had to local and other conditions requiring special consideration and treatment. No hard-and-fast lines can be laid down applicable to roads in every part of the country, or indeed to every part of the same district. Thus, roads running east and west will require somewhat different treatment to those running north and south, as well as roads closely hemmed in by trees to those in open country. The nature of the subsoil, the gradients, the rainfall, the direction of the prevailing winds, and, above all, the suitability or otherwise of the local materials of construction and maintenance, will all require most careful consideration if the best results are to be attained. The nature and amount of traffic likely to pass over the road is one of the first things to be ascertained. Much attention has been recently given to this important subject, both in this country and in the United States.

The elaborate and accurate methods of enumerating traffic on highways as exemplified by one of our esteemed members, Mr. William Jones, Assoc.M.Inst.C.E., surveyor to Colwyn Bay Urban District Council, by Messrs. Blanchard and Patterson, of Providence, R.I.; and by Major Crosby, chief engineer to the States Roads Commission of Maryland, M.S., all of which have been reported in The Surveyor, are worthy of all praise for their painstaking accuracy. Although there is at present some difference of opinion in regard to the relative importance of the different kinds of traffic so far as the maintenance of the road is concerned, there is no doubt but that surveyors will sooner or later agree on a standardised system of enumerating traffic.

The author does not at present propose to further discuss this interesting subject, but will assume that, traffic data having been ascertained with more or less accuracy, it remains to express it in terms which will find common acceptance. Thus, instead of one surveyor expressing his traffic intensity in tons per day and another in tons per week, the author urges that traffic be always expressed in tons per annum per lineal yard of width of roadway. Further, the author suggests that, for convenience, a "scale of traffic intensity" be agreed upon, on somewhat similar lines to the "scale of hardness" for water or minerals, ranging from a minimum of 10,000 tons per lineal yard of width of road per annum to, say, a maximum of 300,000 tons, with intervals of 10,000 tons. The suggested scale would, therefore, be "traffic intensity 10, 20, 30, 40, up to 300," and its meaning would be both definite and easily understood.

Suggested clauses to be included in a specification for a bituminous-bound carriageway:—

(1) *General.*—The carriageway is lin. yds. in length, lin. ft. in width, and has an area of sq. yds.; it is bounded on both sides by stone kerbing (or wayside ditches or channels); its general direction east and west (or north and south, or any nearer definition); the gradients are from 1 in. to 1 in. ; the traffic intensity is, say, 50; it is closely shaded by trees on one (or both) sides (or is open); the subsoil is ; the prevailing direction of the wind is ; the stone available within miles is ; tar can be obtained at a distance of ; and the nearest railway goods depot is at a distance of .

(2) *Period for Construction.*—The work of construction will be carried out during a period of weeks from, say, January to, say, April, and the traffic will be partially (or wholly) suspended while the work is in progress.

(3) *Sub-Foundation.*—The contractor must excavate or fill in the site of the road, so as to form the underbed to the proper levels and contour of the foundation, and shall thoroughly water and roll with a 10-ton steam roller before laying the hand-packed rubble hereinafter specified.

One or more longitudinal subsoil drains must be laid, if required, where the subsoil is of an impervious nature, such as clay, peat, or other water-carrying material. Such drains shall consist of butt-ended drain tiles 3 in. in diameter, laid in trenches 2 ft. 6 in. in depth, and must be connected to the road gulleys or channels. After the tiles are laid the trenches shall be filled up with sand, gravel, or other open or porous material.

(4) *Foundation.*—The foundation shall consist of hand-packed rubble stone, preferably of sandstone, carefully selected. The stone must not be less than 7 in. in depth, from 5 in. to 9 in. in length, and from 3 in. to 6 in. in width, laid on edge, the stones being laid lengthwise across the roadway, to the finished profile. The interstices of the pitching must be thoroughly "blinded" up with any of the following material—*viz.*, broken concrete, broken sandstone, or specially hand-picked clinker. The whole must then be thoroughly watered and rolled with a 10-ton steam roller, afterwards the larger pieces of packing must be picked out, rebroken, respread, and watered, and rolled again to the proper profile. This process must be repeated until the surface presents the appearance of a well-rolled macadam road. The depth of the foundation when the rolling is completed must be not less than 7 in. No tar-macadam must be laid until the foundation has been inspected and approved by the surveyor or his assistant or inspector.

(5) *Stone for Tar-Macadam.*—The tar-asphaltum macadam shall be made with white or gray coloured limestone, or other stone, from a quarry to be approved by the surveyor. The stone shall be broken and gauged to three sizes—*viz.*, not less than 60 per cent to 2½ in., not more than 30 per cent from 2½ in. to 1½ in., and 10 per cent to ¾ in. to ½ in., all below ½ in. being discarded.

(6) *Quality of Tar, Pitch, and Tar Oil.*—The tar, pitch, and tar oil proposed to be used shall be in strict conformity with the Road Board Specifications Nos. 5 and 6, for tar No. 2, pitch, and tar oil, copy of which is attached hereto, and samples shall be taken by the surveyor before the work is commenced and submitted by him to a qualified analytical chemist for testing in accordance with the specifications above referred to.

(7) *Drying and Mixing.*—The whole of the broken stone must be thoroughly dried, all dust removed, and heated to about 220 deg. Fahr. before being covered with the tar, and the mixing must be done under cover. There shall be used from 9 to 12 gallons of tar to 1 ton of broken stone, the tar to be applied to the broken stone at a temperature of from 260 deg. to 280 deg. Fahr., as taken in the tar boiler. Mixing must be carried out by an approved mechanical power asphalt-mixer, while the stone is dry and heated, and shall be treated until the entire surface of every stone is covered with tar.

(8) *Laying.*—The respective sizes of broken stone, immediately after mixing with the tar, shall be spread, levelled, and rolled with a 10-ton steam roller, in separate layers, the 2½-in. stone as a bottom layer, and the intermediate layer of 1½ in. in thickness, with a top dressing of ¼-in. chippings, the total thickness being, on all parts of the surface of the road, not less than 4¼ in. thick after the rolling is completed and the surface brought up to the required contour.

(9) *Tarring and Gritting.*—Within two months of the carriageway being complete as above and used by the traffic, the surface shall be carefully cleansed, and afterwards sprayed with boiling tar as specified, and gritted with granite chippings from an approved quarry gauged between ¼-in and ⅛-in. square meshed screens, to the extent of 1 ton of chippings to 300 to 350 sq. yds. of surface of road.

DISCUSSION OF MR. BRODIE'S PAPER.

Mr. E. J. Elford (Southend-on-Sea), speaking with regard to the suggested scale of traffic intensity, said he thought there was a great deal to be said for an innovation of that kind, and no doubt the matter would be dealt with by the Engineering Standards Committee. The suggested first clause of the specification seemed a little dangerous, for a number of items of information must be based on individual opinion, and he thought it was better to leave more to the judgment of the contractor. If they attempted to give such definite information, they provided the unscrupulous with opportunities for creating trouble. In regard to the sub-foundation, it might be useful in some subsoils to roll the foundation first, but with a light subsoil rolling would be dangerous. In regard to the stone for tar-macadam, he disagreed with the suggestion that limestone should be employed. He had never been able to get a limestone that would carry the steam roller. As to laying the material, his opinion was that, instead of laying the different sizes in separate layers, it was much better to have the gauges for the material properly mixed, so that they got a bituminous compound. With reference to the subsequent drying and gritting, he would suggest that, instead of saying this should be done within two months of the completion of the carriageway, it would be better to specify that the drying should take place after two months and within four months. His experience was that a tar-macadam road in the first two months of its existence closed up under traffic, and it was dangerous to start dressing the surface of a road until it had thoroughly set.

Mr. A. J. Price (Lytham) said he could not help thinking that the roads Mr. Brodie had at Blackpool had not all been carried out according to the specification which he had laid down in his paper. The roads themselves were very good indeed—the road on the front was one of the finest in the country—but he did not think they were all laid according to this specification. As to rolling the foundation, it would be an impossibility in a great part of his district, and practically the same conditions obtained in Blackpool. There were places where they would run the risk of losing the roller altogether if they used a roller in such weather as they had had during the past few months. Then, again, with regard to the period of construction. Mr. Brodie suggested January to April. He did not know why. In seaside towns they tried to get all the work done out of the season; but he would do no tar-macadam work, if he could avoid it, between January and April. When they had private street works they had to do it practically all the year round, but they wanted warm, fine weather for it. With regard to the watering of the foundation, he had made about eighty new streets since he had been in Lytham, and, of course, Mr. Brodie had made a great many more, but he had never watered the foundation. He used hand-picked sandstone for a rubble foundation, and if he was going to put tar-macadam on the top of that he did not see the necessity of watering. He would not use sandstone when he could get granite or limestone, which was as good as most sandstone. With regard to rolling, he had been trying to get his committee to go in for a small motor roller. In one part of his district the sewers were not very deep, and though all the sewers were surrounded with concrete he was not very sure that a 10-ton roller on these streets would not damage the sewers. The road on the front at Blackpool, which was one of the finest in the country, was very largely done with a 4-ton roller.

Mr. Brodie: Both a 4-ton and a 10-ton roller.

Mr. Price, continuing, said, with regard to the quality of the tar, that if he were to get all his tar to the order of the chemist, he would get the "sack." He got his tar from the gasworks which adjoined his storeyard, and he had to take the tar as he got it. It was very good tar on the whole, but there were times, of course, when they got a good drop of water with the tar. It was all very well to lay down rules and regulations, but they had to be used with discrimination, and there were times when it was better to break rules than to carry them out. There was some tar which they might use on a road which was exposed to the sun and had a good deal of traffic on it, but they would not use that kind in a back street where was neither sun nor much traffic. The tar they used in a street where traffic was heavy and the sun was strong wanted to be more of a pitchy nature than that used in a back street. Generally speaking, he used all distilled tar. He never used pitch if he could avoid it. As to drying and mixing stone, he dried as little as he could artificially. He preferred to strew the chippings so as to let the sun get on them, because that was much more economical, and also because if they put stone on a dryer it was very liable to get too hot and convert the tar into pitch. With regard to tarring a finished road within two months, he did not quite see the necessity for that. He had done a good bit of granite tar-macadam work, and he found granite did not take the tar quite so easily as limestone. But for heavy traffic he did not care to use limestone; it made a dusty road. Granite, on the other hand, would practically carry traffic without any watering at all. He had a main road which had been tar-painted, and the watering cart was never on it from one year's end to the other, and it was the road on which all the motor traffic went through from Preston to Blackpool.

Mr. E. Willis (Chiswick) observed that the author suggested that contractors should have opportunities of dealing with certain matters in other ways than those of the specification. He thought that was an excellent idea. He had carried it out in his practice—not only in tar-macadam, but in other kinds of work. It gave the contractors more interest in the work, and put them on their mettle. With regard to standardisation of traffic, that was a thing which they would all like to have, and the sooner the Standards Committee could deal with it the better. He was sorry to differ from Mr. Elford as to Clause 1 of the general draft specification, but he quite agreed with giving the contractor information which was definite and certain. They all knew that in every contract there must be certain conditions affecting it; by all means give those conditions, and then everyone stood on the same footing. He did not think any surveyor round London could give definite information with regard to foundations of roads. He had been content with any suitable material he had in hand, and he had found a vitrified foundation of broken bricks give good results. But the foundation of roads should be largely subject to discretion. He had had experience of a long arbitration with regard to foundation, and he was glad to say that his council came out successful. He had found tarred clinker successful for light-traffic roads, especially when treated on the top with fine granite chippings.

Mr. A. E. Prescott (Eastbourne) submitted that it was not possible to standardise any system of road making at present. He thought Mr. Brodie admitted that, but much depended on local conditions and circumstances. There were one or two points on which he was not in harmony with Mr. Brodie. One was the use of the 10-ton roller on tar-macadam. He con-

sidered a roller of that weight much too heavy. The practice he had adopted was to roll with a light roller, allowing the metal to get a certain amount of cohesion, and from that method he had obtained very good results. He had not used any tarred clinker, but he had no doubt some surveyors found good use for it. For secondary roads he believed it was very suitable.

Mr. O. E. Winter (Hampstead) said he considered that sufficient accuracy was not observed in the description of materials used in road making. Tar was not asphalt, and asphalt was not tar. He had had excellent results from tar-macadam, but he thought there was plenty of room for the use of asphalt and bitumens in connection with roads with considerable traffic.

Mr. W. Nisbet Blair (St. Pancras) said he had taken a good many observations, and he thought they ought all to work under one uniform method. To reduce figures actually taken to a certain rate per annum was misleading. Mr. Brodie proposed that traffic be always expressed in tons per annum per lineal yard of width of roadway. Most of them were content to take traffic over a period not longer than seven days, and many took traffic on one day at one season, on all other days at another season, and to calculate that traffic per annum would convey as much as if they had recorded it per yard per day of eight hours. From his experience they got nearly the whole traffic between 8 a.m and 8 p.m. That, of course, might not be accurate in special circumstances; for instance, in London they got a heavy night traffic to the railway stations, and in such cases it might be necessary to take the traffic for twenty-four hours. Should the night traffic equal the day traffic, it might be reduced to tons per foot in width per hour. He thought, however, that they would get an accurate result if they took the traffic from 8 a.m. to 8 p.m., and reduced it to tons per foot of road. They would then be able to compare one street with another and one district with another. Another important distinction was that between rubber-tyred and iron-tyred traffic. He had two tar-macadam roads. One was a failure and the other was a success. They had had another twelve months' traffic on the road which was a success, and it was still a success. That road was still perfect, carrying a traffic of over 600 vehicles per hour. It was the approach road to Euston Station, and it ran great risk of being spoiled, as it was made in showery weather.

Mr. W. Jones (Colwyn Bay) stated that the sheets on which the records of the traffic taken in his district were entered had been issued by the Road Board, and he felt sure that if these were used generally throughout the country they would give a fair criterion of the traffic. The streets were most carefully drawn up, and although they might be slightly altered, there was no real necessity to depart from the standard laid down. They were published by Messrs. Waterlow & Sons. If surveyors generally would adopt these forms they would have uniformity in the matter.

Mr. W. Stubbs (Blackburn) said the only suggestion he had to make was that where the subsoil was clay it was a mistake to use pitch on it. He would advise filling in the interstices with broken millstone grit, roll it in and water it, after putting on 4½ in. of limestone as suggested. There was no difficulty in rolling limestone; it was as easy to roll as any granite. He did not, however, use limestone on main roads, or for any roads carrying very heavy traffic. They had very large boiler works in the town, and from these works they sent away boilers of 40 tons weight. They had come to an arrangement with the proprietors of these works under which they had the wheels of their lorries wooden shod. Since that had been done they had had no complaints of setts being broken. Previous to the adoption of that system they had sent in a claim to these makers for £2000 for two journeys, a big boiler having made a groove the whole way.

Mr. G. W. Lacey (Oswestry) inquired whether Mr. Brodie could state some means by which with reasonable accuracy the character of traffic along a road could be ascertained. It was a comparatively easy matter to obtain the number of vehicles and the various kinds of vehicles, but to ascertain the weights of rapidly moving loads of altogether different descriptions was almost an impossibility. He could not see how the [illegible] tons per hour with any reasonable degree of accuracy. The sheets of the Road Board were very useful for traffic estimation. He had had occasion to use them, as they had been making an application to the Board for a grant. There was the question of broad-wheeled and narrow-wheeled traffic; the effect of each on the roads was quite different. Again, the character of the traffic in one district was not comparable with that of the traffic in another. As to the specification, there were points with which he agreed and others with which he could not. There was no question that for taking the tar well and making a close and compact road no stone was equal to limestone, but it could not compare with granite in other respects. They had a few sections of granite tar-macadam laid in Shropshire, some of which had been very good and some very bad. There were instances of granite macadam showing most excellent results, but the traffic conditions were quite different from those which prevailed at Sidcup, where the trials were being made. What might last twelve months at Sidcup they would expect to last three, four or five years in Shropshire.

Sir George Gibb, chairman of the Road Board, remarked that this was a very technical subject, and, as they were aware, he had no technical experience; however, he would say a word on statistics, about which he did know something. He was glad that the Road Board form had been referred to with approval. A great deal of trouble had been taken in preparing it, and they did the best they could to provide a form which would suit a variety of conditions. Of course, in classification they could not reproduce all details; they must classify on some group and some average. Although it was quite impossible to reproduce in the tonnage figures the exact tonnage that passed over a road, still it was wonderful how true the averages were, and how near to what the actual working would give. Therefore it was quite useful to employ the figures of tonnage on a computed basis, and he would suggest that the basis of computation used by the Road Board be generally adopted. The forms were prepared by men, all of whom had experience of different kinds of traffic. He was not sure that he liked the idea of dividing the figures into very small units. What they had to aim at in classification was to get accuracy as near as they could. On the question of accuracy was it really a fact that the difference between a 6-yds. and a 7-yds. road was substantial? If they had a certain quantity of traffic composed of different classes of vehicles on a road 6 yds. wide, and they had the same quantity of traffic on a road 7 yds. wide, was the wearing effect on the road in the one case one-sixth more than it was in the other? He had no right to suggest an opinion on that; he put it to them as a query. Still, he confessed he was sceptical, and he rather thought if they got the traffic in tons per day, while dividing it by the width of the road in yards, they got a figure that was accurate in itself, that was easily memorised, and a figure which was true within certain variations of width. Probably if they reduced all figures to tons per yard of width they got a statistical figure which was almost too minute for the rough-and-tumble of ordinary use. Then, again, if they reduced it to per hour or per annum, in the one case they got too small a figure and in the other case too large. His inclination was always towards a simple figure—the number of vehicles per day. So as they got at the number of tons per day, then they had figures which, he thought, would be found adequate.

The President (Mr. R. J. Thomas) said one factor had been omitted in considering the volume of traffic, and that was that the less the volume of traffic on a given road the greater was the proportion of that traffic using the centre of the road. They could not compare the traffic of a heavy street with that of an ordinary 18-ft. country road. What the country surveyors had to face was the universal user of the centre of the road. Some years ago he made careful tests on the main country roads leading out of Aylesbury, and he found that on the central 7 ft. of that 21-ft. country road there was three times the amount of traffic that there was on the haunches. If that was so ten years ago, how much more would be the case now, and he suggested that it was of the utmost importance in [illegible] the factor of traffic to bear in mind the class of traffic and the extent to which it was able to keep to the centre of the road.

Mr. Brodie, in reply, said the main points of the discussion appeared to have taken the direction of traffic enumeration. He had no doubt they might well have a paper devoted entirely to that part of the subject, so great was its interest and importance. He had himself taken some trouble during the past two years to obtain reliable information with regard to the traffic on some of the roads in his district,

and he had taken the traffic on the first working day of every month for two years. In a place like Blackpool the traffic at this time of the year was more than 100 times what it was in January or February, therefore figures taken now or in the depth of winter would give no idea of the volume of traffic using the roads. Mr. Price referred to the specification, and suggested that it was not quite in accordance with his (Mr. Brodie's) practice. He could assure Mr. Price that the Marine Drive-road, which was nearly level from end to end, and was 40 ft. in width, had been constructed on the lines laid down in the paper. Singularly enough, no one put the question to him what the cost of a road made to the specification would be. All the work was done under contract, and the cost was at the rate of 1s. 9d. for the rubble foundation, and about 2s. 6d. for 5 in. of asphalt on the top. They thus got a total cost of about 4s. 3d. per square yard. As to rolling with a 10-ton roller, it was true that part of the road was finished with a smaller roller—4½ tons. He left that to the judgment of the contractor. The whole work was done in a way which was very creditable to the contractor, so much so that very little had been spent on it during the seven or eight years it had been laid down. He thought if they were to give a contractor a fair chance of making roads successfully, they must give him the most reliable statistics possible to work upon. He quite agreed with Mr. Winter about the somewhat loose way in which the word bitumen was used, and he would be obliged to the Road Board if they would simplify the nomenclature. What he meant was tar-bound or pitch-bound roads.

(To be continued.)

WORK OF THE ROAD BOARD.

SECOND ANNUAL REPORT.

The second annual report of the Road Board, which was issued on Tuesday night, states that the income of the Road Improvement Fund in respect of the period from the constitution of the board in May, 1910, up to March 31st last, was £2,181,312, made up as follows: Motor spirit duties £1,292,860, carriage licence duties £863,536, interest from investments £27,916. The grants and loans made and indicated during the same period to county councils and other highway authorities amounted in the aggregate to £1,177,438, and in addition thereto the board have intimated their willingness to grant £875,000 to assist the construction of a new western approach road to London.

The board state that they have adhered to the policy indicated in their first report in selecting the works of road improvement towards which their first efforts are being directed, and the grants and loans have been apportioned as follows: Improvement of road crusts, £446,772; road widenings and improvement of curves and corners, £56,833; road diversions, £18,276; reconstruction and improvement of bridges, £15,128; new roads and bridges, £4,928; total grants and loans, £541,937.

The expenditure on roads by county councils in England and Wales for the year ending March 31st, 1909, is given in order to show the field of choice open to the board. This shows that £2,643,044 was the maintenance cost for 27,802 miles of main roads, while £63,162 was spent on "improvements." The board, however, think this is probably an understatement of actual expenditure on improvements, and that certain items classed as "maintenance" might prove to be more properly charged as improvements. The board point out that grants cannot be made towards expenditure on maintenance, and say "the purpose of grants is to assist improvements, and as the law now stands it would be improper to use them as a means of redressing inequalities in the burden of maintenance expenditure in different districts."

TWO PROBLEMS.

The report says: "There are two distinct problems connected with roads, each of which has a different origin, and requires a different treatment. One of these problems arises from the growth of population in cities, towns, and other urban areas. This growth has led to the necessity for extensive reconstruction of roads and streets in order to provide for the greater volume of traffic, chiefly local, which has caused congestion at many points in urban districts, requiring for its remedy either the construction of new streets or the widening of existing streets; but the substitution of motor traffic for horse-drawn traffic has tended not to increase but rather to relieve this congestion. The other problem arises directly from the introduction and rapid increase of motor traffic, and is concerned chiefly with roads passing through rural areas and inter-urban roads, the crusts of which were, and still are, over a very large mileage insufficient in strength and unsuitable in character for the use of such traffic."

There is a general impression that nearly the whole of the increase in maintenance expenditure which has taken place has been due to motor traffic, but although such traffic has already been responsible for a considerable increase in the cost of maintenance of roads in rural areas, it is doubtful whether this cause has yet affected the figures to as large an extent as it may do in the future, unless prompt and effective steps are taken generally, as has been done in several counties, to arrest the increase, by adopting better methods of maintenance.

So far as improvements either in road crusts or widths of roads in urban areas are concerned, the board says they will have to be carried out without the assistance of the road improvement fund for local purposes, and the opinion is also expressed that it is most unfair that the cost of such local needs should be provided from local resources. There is a very general impression among highway authorities that they ought to get more assistance than they get from exchequer contributions towards the increasing maintenance expenditure, and they do not yet fully realise that the Road Improvement Fund is not a fund for the relief of maintenance expenditure.

ROAD CRUSTS.

Owing to the neglect of road maintenance for many years prior to the passing of the Local Government Act, 1888, there was at the date of the Act, and is still throughout the country, a very large mileage of important roads, the crusts of which are much below a proper standard of strength, and even in those cases where roads have for many years been properly maintained for the requirements of horse-drawn traffic the surface coatings of the bulk of the mileage are found of water-bound gravel, flint, limestone, sandstone, or other inferior stone, and are wholly unsuitable for motor traffic.

The board expresses the opinion that the roads not originally strongly constructed have suffered damage from heavy motor traffic out of all proportions to the number of such vehicles using the roads. Consequently, in such cases the problem to be faced by highway authorities is most serious, and a very large expenditure must be incurred on road crusts. The board is of opinion that it will be greatly to the advantage of highway authorities, and will also enhance the benefit to be derived from the existence of the road improvement Fund, if highway authorities will undertake, with the assistance of loans, a larger amount of recoating work than they are able to accomplish immediately out of rates. The board is prepared, so far as funds permit, to advance such loans, in most cases without interest, for the extra cost of road crust improvements which are likely to increase the life of surface coatings in a greater ratio than the cost.

THE WESTERN APPROACH ROAD SCHEME.

Referring to the proposed western approach in London, which was estimated to cost £1,750,000, the board states that negotiations are going on with the London County Council. It would, they think, be inadvisable to take up other schemes involving any large expenditure, either in London or elsewhere, until a final decision has been arrived at with regard to this scheme, which they regard as one of the most desirable works of its kind in the public interest at the present time.

Ripley's Sewerage System.—Arising out of the medical officer's report on the health of the district, the Local Government Board have written to the Ripley Urban District Council asking the council to consider the question of providing sewerage arrangements in the lower Hartshay district. It is pointed out that, although the council had been granted powers under the Public Health Act, only seven conversions of pail-closets to water-closets were shown for the year. The board consider it desirable in the interests of public health that these should be more extensively adopted, and desire the council to consider the question of a general scheme of conversion, which would reduce the cost of scavenging by 7s. 3d. per house.

PUBLIC HEALTH IN JOHANNESBURG.

REPORT OF MEDICAL OFFICER.

The report of the medical officer of health for Johannesburg, Dr. Charles Porter, for the two years 1909-10 and 1910-11 has been published as a closely-printed foolscap document of 76 pages, with numerous statistical tables and three appendices. In his introductory letter, Dr. Porter remarks that the preparation of such reports is always a matter of very considerable labour, and in Johannesburg has frequently to stand aside for considerable periods, owing to the continuous and insistent pressure of daily work.

According to the municipal census of October, 1910, there were then in Johannesburg 220,304 persons, including 111,857 Europeans, 95,512 natives, 5,176 Asiatics, 7,749 Eurafricans—*i.e.*, persons of mixed European and African blood.

The death-rates per 1,000 of the various sections of the population were as follow:—

	Gross recorded.		Excluding non-residents.	
	1909-10.	1910-11.	1909-10.	1910-11.
Whites	12·5	14·4	11·3	13·3
Natives	24·5	33·6	23·1	32·5
Eurafricans	25·2	31·1	24·7	29·5
Asiatics	18·5	19·7	17·5	19·1
All persons	18·3	23·4	17·0	22·3

In 1910 the death-rate per 1,000 in London was 13·4, in Glasgow 15·1, in Dublin 19·9, Paris 16·7, Berlin 14·7, St. Petersburg 24·1, Cairo 39·7, New York 16·0, Buenos Ayres 16·5, Sydney 10·4, Brisbane 11·1, Durban 6·6, and Capetown 10·7.

TYPHOID FEVER.

The record in this matter is probably the most satisfactory feature of the report, as not only do the mortality figures show a decrease of 40 per cent, but there has been a steady decline in the number of cases, and the case-mortality has not been unduly high.

WATER SUPPLY.

Some 656,000,000 gallons were supplied by the Rand Water Board in 1909-10, and 707,000,000 in 1910-11, a large increase over former years.

The water from the western series of wells at Zwaartkopjes has been satisfactory, but, as in previous years, the bacterial content of the water from the southern section has varied considerably, and as the wells in question can no longer be considered in the developmental stage, these variations have, at times, been a source of considerable anxiety. Before, however, recommending that filtration of the water, with its attendant expenses, should be undertaken, it was decided to try the effects of treating the water with a solution of chlorinated lime.

The chief engineer of the Rand Water Board at once adopted the suggestion of the medical officer of health that a small quantity should be added, as has for some time been done with much success at New Jersey and other places. After some preliminary trials, he designed a very simple arrangement for adding the solution of chlorinated lime continuously and in the requisite proportion to the large "mixing well" at the end of the southern section.

This chlorinated lime is added in the form of a solution of 1 in 164—that is, 15 lb of $CaOCl_2$ (containing 33 per cent of available chlorine) are dissolved in 180 gallons of water, which are added to each 1,000,000 gallons of water pumped.

Difficulties were, of course, experienced at first in getting the right proportion of the chlorine solution added, and it was found necessary to modify somewhat the original arrangement, but the method now in force appears, on the whole, to give satisfactory results. At the commencement complaints were occasionally received as regards the taste of the water, and at one time the question of employing some de-chlorination system was considered, but subsequent experience has not, up to the present, necessitated further action being taken.

The temporary arrangement for the softening of the water at Zwaartkopjes has not proved satisfactory, and it is hoped that the Water Board may see their way shortly to adopt a system which may be relied upon to give better results.

Other special subjects dealt with in the report include aërated water and ice factories, sewerage, sewage disposal, and mine sanitation, the medical officer of health remarking that as regards mining property within the municipal area of Johannesburg there is none of the opposition to necessary sanitary improvement with which health officers in English towns are often only too familiar.

SLUM PROPERTY.

Dr. Porter states that there are in certain quarters of Johannesburg, especially in Fordsburg, Ferreirastown, Marshalls, City and Suburban, and Old Doornfontein, a considerable number of squalid dwellings which were mostly erected before the present by-laws came into force, and which are of very poor construction, dilapidated in condition, and crowded in area. At the same time, if tested by considerations such as sufficiency of lighting, ventilation, water-tightness, closet accommodation, and yard space, most of these places, in spite of their unsightly appearance and the other drawbacks indicated, are of such a nature that it would be difficult to get from any magistrate (even if the council had the power to proceed in that way) an order for their closing, much less their demolition. Further, the fact has undoubtedly to be borne in mind that, in calling upon the people to patch up and more or less to renovate these essentially undesirable dwellings, the council would simply be prolonging the life of structures which, in the medical officer of health's opinion, should be swept away. This statement is not, however, made in extenuation of any insanitary conditions which may exist or arise therein. The medical officer of health deplores the absence of adequate legal powers to deal effectively with these conditions, and asks for (1) Legislation on the lines of the English Town Planning Act; (2) provision of suitable locations for all coloured persons; and (3) power to compel such coloured persons to live in locations.

SCHOOL BUILDINGS.

Ten fine new Government schools (primary) were built in 1909-11, to accommodate 3,700 children.

DUTIES AND DIFFICULTIES OF SANITARY INSPECTORS.

The staff of inspectors numbered twenty-five, with one white and two native constables. The clerical staff numbered four. Each inspector has from 1,300 to 2,000 sets of premises to supervise, and the medical officer of health points out that even with great diligence he cannot hope to visit every house oftener than once in six weeks. As many ratepayers apparently expect frequent visits from, and conversations with, sanitary inspectors, the medical officer of health's remarks in this connection are enlightening. He makes it clear that inspectors have many other important duties besides visiting back-yards, and, further, that if they are to be held personally responsible for the condition of every yard at all times their number must be very greatly increased. He does not, however, consider necessary, nor recommend, any such increase, and is of opinion that if a thoroughly efficient refuse-removal service is organised, supervised and properly carried out, there will be no need for increase in the number of sanitary inspectors by more than one permanent addition, which the recent growth of the town has rendered necessary. On the other hand, Dr. Porter is of opinion that the staff of white men (scavenging overseers), to whom is entrusted the actual supervision of the scavenging natives, should be very materially increased, and this the Health Committee has decided to do. He remarks that complaints by sanitary inspectors are of relatively small value, compared to adequate energetic and conscientious personal supervision of the natives who have to carry out this work. If such supervision be exercised there should in future, he thinks, be little necessity for inspectors or anyone else to make complaints.

The medical officer of health warmly acknowledges the services of the assistant medical officer of health (Dr. Stock), and of Dr. G. D. Maynard (who was acting assistant medical officer of health for six months in 1910) of the public health staff. The Government analyst and bacteriologist are also thanked for their co-operation, and the report concludes with a summary of the important questions requiring early attention, namely, those of (1) Slum property; (2) housing of natives; (3) extension of water carriage; (4) the acquisition of adequate legal powers.

The health of the council's natives is dealt with in an appendix, and Dr. Stock is to be congratulated on their remarkably low death-rates of 5·5 and 8·03 respectively for the two years under review.

Royal Sanitary Institute Congress at York.

ENGINEERING AND ARCHITECTURE SECTION.

The first paper to come before the Engineering and Architecture Section of the recent congress of the Royal Sanitary Institute at York was the following:—

THE MODIFICATION OF MODEL BUILDING BY-LAWS.

By Halsey Ricardo, F.R.I.B.A.

By-laws, we all recognise, are made, not for the good primarily of the individual, but for the community. When a building is erected, the first requisite is that it should not be a danger or a nuisance to its neighbours, and, secondly, a danger or a nuisance to its occupants. By-laws are not enacted to check building, but to secure good building. It is a matter of common knowledge that they have failed to secure the latter. In the country, except for the matter of sewage disposal and the protection of the water supply, one might argue that no building by-laws are requisite. Each cottage, or group of cottages, should stand on an adequate area of land, and the owner should be responsible for their proper construction, and for any strictures that the medical officer of health may have to pass on them. The danger from fire is not a great one; the precautions under the by-laws are not really adequate, or easy to enforce, for the occupant can, and does, stultify some of them habitually when furnishing his rooms.

The Public Health Act is to see that he is neither a danger nor a nuisance to his neighbours, and as long as this can be secured efficiently, the rest might be said to be the owner's business. However, the Local Government Board does not take this view, and has promulgated a series of Model By-laws for rural districts which are in force throughout nearly half the country: laws which, when once adopted, the district councils are powerless to abrogate, and which the Local Government Board declines to modify to suit individual requirements. Moreover, the board enjoins on such local councils as may be desirous of having building by-laws a further embroidery of restrictions, specifications and demands, till the original purpose of the Model By-laws is quite overlaid by the numberless provisions and safeguards, appropriate for the most part to urban requirements, or to districts that are in the process of becoming urban. And the local councils are eager to meet this demand from the Local Government Board, on the ground that it relieves them and their district surveyor from a great deal of responsibility; they have the comfort of knowing that these laws are in pretty general use, and that seems an evidence of their suitability; they adopt the plausible theory that a network of cast-iron regulations protects the individual from many petty injustices, and puts the community on an equal plane of health protection. . . .

COSTLY BUILDING.

Meanwhile, under our present arrangement of local by-laws enforced by our county councils, a system has grown up of unnecessarily costly building; this, as a vested interest, the councils are naturally anxious to preserve. Under their own by-laws they have been penalised in their own efforts; they have been made to conform, regardless of suitability, to their own regulations; they have subscribed painfully to a costly ideal of building, and they do not want the competition of a cheaper form of house. That anybody should be enabled to build, subject to sanitary safeguards, but without restriction as regards construction, would appear to them as an intolerable surrender of the restrictions under which they have worked, and to which they have submitted.

There is, as I have said, practically no appeal from the decisions of the county councils. Literally it might appear to be possible, but no individual, at any rate, would be prepared to devote the time and the money to carry up the appeal to the Local Government Board. Their decisions then are virtually final, and confined within the four corners of their by-laws. But these councils are not agreed as to what they consider to be the principles of health and construction. They are required to define, for example, the minimum height of rooms, and for rooms on the ground floor there is a concensus of opinion that they should be at least 8 ft. high. But when you come to rooms in the roof, or partially in the roof, some councils require that the room shall nowhere be less than 5 ft. in height, and 8 ft. to the extent of half the superficial area of the floor; while others (such as Godalming) are content with 7 ft. in height from floor to ceiling to the extent of two-thirds the area of the floor, with a minimum of 4 ft. at the sides. On the other hand, Midhurst, for example (in the by-laws dated 1895), requires the ground floor rooms to be 8 ft. 6 in. high, the bed-rooms 8ft. 6 in., and the rooms partially or wholly in the roof to be 9 ft. for two-thirds the superficial area of the floor. Some councils seem to insist on the ground floors having boarded floors on joists; others permit what is generally the more satisfactory method of having a concrete floor to which the boards are nailed direct, although this is not contemplated by the Model By-laws.

The provision for space around cottages is shockingly inadequate; it is not nearly sufficient for the disposal of the refuse of the house. It is a minimum that possibly has to be accepted in a congested town, but can never be excusable in a rural district.

WINDOWS.

The Model By-laws require that "every person who shall erect a new domestic building shall construct in every habitable room" one or more windows, the sum of which shall be equal to one-tenth of the floor area, and that one-half at least "of such window" be made to open. This regulation appears to be accepted by all the various local councils who have adopted by-laws without question, and also, I think, without due consideration. Adequate light is, of course, essential to every habitable room, but regard must be given to the source of light available for such purpose. The quality of light depends on the aspect of the window, its position in the house, and its position in the room. It is obvious that the quantity of light given by an attic window that has an unobstructed view commanding the south differs materially from that given by a window on the ground floor looking into a backyard to the north. Also the position of the window in the room matters greatly. A window that occurs immediately under the eaves of the roof and low down near the floor cannot give the room as efficiently its quantum of light as a window whose head is a few inches below the ceiling.

No general statement or regulation can meet the case, and to fix a minimum of one-tenth the floor area is absurd. At most you can only say in general terms that ground floor rooms require larger window area than first floor rooms, since their outlook is generally more obstructed by foreground objects; and that not more window area should be provided than is requisite, since windows make the rooms hot in summer and cold in winter, any excess of which is prejudicial to their occupants.

EARTH-CLOSETS.

The Model By-laws decline to differentiate between an earth-closet and a privy. The local councils, as a rule, make the distinction. Some allow an earth-closet within the house; some forbid, and stipulate that it shall be at least 10 ft. away. Now, while this might in some cases be a valuable precaution to take in poor cottage property, it is an extremely arbitrary interference in the case of superior buildings, for there is no question that a properly managed earth system is more sanitary than a water-borne one.

Again, wastes from baths and sinks are far better dealt with above ground than being made to travel through pipes to a cesspool, which is to be constructed according to the Model By-laws to be "impervious to liquid." In other words, you arrange a costly system of traps, pipes, and receptacle to enable you to keep your sewage until it is putrid, and then in that state have to bale it out on the ground; whereas, if it is to go there, it is better to put it there before it goes bad. The Model By-laws go on to say: "He shall also cause such cesspool to be arched or otherwise properly covered over, and to be provided with adequate means of ventilation." This, in my own experience, I find is interpreted to mean that a relief pipe must be provided for the escape of the gas generated in the cesspool. Such outlet is not, in my opinion, adequate ventilation, or even ventilation at all. A stream of air should be passing continuously through the cess-

pool if it is to ventilate it, to be got by providing an inlet pipe as well as an outlet, or, better still, to leave the top of the cesspool wide open, with wooden slats across the opening, to prevent accidents.

But the truth is, we waste too much water in our present sewage arrangements, and where, especially, the amount of ground is limited, we ought to use the dry-earth system more. . . . The provision of a water supply, with its pipes liable to burst in frosty weather, its flushing cisterns not always in working order, traps, ventilation, and anti-syphonage pipes, its underground drain pipes, and the evil insanitary cesspool are all heavy items to put to the other side of the account.

HOLLOW WALLS.

I suppose it is a vain thing to ask the county councils to discourage the use of hollow walls above ground. I consider them a faulty construction, leading to all sorts of subsequent disasters. Their sole excuse, that I know of, is that the outer skin, being separated by a cavity from the inner, protects the latter in case of severe stress of weather from the rain and damp. This is valid in theory, but the theory is largely stultified in general practice. The by-laws should insist on two damp courses where hollow walls are being used, one at the bottom of the cavity and one to the inner wall some 3 in. above this wide damp course, otherwise the wet passing through the outer skin collects at the bottom and is sucked up by the inner skin. Not only ought there to be this second damp course, but there should also be a cement or damp-proof rendering made, weathered to a sharp slope, so that the water that has penetrated into the cavity runs at once away from the inner wall and accumulates against the outer; without this precaution the hollow system is no remedy against damp walls.

But it is far better, and not much more expensive, to build the walls solid, and jacket them with a waterproof outer coat of cement stucco or rough cast. The evils of hollow walls are many. You have a space, if unventilated, full of damp air, in which the ends of your timbers are rotting away. Seeing that your floor joists rest probably on a wood plate (tarred or sanded hoop iron meet this difficulty better), when this decays, the ends of the joists, also partially decayed, drop down some 3 in. or more on to the brickwork. If the space is ventilated it becomes the sanctuary and playground for vermin. This open space, under any conditions, is a conductor of sound throughout the building. The system is bad in construction because the main weight of the roof and the floors comes on the inner wall, which in consequence settles down at a different ratio to the outer, almost unweighted, wall. If the ties are of iron (and even when galvanised they rust under their unfavourable conditions), they meet the strain by bending, and such water as lodges on them drains in consequence towards the inner wall; if the ties are made of stoneware or terra-cotta, not being able to bend, they get fractured. I do not know the reason, but there seems to be a general agreement that the cavity must not exceed 2½ in. It would be just as easy to build the walls with a 5-in. cavity, and less chance of the effect of the void being neutralised by chance lumps of mortar resting on the ties and bridging over the cavity. Moreover, pipes, waste and others, have a way of going wrong as they pass from inner to outer walls, and the hollow space has been known to get filled with foul water and sewage, and as the warmer air of the rooms and the open fires act as a pump the bulk of these effluents were sucked into the inner wall.

If the councils are going to insist on minutiæ of construction, as they do when they specify the scantlings of roof timbers and floor joists, and their distance away from smoke flues, they should carry their insistence still further: they should require that the walls over the mantelpiece and at the sides of the chimney breasts should be 9 in. thick where the flues occur; that the external faces of the chimney stacks, where they emerge from the roof, should be at least 9 in. thick; that all skirtings should preferably be in cement, and where the question of cost may render this impracticable the plaster must be carried down behind the wooden skirtings flush with their backs. In the usual building methods the space left affords a run for vermin, and in case of fire adds materially to its power of spreading, where plastered wood partitions occur. This open communication between two rooms, or passages and rooms, carries the fire from one part to the other, and feeds it with the necessary air supply. The councils' by-laws generally specify the scantlings of the roof rafters and floor joists, in several cases regardless of what the nature of the wood to be used may be. It would be better, if they must be so particular, to content themselves with specifying the sectional area; but why do so at all? As it is, by prescribing the minimum (which is really too little for inferior timber) the by-laws set a kind of standard, both in masonry and carpentry, so that any architect who exceeds the minimum is held by his client to have committed an extravagance.

On the other hand, by insisting on footings to every wall where concrete foundations are supplied, they create in many cases an expensive obstruction of no constructional value. If the concrete is thick enough, the walls may just as well rise from it their natural thickness, and it is often cheaper to build the walls in concrete, below the ground level, than in masonry or brickwork. The footings take up a lot of valuable floor space, and are a permanent nuisance.

CONCLUSION.

My conclusion then is that, though the Model By-laws issued by the Local Government Board for rural districts require amending in the article of window area, and bringing up to date in the matter of its provisions for the drainage and sanitation of buildings, they are in the main sufficient; and if they had been accepted by the county councils without any glossary there would not have been this dissatisfaction and outcry. It is true it would have made the position of the district surveyor more responsible, but their relief from responsibility is not a wholesome element, and it leads in many cases to hardship and absurdities. And with all these doctrinaire prescriptions and restrictions, shoddy buildings are being erected all over the country, which, I believe, would be almost impossible if the surveyors had a freer hand in their examination of the plans submitted for proposed buildings.

DISCUSSION OF MR. RICARDO'S PAPER.

Mr. H. D. Searles-Wood, F.R.I.B.A., in a communication on the subject of the paper, wrote: The Model By-laws issued by the Local Government Board for use in rural districts only deal with—(*a*) structure of walls and foundations for purposes of health, and not of stability; and (*b*) sanitary matters. Even if the by-laws have not secured good buildings they have checked bad buildings, and this was their main object. There are no fire prevention clauses in the rural Model By-laws. The Public Health Act has a far wider scope than the author indicates, and in the matter of streets and buildings the principal object is to protect the public. District councils are not powerless to abrogate their by-laws. The Local Government Board does not decline to modify by-laws to suit individual requirements, as is seen in the circular letter of January 5, 1906. The Local Government Board do not enjoin unnecessary restrictions, specifications and demands on local authorities. With regard to the statement that "the local councils are eager to meet this demand from the Local Government Board," there is no demand from the Local Government Board. County councils have no power to make by-laws. There are no restrictions as regards construction in rural Model By-laws. There is no power of appeal to the Local Government Board, and the Local Government Board have no power to give a decision. A magistrate's decision is final unless carried to a higher court. The Local Government Board are, however, very frequently appealed to, and have secured modifications in numerous cases in consequence. Councils are not required to define minimum height of rooms; it is purely optional. The clauses relating to height of rooms in the Midhurst by-laws were repealed in 1902, and another by-law substituted requiring 8 ft. and 9 ft. for superficial area of floor. Solid floors are provided for in Model By-laws. It would be inconsistent "for purposes of health" to require a larger area of space round cottages in a rural than in any other district. The fault, if any, is in the Act. With regard to the requirement of one or more windows, the sum of which shall be equal to one-tenth of the floor area, that is not excessive under any circumstances. Too much is better than too little. The fashion of small windows is largely disappearing. The Model By-laws (urban) allow an earth closet within a building, and differentiate between the earth-closets and privies. There is no power to enforce the use of movable receptacles or of earth. A distance of 10 ft. for privies from a house is not a hardship. It would obviously be undesirable to allow open drains in small back-yards, or open cesspools. There is now power under the Act to make by-laws as to water supply, and hence their omission. The Public

Health Act gives sufficient power to prevent the occupation of houses without a proper water supply. There is nothing in the rural Model By-laws to prevent timber buildings being erected, or the use of thatch. It is impossible to prohibit the use of hollow walls. With regard to the suggestion that the councils should require walls where the flues occur, &c., to be 9 in. thick, this would rather add to the cost of cottage building. The by-laws always define the timber from which scantlings are given. The sectional area is not a sufficient method. The strength varies according to depth and width. There are no clauses as to footings in rural Model By-laws. Footings are not prescribed to be of brickwork, and might be of concrete. The by-laws require only 4 in. of concrete under buildings, which is hardly sufficient to carry a heavy wall. There are clauses specially prepared to deal with housing provided for transitory labour, and local authorities have power under the Public Health Act, 1907, to license temporary buildings for this and other purposes.

Mr. G. W. Lacey (Oswestry) said the communication of Mr. Searles-Wood had practically cut the ground from under other people's feet in attempting to criticise the paper. There was no doubt this was a very difficult subject, and one could agree that a remodelling of the by-laws both as to urban and rural districts might be advisable. There was no doubt that there were things in the by-laws in many districts which were not up to date with present methods of construction. Unquestionably rural conditions should be more taken into account than they had been. It was within his knowledge that the by-laws in some rural districts were even more stringent than those in the urban districts adjoining them, and there was no sense or reason in that. Mr. Ricardo seemed to think that it would be sufficient to have some very generalised treatment, and to leave a good deal of detail to the architect and builder, but he was afraid that would produce considerable difficulties in administration. There must be laws of control, and there must be obedience to them, for without obedience to the law they would have a state of anarchy. As to the question of a cheaper mode of construction, that was an important point in view of the enhanced price of materials. It might be advisable to cheapen construction, but a cheaper class of building would entail more for maintenance, and perhaps the old adage that the best was the cheapest in the end would apply in this case. There were no doubt many inconsistencies in the by-laws, and these should be removed where necessary, but these could only be ascertained by investigation. There must be a minimum fixed, and the danger was that it might be fixed too low. What was put as the minimum was too often regarded by people as the maximum and they did not set themselves to go beyond the actual requirements of the law. He considered particularly that the by-laws with regard to the air space about buildings required to be remodelled. He held that where there was not sufficient development to warrant the preparation of town planning schemes, great good might be attained if the model by-laws were framed so that a greater amount of air space should be given at the rear or the side of houses in urban districts than was the case at present. His contention was that houses should not be permitted to be built in long rows of fifty or sixty without a break for the circulation of air. With reference to the concluding paragraph in the paper as to the asking of too much causing danger of a neglect of sanitary laws he was afraid that by asking for too little the evil would be greater.

Mr. W. B. Pindar (Rural District Councils' Association) said the author appeared to have an extremely hazy idea as to the authorities charged with the administration of the by-laws in rural districts. He took it that the author's complaint was not so much against the Model By-laws of the Local Government Board as against the by-laws adopted in particular rural districts, which were considerably more stringent than the Model By-laws. It was a treat to him to attend a meeting where the rural district council was given the credit for being somewhat in advance of the statutory requirement, because the complaint generally was that they were behind the times and very slack. With regard to the air space about cottages, they ought to keep clearly in their minds what the object of land being attached to a cottage was. It was not for the disposal of refuse, but simply to secure free ventilation and light to the building. There was no power, so far as he knew, to make any by-law to provide land for the disposal of refuse, and the proper remedy was to enforce the clauses of the Public Health Act, which empowered the Local Government Board to call on the local authority to undertake the disposal of refuse. As to water supply, that was dealt with under the Public Health Act, and it was illegal to occupy any cottage erected since that date in a rural district unless there was a sufficient and adequate supply of water available for the inmates of the dwelling. He thought that the effect of the by-laws in restricting building operations had been grossly exaggerated. There was at present something like 200 rural districts in England and Wales where there were no building by-laws at all, and he had heard that there was a greater dearth of dwellings in those districts than there were in the districts where stringent by-laws were enforced. If that was so, it seemed to him there was no real basis for the complaint that the by-laws in rural districts prevented the erection of cottages. In those districts architects would have an entirely free hand, and a wide field for experiment, and there was nothing to prevent them experimenting in their own materials and according to their own design.

Dr. Tempest Anderson (York) said they were suffering very much at the present time from an epidemic of grandmotherly legislation, and if they went on as they were doing they would soon have to apply to the sanitary authority for leave to blow their noses. Someone had said there ought to be rigid powers to prevent the disposal of refuse about a house, but that he absolutely disagreed with. When he was in practice he attended farmers who lived with the fields around them heavily manured, and the same thing was the case with market gardeners, and yet they were the most healthy class of the community. When plans were being laid out for the building of a village, it was utterly absurd to spend enormous sums of money in putting down expensive and often abortive schemes for carrying the sewage to be disposed of at a sewage farm miles away. If they had a place in the country where they could dispose of the manure round about the house, and by that means convert it into wholesome vegetables, they would be conferring a great benefit on the community at large. In his opinion the utter waste of manure was one of the greatest national dangers at the present time. They went on exhausting the land, and took the manure which ought to go back to the land, and by septic tank treatment rendered it incapable of being used on the land. That being so, it was absurd to enforce on rural districts by-laws which might be necessary in the big cities, and which, by the way, had been made generally by public officials living in London who had never seen a farm.

Mr. J. S. Munce (Belfast) said that from what had been said that morning one would think the Local Government Board were a set of fools. Instead of crying out at conference after conference about the by-laws, why did they not first agree as to the by-laws they were satisfied with, and then discuss the others? The fault lay with the local authorities and their advisers. Instead of coming there and grumbling, engineers and surveyors should explain the whole thing to their councils, and if they objected to anything, and went quietly to the Local Government Board they would find they would be listened to. In Ireland, if they had anything to discuss they discussed it with the officers of the Local Government Board by arrangement, and showed their reasons for wishing to take a particular course, and they always found the officials most courteous to them. If they sent for a copy of the Model By-laws they would find a space reserved for the making of notes. Why then did they not make the notes and send them to the Local Government Board? His opinion was that the bulk of them were not able to amend the by-laws.

Mr. Cresswell (Carshalton) said, from a perusal of the paper, it would seem as if they wished to go back to the Dark Ages. They seemed to forget that the Local Government Board did not force these by-laws on them. They simply issued the Model By-laws, and each local authority had the remedy. It was the bounden duty of the local authority to consider the local circumstances, and each authority had the right to make its own by-laws, modelled on those submitted by the Local Government Board and approved by the Local Government Board. Speaking as an architect, he would at once say he would be very sorry to think that any brother architect would endeavour to go under the existing by-laws. If he was worth his salt

he would endeavour to go above them, and he had always found that architects did go above them. He had always held that hollow walls were not nearly so good as solid walls. It was a very good thing that a minimum was put in with regard to windows, but he felt that architects would be doing a very bad thing if they got anywhere near the minimum, as it was not sufficient. He agreed with the author as regarded cesspools. He had had a curious experience of adjoining rural districts. In one he had been allowed to put a cesspool with open joints, while a few yards away in another district he had had to deal with it as described in the paper. It seemed to him that the rural districts should come into line. A good deal was said about utilising timber, but a day or two ago a great authority said that they ought to be wary about using timber, as it was not so sanitary.

Mr. Ricardo, in reply, said he was glad the paper had produced so much discussion. He agreed with Dr. Anderson about keeping the manure in the country. In a rural district they had fields all around them. Where they had sewage enclosed in pipes, unless they were kept in efficient order, it meant sewer gas getting into the houses. They could take things into the open air, and not even bury them, and they remained sweet. If the whole country would accept the Model By-laws, subject to bringing them up to date as regarded sewage, and subject to their being a little more reasonable about window space, that ought to be enough. After that, when plans were presented, the local authorities should take on themselves the responsibility of saying they were not adequate if they thought so. It was the taking away of responsibility by putting things into the by-laws which did the harm.

(To be continued.)

SELF-CONTAINED COTTAGES *v.* BLOCK DWELLINGS.*

By J. Wright Mason, M.B., D.P.H.,
Medical Officer of Health, Kingston-upon-Hull.

The problem of how to deal with insanitary properties differs in various towns. In some it may be desirable to pull down the houses entirely and rebuild new dwellings on the sites, while in others it might be possible so to repair and alter the already existing dwellings as to make them reasonably habitable. The latter course is an exceedingly doubtful one, as, in my experience, sooner or later the properties again fall into disrepair, and therefore the action taken does not lead to any permanent improvement.

Buildings of a suitable elevation, and wider spaces between them seem to be a necessity for the future, especially in our large industrial and commercial centres. The essential requirements of every dwelling, however small, in my opinion, should be self-contained, so that the responsibility for their cleanliness and preservation can be fixed upon the individual occupying them. In this class of property each dwelling-house should, as far as possible, be adapted for the class of people by whom it is intended they should be occupied, and in planning them regard should be had to the provision of open spaces to be used as playgrounds and airing grounds. Flats or double-storied buildings are not to be commended, as wherever a common occupancy is resorted to the conveniences and yards attached thereto become more or less neglected, owing to the responsibility being a collective instead of an individual one.

I admit that the easy modes of locomotion provided by municipalities has been the means in recent years of inducing many of our artisans to live in the outlying districts where there is better housing accommodation and less overcrowding, but there remains a class who have possibly no choice but to live in the immediate vicinity of their occupation. Notwithstanding the improvement brought about by the condemnation of dilapidated houses and the clearing of small insanitary areas, the carrying out of this work has undoubtedly led to other localities similarly populated becoming more crowded, and to many of the displaced inhabitants migrating into some of the larger houses which are let off in tenements.

COST OF BLOCK DWELLINGS.

Mr. Aldridge, in a contribution, has stated that the cost of the block dwelling per room in Great Britain and Scotland, apart altogether from the land cost, is higher than the cost of the cottage per room, consequently the accommodation provided for a given sum is less in the block than in the cottage. He further states that the London County Council between 1893 and 1905 erected 3,300 dwellings in blocks, with 8,726 rooms, and the cost of these blocks, erected as they have been in many parts of London, and under a variety of conditions, may be regarded as giving an accurate index to the cost of building blocks throughout London. The building cost per room of these dwellings, apart from site cost, varies from £70 to £140 per room. The average building cost per room prior to 1902 was £102, but as a result of some economies in building methods, the average building cost has been reduced to £92 per room.

The self-contained cottage is, from a hygienic point of view, much superior to the block system. Firstly, the death-rates are lower in the cottage towns of England than in the block towns of Germany; secondly, consumption takes almost twice as many victims from the block dwellings of Germany as from the English cottage home; thirdly, the infant death-rate is far higher in block dwellings than in cottage homes. The building cost per room of cottages varies from £30 to £55 (Alderman Thompson in "Housing Up-to-Date"). These figures prove conclusively that in Great Britain the cost per room in the cottage for both building and site is less than the cost per room in the block.

The block method of housing was introduced into Great Britain in the period between 1850 and 1880, and had a brief period of popularity, the name "model dwelling" being given to this type of dwelling. Outside London, however, the proposal to erect model dwellings failed to secure approval. Manchester, Liverpool and Nottingham, and a few other towns, made experiments of a costly kind in building these dwellings, but the pressure of public disapproval has led the municipalities of these towns to discontinue their efforts in this direction.

Outside London, the block dwelling is to-day regarded as an undesirable method of housing. English workmen and their wives object to it as inconsistent with the English conception of a proper home. Even in London the block is not popular with the workmen, and that great city is still a city of small dwellings. Scotland is the only part of Great Britain in which the block dwelling is extensively found, and even in Scotland the growth of quick means of transit by tram and train, and the advocacy of the garden city idea, are rapidly inducing Scotch builders to erect cottages instead of blocks in the new housing areas.

* Extracts from paper read at the annual congress of the Royal Sanitary Institute at York.

Drainage Works and Sanitary Fittings.—A third edition, revised and brought up to date, particularly as regards the questions of concrete sewers, sewer ventilation and flushing, and the Public Health Acts Amendment Act of 1907, still further evidences the success of this little manual,* which manifestly deserves the attention and confidence of all concerned in the important subject with which it deals.—*The Bookseller.*

Institute of Sanitary Engineers.—On Saturday, the 31st inst., the members of this body will pay a visit to the Linslade Urban District Council's sewage works. Leaving Euston by the 12.20 p.m. train, they will arrive at Leighton Buzzard at 1.45 p.m., proceeding thence by brakes to the works, where they will be received by the chairman of the council (Dr. Johnston Harris, J.P.). At 3.30 the party will make an inspection of the Grove isolation hospital, leaving later in the afternoon for Ascott, where tea will be provided by Mr. Leopold de Rothschild.

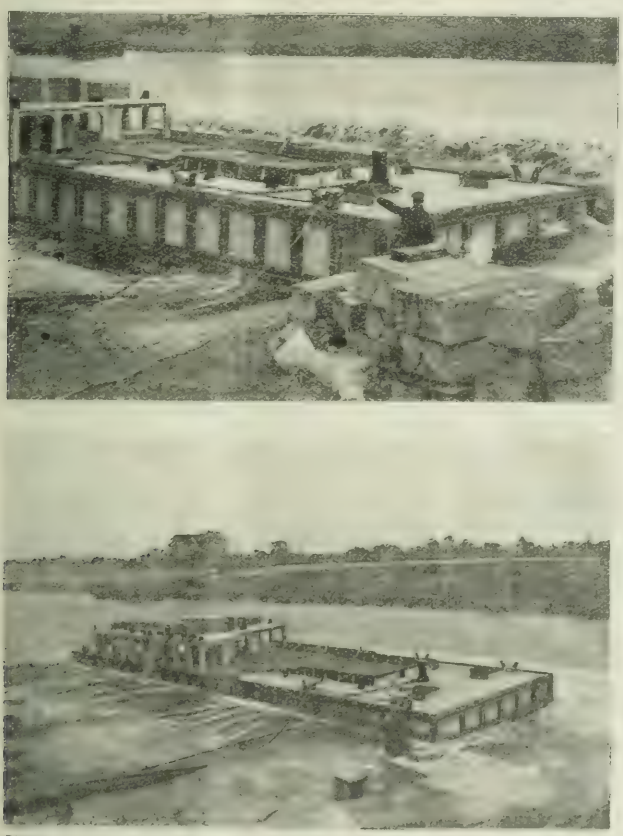
New School Buildings at Dewsbury.—The new Batley Carr council schools, Dewsbury, which have cost about £10,000, were opened on Monday last. Messrs. Holton & Fox, the architects, designed a structure which, besides supplying all modern requirements of an elementary school, has an imposing appearance. The schools, which provide accommodation for 500 children, are built on the central hall system. Separate class-room accommodation is provided for each standard, there being six senior class-rooms for boys and girls jointly, and four infant class-rooms. There are, in addition, manual, laundry and cooking rooms, and four separate teachers' rooms.

* "Drainage Work and Sanitary Fittings." By Wm. H. Maxwell. Price 2s. nett. London: St. Bride's Press, Ltd., 24 Bride-lane, E.C.

FERRO-CONCRETE SLUDGE PUMPING PONTOON.

Numerous barges and other vessels of ferro-concrete have been constructed abroad during the past few years, but the first example of this class of work to be turned out in Great Britain is a sludge pumping pontoon supplied to the order of the Manchester Ship Canal Company in accordance with the designs of Messrs. L. G. Mouchel & Partners, of Westminster.

The pontoon (says *Ferro-Concrete*) measures 100 ft. long by 28 ft. wide by 8 ft. 6 in. deep from the keel to the main deck. Its construction was authorised by the late Mr. Hubert Congreve, M.INST.C.E., chief engineer to the Manchester Ship Canal, and the contract was entrusted to the Yorkshire Hennebique Contracting Company, Limited, of Leeds. The reasons influencing the adoption of ferro-concrete instead of steel are said to have been the lower initial cost, the elimination of maintenance charges, and the readiness with which repairs could be executed in the event of collision or other accidental causes.



Photos. *A. Waterall.*

Launch of Ferro Concrete Pontoon

An interesting point connected with the safety of the pontoon is that it is divided transversely by two watertight bulkheads—one on each side of the boiler-room—and by three similar bulkheads elsewhere.

The place allotted to the pontoon in the general programme for dredging operations on the ship canal will be clear after perusal of the following statement. The dredgers in regular operation discharge into hopper barges, by which the sludge is transported to points where arrangements have been made for its disposal. The new pontoon has been built for the purpose of enabling dredged material to be deposited on low-lying land anywhere along either bank of the ship canal, improving the quality of the land and conducing to economical disposal. The pontoon will be towed by steam tugs to selected points and there moored, the hopper barges will then be towed from the dredgers as they are filled and moored alongside the pontoon. The suction-pipe of the pontoon will be lowered into the barge to be discharged, and the delivery pipe will deliver material upon the area selected for its reception. The pontoon will remain in position for as many days or weeks as may be convenient, and will be moved from place to place as necessitated by the exigencies of dredging operations.

DERWENT VALLEY WATER SCHEME.

COMPLETION OF WORKS.

The Derwent Valley Water scheme, the completion of which was lately reported, is intended to augment the water supply of Sheffield, Derby, Nottingham, and Leicester, and to satisfy the needs of their increasing populations for many years to come. To this end the head-waters of the river Derwent and its tributaries have been impounded by the construction of dams, the laying of many miles of great pipes, and the carrying out of other engineering devices, at a cost of about £3,500,000. The total gathering area was put down at something over 31,000 acres, and the total yield was estimated at 50,000,000 gallons per day. The arrangement made for the disposition of the water recognised the right of the county of Derby to 5,000,000 gallons per day, of the county of Nottingham to 1,000,000 gallons, and the division of the remainder in the following proportions: Derby, 25 per cent; Leicester, 35·72 per cent; Nottingham, 14·28 per cent; Sheffield, 25 per cent.

The main aqueduct, from the dams to the service reservoir at Ambergate, is 30 miles long. It includes 4 miles of tunnels, 8¼ miles of cut and cover, and 17½ miles of cast-iron pipes. From the service reservoirs the Joint Board controls the mains to Nottingham and Leicester to the boundary of Derbyshire only, the work being thence taken over by the respective corporations. The water passing through the service to Derby, Nottingham, and Leicester is filtered at Bamford, a few miles below the reservoirs.

Lochmaben Water Supply.—The new water supply for Lochmaben was inaugurated last week. The supply is a gift to the burgh by the Provost and Mrs. Halliday. The engineers for the work were Messrs. Balfour, of Newcastle, and the contractor Mr. Simpson, of the same city.

The Lady and the Lamp.—An example of the curious requests sometimes made by ratepayers cropped up at a recent meeting of the Tettenhall (Staffs) Urban District Council, at which the clerk mentioned that he had received a letter from a lady residing at Tettenhall who asked that a public lamp opposite her residence should be removed, as the light shone into her bedroom and she could not sleep. He had replied that the request could not be complied with, as the lamp was one of the most important in the district. A member remarked that the lamp was at the bend of a road, and was one of the most useful lamps they had. The surveyor, Mr. John Denton, remarked that someone had suggested that the house should be turned round. A member said, amidst laughter, that the lady must turn her bed round. The council agreed with the reply of the clerk that the lady's request could not be complied with.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

266. Surveying.—Describe in detail the operation of measuring a horizontal angle with a theodolite. ("Surveyor.")

267. Road Making.—Will some reader kindly give the heads of a specification for the conversion of a macadamised into a wood paved road? ("Inquirer.")

268. Text-books.—In what text-books can information be found in regard to (1) Theory of earth pressure suitable for reinforced concrete design; (2) Theory of elastic bridges; (3) Methods of taking float observations to ascertain the probable effect of tides on sewage discharged at different positions along shore? (R. W. T., *Gosport.*)

269. Masonry Arch.—Draw the line of least resistance in a stone segmental arch of 10 ft. span with a rise of 2 ft. 6 in., the voussoirs having an equal thickness of 12 in. and each being equally loaded. (A.M.I.C.E.)

REPLIES TO QUESTIONS.

264. Concrete Beam.—A concrete beam reinforced with steel rods is to be designed to carry a distributed load of 20 tons. The span is 15 ft. Show by calculations what size of beam you would use—the method and formulæ to be as simple and short as possible. ("Greenland Farm.")

Let c = compressive stress at top edge of concrete (lb. per sq. in.).

t = tensile stress on the steel (lb. per square inch).
b = breadth of beam (inches).
d = effective depth of beam (inches).
l = span of beam (inches) 180.
n = depth of neutral axis from top edge.
m = ratio of modulus of elasticity for steel to that for concrete, taken as 15.
B = bending moment (lb.-inches).
W = external load (lb.).
A_t = area of tensile reinforcement.
a = arm of resisting moment = $d - \frac{n}{3}$
A_s = area of shear members.
s_s = shear stress on steel
p = ratio of area of steel to concrete.
$B_2 - B_1$ = increment of bending moment between adjacent shear reinforcements.

The maximum values for c and t are 600 and 16,000 respectively.

Neglecting the strength of the concrete in tension the equations are

$$\tfrac{1}{2} c.b.n = A_t.t \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

$$t = \frac{cm\,(d-n)}{n} \quad . \quad . \quad . \quad . \quad . \quad (2)$$

$$n = \frac{mA_t}{b}\left[\sqrt{1 + \frac{2bd}{mA_t}} - 1\right] \quad . \quad . \quad (3)$$

$$B = \frac{c.b.n}{6}(3d - n) \quad . \quad . \quad . \quad (4)$$

$$B = \frac{A_t.t}{3}(3d - n) \quad . \quad . \quad . \quad (5)$$

The beam will have to carry its own weight in addition to the external load. Assuming the beam to be 18 in. × 28 in. its weight at 150 lb. per cubic foot will be

$$\frac{28 \times 18 \times 15.0 \times 1.0}{144} = 7,900 \text{ lb. (say)}$$

$$W = (20 \cdot 2,240) + 7,900 = 52,700$$

$$B = \frac{W}{8}.l = \frac{52,700 \times 180}{8} = 1,185,750$$

If it is desired to use the economical percentage of metal—*i.e.*, to adopt the maximum values for c and t—insert these values in (2).

$$\text{Then } \frac{n}{d} = \frac{cm}{t + cm} = \frac{6.0 \times 15}{16,000 + (6.0 \times 15)} = \frac{9}{25}$$

Now let $A_t = pbd$ and substitute in (1),

$$\text{then } \frac{1}{2} \times 600 \times b \times \frac{9}{25}\,d = p.b.d \times 16,000$$

$$\therefore p = .00675.$$

Insert the known values in (4)

$$1,185,750 = \frac{600 \times 18}{6} \cdot \frac{9d}{25}\left(3d - \frac{9d}{25}\right)$$

$$\therefore d = 26\tfrac{1}{2} \text{ in.}$$

$$A_t = 26{\cdot}5 \times 18 \times .00675 = 3{\cdot}22$$

$$\text{say 5 bars } \frac{15}{16} \text{ in. diameter.}$$

The bars will require at least 1 in. of cover; the over-all depth will therefore be 28 in. and the width 18 in.

These dimensions may be reduced somewhat by adopting a higher percentage of steel. In such case, however, the steel will not be stressed to the maximum of 16,000 lb.

Assume for instance a ratio of reinforcement of $1\frac{1}{2}$ per cent.

First estimate the weight of the beam, say 6,900 lb., then W = 51,700 lb. and B = 1,163,250.

Next determine the depth of the neutral axis by substituting pbd for A_t in (3).

$$\text{Then } \frac{n}{d} = 15p\left[\sqrt{1 + \frac{2}{15p}} - 1\right]$$

$$\therefore \frac{n}{d} = \frac{15 \times 1{\cdot}5}{100}\left[\sqrt{1 + \frac{2 \times 100}{15 \times 1{\cdot}5}} - 1\right] = .48$$

As the concrete is fully stressed use (4), adopting a width of beam (say) 17 in.

$$\text{Then } 1,163,250 = \frac{600 \times 17}{6} \cdot \frac{48d}{100}\left(3d - \frac{48d}{100}\right)$$

$$d = 24 \text{ in.}$$

$$A_t = \frac{1{\cdot}5}{100} \times 17 \times 24 = 6{\cdot}12$$

$$\text{say } 12 - 1\tfrac{1}{8} \text{ bars in two rows of 6 each.}$$

Taking the case of the first mentioned beam, the shear stress is greater than is allowed by the R.I.B.A. recommendations, so that stirrups will be required.

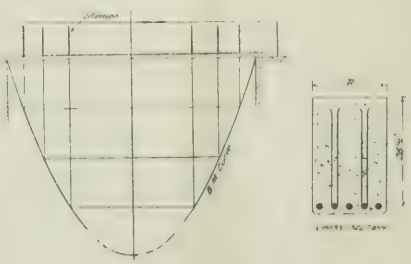
Their area will be

$$A_s = \frac{B_2 - B_1}{s_s.a} \quad . \quad . \quad (6)$$

where s_s = 12,000 lb./in.² and a = 23·3 in.

To obtain their position along the beam plot a diagram of bending moments and divide the maximum vertical ordinate into equal divisions, draw horizontal lines to cut the curve, and from these points of intersection draw verticals to give the position of the reinforcements.

The first stirrup should in this case be placed at a distance of about 12 in. from the support.



$$\text{From (6)} \quad A_s = \frac{300,000}{12,000 \times 23{\cdot}3} = 1{\cdot}1 \text{ sq. in.}$$

say two flat bars $1\frac{1}{4} \times \frac{1}{4}$ bent as shown in the cross-section. (H. F. W., *Tottenham.*)

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
Appointments Vacant	282
Assistants' and Students' Section	270
By-Laws in Rural Districts	258, 265
Condition of Roads in Ireland	259
Correspondence	274
Derwent Valley Water Scheme	269
East Suffolk Roads	282
Essentials of a Garden City	274
Ferro-Concrete Sludge Pumping Pontoon	269
Insects and Disease	259, 279
Institution of Municipal and County Engineers:—	
Annual General Meeting in London	260
Notices	282
Leeds Sewage Disposal	281
Local Government Board Inquiries	273
Modification of Model Building By-Laws	258, 265
Municipal Competitions Open	283
Municipal Contracts Open	283
Municipal Tramways Association	282
Municipal Work in Aylesbury	280
Municipal Work in Progress and Projected	275
Personal	277
Proposed London Improvement	258
Public Health in Johannesburg	259, 264
Road Board's Second Annual Report	263
Road Maintenance Problems	257, 271
Road Scarifiers	272
Royal Sanitary Institute Congress at York:—	
Engineering and Architecture Section	265
Self-Contained Cottages v. Block Dwellings	268
Suggestions Towards a Standard Specification for Bituminous Bound Carriageways	257, 260
Torquay's New Pavilion	278
Wiltshire Roads	257, 271
Yeadon's Municipal Bazaar	259

ROAD MAINTENANCE PROBLEMS.*

By J. George Powell,
County Surveyor of Wiltshire.

One of the chief difficulties of maintenance in this county is that during alternate periods of frost and thaw, when work upon the land is impossible, horses are employed largely upon the roads when the surface is in a condition least able to bear traffic. In the parts of the county where there are large tracts of arable land this traffic is particularly destructive to the road surfaces, which are destroyed, rather than worn out, by the picking up of the metalling by the plastic mud brought on to the roads, sometimes direct from the fields, and in other cases from the occupation roads, which are almost invariably mud ponds in bad weather. I feel I must again appeal to the agricultural community to render all the assistance it can in minimising the damage by cleaning wheels, or hardening the ends of the occupation roads where they come upon the main roads. It most materially affects the cost of upkeep of the main roads, and is consequently of great importance.

SUBSOIL.

The subsoil of the main roads throughout the county varies considerably, and this fact to a great extent is accountable for the heavy cost of upkeep of some roads compared with others. Take, for instance, a road where the subsoil is rock (oolite), marl, or chalk if well covered, and it will be found that the cost of upkeep will be from 30 to 40 per cent less than on another road on a subsoil of clay, greensand, and silt, with the same traffic.

The access of water to a clay subsoil tends to convert it superficially into a semi-fluid mass of soft mud, which is not a desirable foundation for a road to rest upon. The impermeability of clays, however, facilitates the removal of water by proper drainage before it has time to soak into and soften the substratal portions of the road. The worst kind of subsoil to deal with is silt, which, while nearly as retentive as clay, is at the same time very absorptive.

A wet subsoil cannot give a firm unyielding foundation, and will invariably destroy the efficiency of the road under the pressure of heavy traffic. The action of the water will be found to be twofold. (1) The natural cohesion of the road bed will be mechanically weakened, and (2) the chemical disintegration of the road metal will be hastened. When, therefore, the road bed consists of any substance which is liable to become sodden with water, steps should be taken to remove the water by efficient drainage.

HEDGES AND TREES.

For economical and efficient upkeep of roads I attach very great importance to cutting hedges and trees. From experience I have found, where high hedges enveloping, and therefore shading and excluding wind and sun from the surface of the road, have been cut down to the ordinary height of about 4 ft., a saving of from 15 to 20 per cent in the annual cost of repair has been effected. Therefore it is in the interest of every ratepayer in the county to keep both hedges and trees on the sides of the main roads properly cut.

MECHANICALLY PROPELLED TRAFFIC.

I pointed out in my annual report last year that the roads had suffered considerably in consequence of an increase in the number of mechanically propelled vehicles. I again desire to emphasise that fact in respect of this year very strongly.

The increase in the number of self-propelled vehicles since, say, 1903 is great, and the injurious effect of such vehicles on roads is very alarming. With regard to the number before 1903, so far as I am able to ascertain, there were not more than 1,200 motor cars in use, whereas the number using roads in England and Wales on December 31, 1911, amounts approximately to 200,000. Included in this enormous increase in number are some 8,000 heavy motors. To the use of these I attribute the greatest injury to roads. In my opinion greater danger is caused to the surface of roads by the heavy motor than by the traction engine.

Consider for one moment not only the great increase in the number, but the enormous increase in weight and speed the surface of the road has to stand now compared with, say, 1903. Although I have made a comparison, I think it an unfair one; a fairer comparison would be to take 1877 and 1912.

Take the strength and condition of roads in 1877. Although sufficient for the traffic at that time, only about 30 per cent were made roads; the remainder became roads by an annual application of broken metal in the ruts or tracks formed by the traffic on the natural soil. In this way the surface became covered, and eventually a thin crust sufficient to carry the traffic at that time was formed. Between 1877, and more particularly between 1888, and the present date a great improvement to roads has, by a burdensome expense to the ratepayers, been effected, but the fact must not be lost sight of that it was a surface improvement on an unmade foundation. This kind of road sufficed until about 1897 (except where there was heavy traction-engine traffic), but from that date up to the present an entirely new form of traffic has been legalised.

It is inconceivable that measures so drastic should have been passed by the Legislature without inquiry having been made as to whether the roads were capable of carrying the traffic or not. Only a small percentage of them have foundations, and even those by present-day traffic are tried to the uttermost. A great percentage, as before stated, are without made foundations, and these were made and maintained in a sufficient state for the traffic of the county or district. A very great injustice to the ratepayer was undoubtedly done by legalising this new form of traffic. The roads should have been made capable of carrying it by a grant from imperial funds before such traffic was allowed upon them.

This new form of traffic is responsible for the great increase in the cost of road in the county, a fact very regrettable to me, but one which I am utterly unable to prevent. My greatest wish is that I could hold out even a hope that the expenses in the future will be less. A change can only be achieved in one way, and that is by concerted action of county councils and other councils in petitioning Parliament direct, or the Members of Parliament representing each county, praying for immediate legislation in the matter.

MATERIALS.

Owing to there being no material of a mineralogical and chemical nature obtainable in the county—except flints—suitable for the repair of the heavily trafficked roads, a quantity of material continues to be imported. Recognising the fact that carriage forms a great proportion of the cost, I am continuing to use flint on

* Extracts from Annual Report.

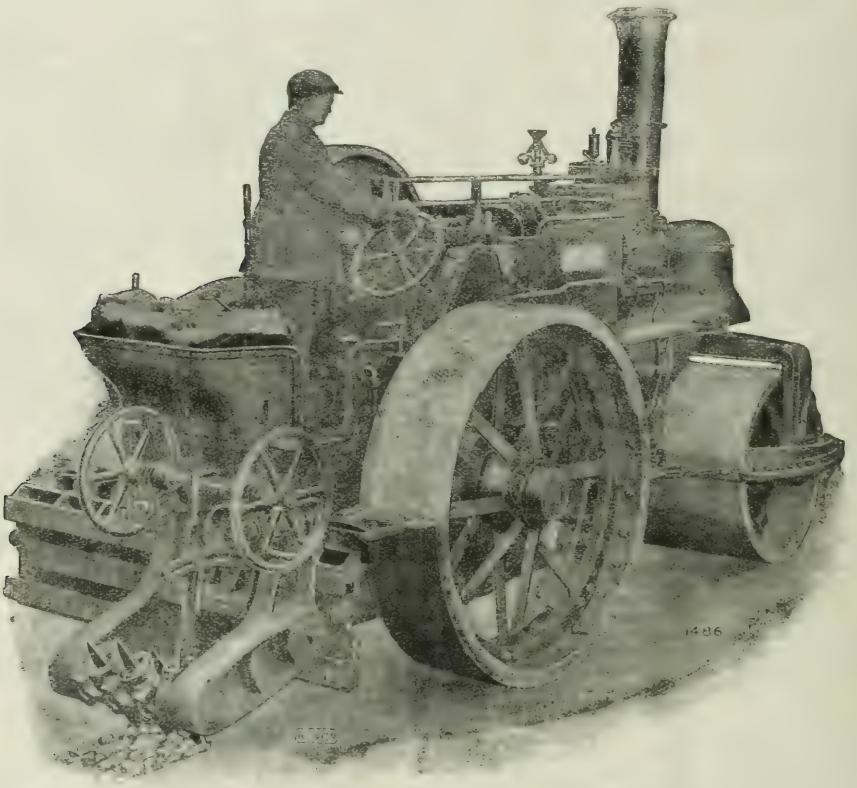
certain roads which hitherto were repaired with limestone. . . . I am of opinion that flints should be used in future on roads which at present are repaired with limestone, for the following reasons: (*a*) A resilient, non-slippery, elastic, quick-drying and clean surface is generally maintained. (*b*) The material is purchased by measure (not as limestone is—by weight), consequently greater bulk, compared with limestone, is obtained. For instance, 1 ton of limestone = about 19 cub. ft.; one yard of flints = 27 cub. ft. Bringing these cubical contents to yards super. of road surface to be metalled 3 in. thick, the following is the result: Flint, 12 yds. super.; limestone, 8 yds. super. The cost of flints is 6s. per cube yard = 6d. per yard super., and the cost of limestone 5s. per ton = 7½d., or 25 per cent per yard super. more than the flint. (*c*) The cost per mile of road would be considerably less. (*d*) Money which is at present sent out of the county would be spent in it.

Scarborough Bathing Pool. With the view of further increasing the bathing facilities, Scarborough Corporation have decided to construct a bathers' pool on the south beach at a cost of £2,600. It will be so constructed as to be available at all times for safe bathing.

Street Cleansing by Electricity.—In several German cities street-washing machines, driven and operated by storage batteries, are in operation (says *Scientific American*). The machine employed is a 3½-ton vehicle equipped with a 40-cell battery giving 200 ampere-hours at the five-hour discharge rate, with travelling speeds of 3, 6 and 9 miles per hour. It carries a heavy tank of water, brushes and rotating rubber scrapers. There are twenty-four of these machines at work in Berlin at present, with six special charging stations, and each machine covers 18 to 25 miles per day, and costs less to operate than a horse-drawn machine.

ROAD SCARIFIERS.

In the latest sectional catalogue of Messrs. Marshall, Sons & Co., Limited, Britannia Ironworks, Gainsborough, one of the numerous illustrations depicts a compound road-roller fitted with the firm's patent scarifier, which is claimed to embody several important advantages over other apparatus of the kind. From the illustration in question it will be obvious that the weight and strain of the scarifier are equally distributed over the full width of the tender. By the traversing motion, scarifying up to the gutter on either side of the road can be done without having to turn the roller round; moreover, the scarifier will operate either backwards or forwards, and the depth of the cut in each case can be regulated. The tools are held rigidly in position, but can be readily withdrawn for sharpening or replacement. The appliance will scarify in one cut about 12 in. to 15 in. wide, and the depth of the cut can be varied from 2 in. to 3 in., according to the nature of the road.



Compound Road-Roller fitted with Marshall's Patent Scarifier.

The catalogue is mainly taken up with the illustration and description of Messrs. Marshall's traction engines and road rollers, but a number of pages are devoted to their trailer and traction wagons, living and sleeping vans, water carts, and useful type of hand-force pumps.

Messrs. Marshall, Sons & Co. have been large makers of engines for over sixty years, having been established since 1848, and the extent of their business will be understood when it is stated that their Britannia and Trent works combined cover over 40 acres, and that they employ more than 5,000 hands.

Institution of Municipal Engineers. The annual meeting of this body will be held in London in October next.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Alfreton U.D.C. (August 8th. Mr. F. O. Stanford).—£1,400 for widening and improving Pentrich-lane, Swanwick, and £700 for the purchase of land adjoining the Butterley reservoir in the parish of Ashover for reservoir extension. With respect to the Swanwick scheme, the clerk gave the following details: £800 the price of land and houses, £25 costs, and £575 the estimated cost of the works. The scheme was a necessary one, because there was a good deal of excursion traffic on the road, which had several dangerous angles. Its width would be from 22 ft. 6 in. to 38 ft. Its proposed width would be from 36 ft. to 52 ft. The surveyor, Mr. R. F. Ward, gave details as to the making up of the road. The footpath on the new side would be a temporary one pending the development of the land abutting as a building estate. As to the reservoir scheme, it was explained that the council had agreed to give £700 for the farm which adjoined the Butterley reservoir, which contained about 14½ acres. With an increasing demand for water the time would come when they would have to extend that reservoir, and the council's proposal was to utilise the farm in question.

Boston T.C. (August 14th. Mr. F. O. Stanford).—£7,370 for the construction of a new town bridge.—The town clerk, in explaining the case for the corporation, mentioned that the county council had promised to contribute £2,000 towards the cost of the bridge. The corporation, it was stated, had arranged to pay £200 for 11 sq. yds. of land at the south-west corner of the bridge, so as to permit of the widening of the structure.

Bridlington T.C. (August 9th. Mr. W. O. E. Meade-King).—£1,600 for the purchase of a house in Manor-street, and for widening the narrow street. The inspector intimated that he had visited the site, and he considered the corner was a very dangerous one, and, as far as his opinion went, he thought the improvement a necessary one. The surveyor, Mr. E. R. Matthews, produced plans showing that when the house was taken down the space would be utilised as far as the passage on the east side of the house. A 10-ft. footpath would be made in place of the existing 3-ft. 6-in. footpath, and the extended roadway would be 24 ft. in place of 16 ft. 6 in.

Bridlington R.D.C. (August 7th. Mr. W. O. E. Meade-King).—£260 for the extension of the water main in North Marine-road, Flamborough, to the Thornwick Hotel, a distance of about 1,100 yds.—It was explained that the existing waterworks were carried out in the years 1906-7. They consist of a well 230 ft. deep, a reservoir storage of 50,000 gallons, a Canadian windmill, with pumps 8-horse power, and a Campbell oil engine attached to three-throw pumps capable of lifting 3,000 gallons of water hourly. There are 4-in. mains in the village, and 3-in. mains outside the village. The whole of the work was done in accordance with a plan and scheme propounded by Messrs. Elliott & Brown, civil engineers, of Nottingham. The supply of water has always been adequate, and the quality good. The existing main is only laid on the North Marine-road to the new property on the north side. The estimate of the engineers for carrying out the proposed extension is for the sum of £260, the following being the details: 1,100 yds. of 3-in. main, £192 10s.; standpipe and two hydrants, £14 18s. 6d.; air and sluice valves, £13; contingencies, £9 12s.; engineers' fees and expenses, £15; loan, advertising, and other expenses, £15; total, £260.

Cambridgeshire C.C. (August 7th. Mr. M. K. North). £6,260 for the purchase of premises in Hobson-street, Cambridge, as a site for county offices, and £9,740 for the erection of the buildings.—It was stated that at present the council work was carried on in a series of scattered offices, the aggregate rent of which was £526. The site of the proposed offices was freehold, and evidence was given that it was well worth the money it was proposed to pay. The county council were not able to make use of the Shirehall, as it was at the extreme end of the town.

Colchester T.C. (August 6th. Mr. A. W. Brightmore).—£820 for works of sewerage in St. John's-street, Crouch-street, Head-street, Eld-lane and Lion-walk.—The borough surveyor, Mr. H. Goodyear, produced plans and specifications.

Fylde Water Board (August 14th. Mr. A. W. Brightmore).—£120,000 for extra expenditure incurred in the completion of the new reservoir at Grizedale Lea, in the construction of which unexpected difficulties have been experienced, and £4,500 for the purchase of land and the allocation of buildings at Blackpool and Kirkham.—It was stated that the reservoir would have a storage capacity of 320,000,000 gallons, and that the area of supply extended over 207 square miles. There was no opposition to the application.

Repton R.D.C. (August 14th. Mr. R. G. Hetherington).—£6,000 for purposes of sewage disposal.—Several members of the parish council opposed on the ground that the brook was not polluted by the present system, Dr. Cronk upholding their contention. Mr. Hetherington inspected the existing sanitary arrangements at the close of the inquiry.

Saddleworth U.D.C. (July 25th. Mr. Courtenay Clifton).—£16,000 for the erection of fifty-five cottages.—The clerk, Mr. E. Rowbotham, stated that the wards in which the houses were to be built were Uppermill, Dobeross, Delph and Diggle. In Greenfield houses were not thought necessary, as suitable working-class dwellings had been erected there. The cost of the Diggle scheme would be £6,755, giving a yearly loss of £6 15s. 2d.; Gatehead, loss of £10 9s. 3d.; Uppermill, loss of £13 18s. 2d., making a total yearly loss of £35 13s. 7d.

Warrington T.C. (August 20th. Mr. Edgar Dudley).—£11,223 for works of private street improvement and £1,777 for the purchase of land for purposes of street improvement.—The deputy town clerk (Mr. A. T. Hallaway) said the period asked for the repayment of the loan for private street works was ten years. They had asked for that at nearly every inquiry for the last four or five years, but had not been successful in obtaining it. If they put down paving that would only last a short period they could understand the principle that the Local Government Board had acted upon in granting only seven years for repayment. But the quality of the paving done by the corporation was such as to last at least fifty years. The pavement in Sankey-street had been down for that period, and was as good to-day as it was when it was constructed—in fact, the system of paving would last 100 years. The borough surveyor (Mr. T. Longdin) said no town in Lancashire had a cheaper method of street paving than Warrington.

APPLICATIONS FOR LOANS.

Barnsley T.C.—£1,000 for the extension of the Old Town School.

Clowne R.D.C.—£10,000 in connection with the water supply scheme.

Desborough U.D.C.—£1,307 for the purchase of land for a recreation ground.

Eastbourne T.C.—£931 for road improvements.

Grange U.D.C.—£200 for the extension of a recreation ground.

Halifax T.C.—£2,000 for additions to public baths.

Kent C.C.—£400 for a school site at Cudham, £150 for alterations to the Hollingbourne School and £475 for alterations to the Sheerness School.

Kingsbridge R.D.C.—£400 for a water supply for Stoke Fleming.

Maesteg U.D.C.—£4,069 for alterations to the town hall.

Manchester T.C.—£2,157 for a school site at Chorlton-cum-Hardy.

Middleton T.C.—£25,000 for sewage disposal works.

Pembroke U.D.C.—£8,600 for a housing scheme.

Penistone U.D.C.—£3,500 for the provision of municipal buildings.

Pontefract T.C.—£5,600 for new public baths.

Ramsgate T.C.—£3,206 for the extension of Victoria parade and gardens.

Sandgate U.D.C.—£5,500 for water supply works.

Slough U.D.C.—£150 for a sewer flushing tank.

LOANS SANCTIONED.

Alsager U.D.C.—£3,470 for a sewerage and sewage disposal scheme, of which the surveyor, Mr. H. V. Lynam, is engineer.

Farnham U.D.C.—£560 for road improvement works.

Felixstowe U.D.C.—£849 for works of sewage disposal, to be repaid within thirty years.

Ince U.D.C.—£5,500 for private street works.

Margate T.C.—£13,218 for a refuse destructor.

Morpeth T.C.—£5,810 for workmen's dwellings.

Ossett T.C.—£200 for surface-water drainage and £4,963 for sewerage works.

Pontefract T.C.—£19,000 for the erection of workmen's dwellings.

Prestwich U.D.C.—£2,018 for private street works.

Radstock U.D.C. — £7,044 for forty workmen's dwellings.

Richmond (Surrey) T.C. £3,250 for extension to public baths (to be repaid in thirty years), and £607 for water main (for thirty years).

Saffron Walden T.C.—£2,025 for a water tower.

Stalybridge T.C.—£1,931 for a higher elementary school.

Stamford T.C.—£850 for the provision of public baths.

Thornaby T.C.—£4,300 for the purchase of land for a depot.

FORTHCOMING INQUIRIES.

AUGUST.

		£
27.	**Bentley.** For sewage disposal purposes (Mr. A. G. Drury)	12,225
27.—	**Bettws-y-Coed.** For water and electricity purposes (Mr. T. C. Ekin)	13,420
27.—	**Bradford.** For baths and bowling-green purposes and the provision of filtration plant (Major J. Stewart)	13,099
27.—	**Salford.** For sewerage and refuse-tip purposes (Mr. H. Shelford Bidwell)	1,914
27.—	**Southport.** For sanitary, recreation ground and street purposes (Mr. F. H. Tulloch)	11,200
27.—	**Stockport.** For street and filtration plant purposes (Mr. Courtenay Clifton) ...	4,171
28.—	**Barnsley.** For baths and cattle market purposes (Major J. Stewart)	7,300
28.—	**Ellesmere Port.** For the provision of a cemetery (Mr. Courtenay Clifton) ...	4,764
28.—	**Gloucester.** For water and sewage disposal purposes	11,640
28.—	**Leigh.** For street improvement purposes (Mr. F. H. Tulloch)	6,402
28.—	**Shrewsbury.** For widening a bridge (Mr. H. Shelford Bidwell)	12,000
28.—	**Buxton.** For the purposes of the pumping and baths (Major J. Stewart) ...	5,000
29.—	**Hoylake.** For electricity purposes (Mr. T. C. Ekin)	1,300
29.—	**Manchester.** For baths, street and recreation ground purposes (Mr. F. H. Tulloch)	10,100
30.—	**Cannock.** For works of street improvement (Mr. Courtenay Clifton)	4,240
30.—	**Leek.** For the extension of the cemetery (Mr. F. H. Tulloch)	1,050
30.—	**Wallasey.** For [illegible] street and depot purposes (Mr. T. C. Ekin)	7,707

Municipal Engineering (Edited by Sydney G. Turner, Assoc.M.Inst.C.E. Price 3s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.).—This volume consists of model answers to questions set at recent examinations of the Institution of Municipal and County Engineers, and is the second edition. It is practically identical with the first issued. It is not suggested that it should take the place of recognised text-books, but it provides useful summaries of various subjects, as well as indications as to how different types of questions may be answered. Every effort has been made to render the answers as accurate and comprehensive as possible, though [illegible] than a candidate would be expected to supply. The answers are founded upon examination papers set in Birmingham, London and Manchester. The appendix contains examples of questions on sewerage, sewage disposal, tramway construction, bridges, water supply, road construction, buildings, sanitary science as applied to towns and buildings, drainage, and other matters. It will be seen, therefore, that the book is comprehensive, practical and exhaustive.—*Local Government Journal.*

CORRESPONDENCE.

"*Be dumb in arguing; for fewness makes*
Error a fault and truth discourteise."
— Geo. Herbert, "*The Temple*"

ESSENTIALS OF A GARDEN CITY.

To the Editor of The Surveyor.

Sir,—During the past few days a paragraph has gone the round of the Press, under the heading of "A New Garden City," stating that a new garden city is being started at Dovercourt, and the details given show that on 14 acres of land ninety houses are to be built.

May I again be allowed to point out what a garden city really is? After thirteen years of propaganda by the Garden Cities and Town Planning Association, it might have been supposed that the term "Garden City" was tolerably familiar, and that its real meaning was understood by all thinking people taking any interest in social matters. As the appearance of the above-mentioned paragraph this week, and scores of similar instances during the year, show that there is still a good deal of misunderstanding, might I be allowed to define the essentials of a garden city as distinct from a garden suburb and from ordinary development? They may be stated as follows:—

(1) That before a sod is cut, or a brick is laid, the town must in its broad outlines be properly planned with an eye to the convenience of the community as a whole, the preservation of natural beauties, the securing of the utmost degree of healthfulness, and proper regard to communication with the surrounding district.

(2) That in the town acre the number of houses should be strictly limited, so that every dwelling should have ample light and air, with a suitable garden, and that public recreation ground and open space should be provided generously.

(3) That the town area should for ever be surrounded by a belt of agricultural and park land, so that while in the centre the urban problem is being dealt with, the rural portion, which should be the larger part of the estate, may be available for farms and small holdings, in order that the small holder and market gardener may have a new market direct to hand for the sale of produce.

(4) That the return on capital should be limited to, say, 5 per cent, any profit above that amount being applied to the estate itself for the benefit of the community.

(5) That the town should be not merely residential, but also commercial and industrial, that provision should exist for taking the worker and his work away from the crowded centres into the fresh air of the country district, where not only should the land be cheaply obtainable for the employer, but the worker should have a comfortable cottage at a convenient distance from his labour.

It is therefore essential that the land should be of considerable area, and its development should be in the hands of one controlling body, which, in Mr. Howard's scheme, should have for its ultimate object, not the making of huge profits, but the improvement of the conditions of life for all who live on the area. The estate should be somewhere from 6 to 10 square miles in area, and in order to give effect to the desire for the combination of town and country about two-thirds should be reserved for the rural area.

It will therefore be seen at once how absurd is the designation "Garden City" when applied to 14 acres of land.

A "Garden Suburb" provides that the normal growth of existing cities shall be on healthy lines; and, when such cities are not already too large, such suburbs are most useful and even in the case of overgrown London they may be, though on the other hand they tend to drive the country yet further afield, and do not deal with the root evil—rural depopulation.

"Garden Villages," such as Bournville and Port Sunlight, are garden cities in miniature, but depend upon some neighbouring city for water, light and drainage; they have not the valuable provision of a protective belt, and are usually the centre of one great industry only.

The garden city movement stands for the preventive, not as the palliative.—Yours, &c.,

Ewart G. Culpin,
Secretary,
Garden Cities and Town Planning Association.

3 Gray's Inn-place, W.C.
August 14, 1912.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Arbroath, Failsworth £9,000, Louth, Pontefract £6,200; housing and town planning—Fifeshire, Glasgow; roads and materials—Aberdeen, Dundee, West Suffolk £24,000; sewerage and sewage disposal—Audley £15,000, Durham £3,039, Hampton; water, gas and electricity—Barry £130,000.—Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

ADMINISTRATION.

Camberley U.D.C.—A draughtsman capable of taking levels and preparing plans is to be appointed in the surveyor's department.

BUILDINGS.

Arbroath T.C.—The provision of public baths is under consideration.

Bacup T.C.—The provision of a public convenience in the centre of the town is under the consideration of the Health Committee.

Bourne R.D.C.—The council have approved the plans for the new isolation hospital proposed to be erected on the South-road, and at which it is also proposed to make some provision for sanatoria treatment. The plans provide for sixteen beds, and a sanatoria shed, with an administrative block, and the estimated cost is £4,850. With regard to the sanatoria sheds, the council have decided that the surveyor, Mr. T. Lake, and the medical officer, shall visit and inspect a similar institution recently erected.

Cornwall C.C.—The new county council offices at Truro, built at a cost of £20,000, were formally opened last week.

Dumbartonshire C.C.—It is proposed to build a small-pox hospital at South Hutcheon.

Dumbarton T.C.—Alterations to the slaughter-house are to be carried out, at an estimated cost of £1,300.

Failsworth U.D.C.—A proposal has been made to erect public baths, at an estimated cost of £9,000.

Kingstown U.D.C.—The tender of Mr. Frank Weafer, at £1,053, has been accepted for the erection of baths and wash-houses.

Littlehampton U.D.C.—The Duke of Norfolk has offered the council a site for a fire station on condition that the building is erected in two years, and the council has agreed to this.

Louth T.C.—A sub-committee of the General Purposes Committee are drawing up alternative schemes for the provision of public baths in the borough.

Machynlleth R.D.C.—The tender of Messrs. Holbrough & Co., of Gloucester, at £485, has been accepted for the construction of a new bridge.

Oldham T.C.—The borough surveyor, Mr. E. C. Foote, has received instructions to prepare plans of a small-pox hospital, and for the extension of the Westhulme and Strinesdale hospitals.

Pontefract T.C.—With respect to the scheme for new public baths, it has been decided to accept the plans and estimates, with the provisional tenders, of Mr. A. Nunweek, of Sheffield, whose plans had been selected by the assessor, Mr. Brearley, of Leeds, as the most suitable among eighteen sets entered for competition ten months ago. The total cost, allowing £238 for contingencies, is estimated at £6,200.

Sunderland T.C.—It has been agreed to build a day training college and reconstruct the Bede Collegiate School so as to provide accommodation for 800 secondary school pupils.

Thingoe R.D.C.—It has been decided to build six cottages at Barrow.

Warrington T.C.—A special committee is to consider a report by the surveyor, Mr. T. Longdin, on his proposed instructions and conditions to architects for competition for a new council chamber, or, in the alternative, for the alteration of the existing council chamber.

West Hartlepool T.C.—The tender of Messrs. Pearson & Son, at £174, has been accepted for extensions to the electricity power station.

Whitley and Monkseaton U.D.C.—The tender of Mr. W. Allison, at £4,725, has been accepted for the buildings at the new cemetery.

Yarmouth T.C.—A tram shelter is to be provided on the west side of Caistor-road.

HOUSING AND TOWN PLANNING.

Bourne U.D.C.—A special committee have recommended that a number of houses should be erected on the portion of the recreation ground abutting on Manning-road, at such a cost as would admit of the houses being let at an inclusive rental of 3s. per week.

Dublin T.C.—Resolutions have been passed declaring the Ormond Market area unfit for habitation, adopting schemes for the improvement of both it and the Beresford-street areas, and requesting the Local Government Board at the proper stage to appoint an arbitrator to determine the site value.

Fifeshire C.C.—Dunfermline District Committee have decided to apply to the Local Government Board for permission to proceed with two town-planning schemes for separate areas within their jurisdiction. Mr. J. E. Wilkes, who is preparing the plan for the extended area of Dunfermline, and was also appointed to plan the territory under the Inverkeithing Town Council's scheme, has been selected to prepare their plans.

Glasgow T.C.—The council last week adopted a proposal by a special committee on the Housing of the Working Classes Acts, to take steps for the clearance of five areas of dwelling-houses and buildings, which are alleged to be overcrowded and congested, in the wards of Blackfriars, Hutchesontown, Cowcaddens, Townhead, and Mile End. In an elaborate report prepared in connection with the scheme it was shown that the areas are similar in character, varying from about 2¼ to 3½ acres in extent, the population on each being about 1,200 to 1,500 persons, occupying for the most part houses of one and two apartments.

Horncastle R.D.C.—A move is to be made with the housing question by communicating with the parish councils to ascertain the needs of the various districts. The sanitary inspector has 300 houses on his "black list," 135 of which ought to be closed.

Houghton U.D.C.—A scheme is being considered for the provision of fifty houses.

Lyme Regis T.C.—An additional eight cottages is to be provided in Lower Early Mead Field.

Merthyr T.C.—The tender of Mr. Richard Lloyd, Cefn, at £9,945, has been accepted for the erection of forty-four municipal dwellings at Thomastown.

Morpeth T.C.—The Local Government Board have expressed approval of the scheme for the appropriation of corporation land, on which to build workmen's houses.

Spalding R.D.C.—In response to a suggestion from the Local Government Board, it has been decided to interview the contractors for the housing schemes with a view to seeing whether it is practicable to reduce the cost of building the houses. With regard to the Donington scheme, it was stated that the total cost for the six houses was £1,100. The estimated expenditure, including rates, &c., would be £65 a year, and at 4s. 3d. per week the six houses would bring in £66. At Moulton the conditions were nearly the same, and the rents would work out at 4s. 6d. per week. It was mentioned that at Moulton there was half an acre of land attached to each house, and, considering this fact, it was thought the place would be worth the rent. The clerk remarked that the point of the whole matter was that after the working men had paid for the entire cost of the houses, they would not be their property, but would belong to the parish.

PARKS AND OPEN SPACES.

Partick T.C.—Two new public bowling greens were opened last week at Meadowside Park. The estimated cost of the greens was £1,500, but a sum of £213 was saved on that estimate.

Southport T.C.—A scheme of the Parks Committee has been adopted for the extension of the South Marine Gardens at a cost of £8,500.

REFUSE COLLECTION AND DISPOSAL.

Clacton U.D.C.—The inspector of nuisances now undertakes the removal of trade refuse in the town at a charge of 1s. per hour in respect of horse, cart and man. In order that the house refuse may be collected more expeditiously and the nuisance caused by the carts in the streets minimised, the council have directed the surveyor, Mr. D. J. Bowe, to obtain prices for the supply of two dust vans, with metal covers, and recommend that the vans should be purchased at the earliest possible date. It has also been decided to reorganise the system of collection, so that during the remainder of the season the carts and vans could be filled and despatched to the tip in a more expeditious manner.

Hackney B.C.—Over 39,024 tons of refuse were removed last year from the houses in the borough to the destructor at Mill Fields, a distance varying from ½ mile to 2 miles at the extreme boundaries of the borough. At the rate of 4s. 8d. per load the total cost was £8,561, which was £157 less than in 1910, when the quantity was greater by 457 tons. The total cost of destruction was £6,010, £139 more than in 1910, and reckoned on the estimated population of the borough it amounts to 1s. 3¼d. per head.

ROADS AND MATERIALS.

Aberdeen T.C.—The burgh surveyor, Mr. W. Dyack, has submitted to a special committee alternative plans of road improvement, the details of which will be duly considered. The first proposes the construction of a thoroughfare by way of Commerce-street and Albion-street to Bannermill-street, at a cost of £40,000. The other scheme suggests the opening of a roadway at East North-street to Constitution-street, widening the latter thoroughfare by about 15 ft., to a total breadth of 55 ft. It was pointed out that if this proposal were adopted it would entail the clearance of the slum properties in the Shuttle-lane area, and would further the city improvements scheme. The estimate of cost is £80,000.

Barnsley T.C.—Longman-road is to be improved, at a cost of £333.

Barry U.D.C.—The surveyor, Mr. J. C. Pardoe, has been instructed to prepare plan and estimate for a Marine-drive.

Camborne U.D.C.—The surveyor, Mr. C. D. Bell, has been instructed to prepare an estimate for making up the road at Highville-street.

Chesterfield T.C.—The estimate of the surveyor, Mr. Vincent Smith, at £797, for road widening and fencing in connection with Eastwood Park, Hasland, has been approved.

Cork T.C.—The city engineer stated at a recent meeting of the Works Committee that, as regarded the brick paving of lanes in the city, he had visited some of them with Mr. Price, the Local Government Board engineer, and in some cases they were impressed with the fact that brick paving on concrete was a rather expensive material to put into lanes. Mr. Price thought it would be a good idea if he (the city engineer) would make some suggestions. Brick paving would cost 8s. per super. yard, and there would be a saving if concrete were substituted at 4s. 6d. per super. yard.

Dundee T.C.—At a meeting of the Works Committee Mr. Peter Girrity stated that, although the extent of roadway receiving the attention of the department had been greatly increased, the sum allowed for the upkeep was the same as that allowed twenty years ago. The actual expenditure for last year was £11,871, and the estimate for the ensuing year was £15,920. He considered that this additional £4,000 was very much required, and drew attention to the dangerous condition of the streets, at the same time expressing surprise that there were not a lot of claims for accidents caused by the holes in the roads. It would take £60,000 to make the streets of Dundee right. The estimates were approved.

East Suffolk C.C.—A scheme is being considered for the construction of a new road from near White House Farm, near Carlton Colville, to Burgh St. Peter Staithe, so far as the work is situate in the county of East Suffolk. The proposal is to construct a new road, about 1½ miles in length, with an available carriageway 18 ft. width, with a flint surface, at an estimated cost (to East Suffolk) of £3,500.

Galway C.C.—The council, at their last meeting, adopted a direct labour scheme for road maintenance.

Hackney B.C.—The whole of the property has now been acquired for the widening of the narrow neck in Mare-street, near the Triangle, and the London County Council propose to proceed with the doubling of the tramway at an early date. The cost of the work, including 60 yds. new rails and alterations to mains, is estimated at £1,200.

Hythe T.C.—Barrack-hill is to be improved, at a cost of £650.

Kingstown U.D.C.—The tender of Messrs. Hull & Co., of Ringsend, at £1,049, has been accepted for the construction of a new road from Lower George's-street to Northcote-avenue.

Lancashire C.C.—The Local Government Board have refused the application of the council for powers to borrow £3,000 for strengthening and sheeting Ewood Bridge-road at Haslingden, a portion of the main road between Accrington and Manchester, the upkeep of which has become expensive because of the heavy motor and other traffic. The board hold that the proposed work is a repair, and should be paid for out of revenue. The inspector of the Local Government Board who held the inquiry advised that the road should be paved, and said a macadam surface could not bear the heavy strain now put on some Lancashire roads. The Local Government Board would sanction a loan for paving. The county council had agreed to bear 90 per cent of the cost of strengthening and sheeting, and it lies with them to decide what shall be done.

Louth R.D.C.—An improvement is to be effected at Elkington Hill, a very steep gradient, at a cost of £375.

Maidenhead T.C.—The plans of the surveyor, Mr. P. Johns, for the widening of St. Mark's-road have been approved, and application has been made for a loan for carrying out the work.

Surbiton U.D.C.—The tender of Messrs. W. H. Wheeler & Co., Limited, at £1,357, has been accepted for making up Malvern-road.

West Suffolk C.C.—A road improvement scheme at Bury St. Edmunds, estimated to cost £24,000, has been approved.

SEWERAGE AND SEWAGE DISPOSAL.

Audley U.D.C.—A scheme of sewage disposal, estimated to cost £15,000, is under consideration.

Droylsden U.D.C.—The tender of Messrs. Mather & Platt, Limited, at £315, has been accepted for the supply of sludge plant.

Durham R.D.C.—The surveyor, Mr. G. Gregson, has submitted a revised estimate (£3,039) for sewerage and sewage disposal works for East Hetton.

Hampton U.D.C.—The surveyor, Mr. S. H. Chambers, and the sewage disposal works manager, have been asked to prepare a scheme jointly in connection with the proposed extension at the sewage disposal works, such scheme to embrace the best points of the three schemes submitted to the council, so as to provide for a present and future population of 12,000.

Linthwaite U.D.C.—A special meeting is to be called to consider a letter from the West Riding Rivers Board stating that now progress was being made with the construction of the Linthwaite and Golcar joint sewage disposal works at Johnny Moor Hill, the board felt that the time had come for asking the manufacturers and the council to come to some definite agreement as to what trade refuse would be received into the sewers and dealt with by the local authority, and what would have to be purified by the manufacturers themselves.

Mansfield-Woodhouse U.D.C.—The plans of the surveyor, Mr. F. P. Cook, for the sewering of Welbeck-street, at a cost of £140, have been approved.

Thirsk R.D.C.—A sewage disposal scheme is to be prepared for Pickhill.

WATER, GAS, AND ELECTRICITY.

Alsager U.D.C.—The surveyor, Mr. H. V. Lynam, reported at the last meeting that the New England Boring Company had now bored to a depth of 262 ft. at the Oak Farm boring, and that there was a continuation in the strata of red sandstone. The council decided, upon the advice of their engineer, Mr. G. B. H. Soame, to proceed to 600 ft. deep if necessary.

Barry U.D.C.—Steps are to be taken to promote a Bill for a water supply scheme, estimated to cost £130,000.

Dundee T.C.—Extensions estimated to cost £49,000 are proposed at the electricity works.

Greenock T.C.—A surplus of £5,255 is shown in the accounts of the electricity undertaking for the past year.

Hammersmith B.C.—The growth of the electricity undertaking is a satisfactory feature of the year, although the rate of increase is substantially less than during the previous year. There was a nett surplus from the undertaking of £8,307.

Loftus (Yorks) U.D.C.—It has been decided to provide a tank with a capacity of 6,000 gallons to store water for improving the supply at East Loftus.

Louth T.C.—The Lighting Committee have under consideration, and will shortly present for the approval of the council, a scheme for the automatic lighting and extinguishing of lamps.

Penzance T.C.—The tender of the gas company for public lighting has been accepted at 2s. 10d. per 1,000 cub. ft., repairs at £105 per annum, and hire of meters at 4s. per annum.

Spalding R.D.C.—The council have purchased a portion of the South Lincolnshire Water Company's undertaking, and it has been decided to appoint an engineer to advise in connection with the carrying out of the scheme.

Tavistock R.D.C.—The tender of Mr. G. Doney, of Horrabridge, at £1,658, has been accepted for the construction of waterworks.

Welshpool T.C.—The corporation have been advised by the Local Government Board to engage the services of an experienced water engineer with the object of improving the waterworks.

Widnes T.C.—The provision of a new water tower, at an estimated cost of £8,500, is being considered.

Wigton R.D.C.—The surveyor, Mr. T. B. Simmons, has been instructed to prepare an estimate of the cost of a 4½-in. main for the supply of water to Hatcliffe.

MISCELLANEOUS.

Market Bosworth R.D.C.—The Finance Committee called attention to an item of £70 for disinfectants per annum, and Mr. Pegg said there ought to be a contract. The sanitary inspector said the majority of the disinfectants were used in scavenging, and there was no waste. The council decided to contract for disinfectants in future, the sanitary inspector stating that no tender had been invited for six years.

Surbiton U.D.C.—Mr. H. T. Mather, the surveyor, has been asked to have plaster casts made of some of the tramway points and lines where the groove is of a dangerous width, or otherwise defective, and the highway Committee have been authorised, if they consider it advisable, to engage a tramway engineer of experience, at a fee not exceeding £10 10s., to assist them in formulating a statement of their requirements for presentation to the London United Tramways Company.

Municipal Profits at Portsmouth.—With one exception only, the municipal undertakings at Portsmouth were last year a marked financial success. The nett profits were: Tramways, £24,035; docks, £2,585; electric light, £3,491; telephones, £601. After all capital charges had been paid upon a pier costing £70,000, there was a nett loss upon its working of £4,000, but this year the loss will be only £2,000.

Bricks from Clinker.—The borough surveyor of Bermondsey, Mr. R. J. Angel, has reported on a suggestion that the clinker from the refuse destructor could be largely used for making concrete and grout for paving roads and for making bricks. He has made various experiments which tend to show that it is impracticable to make bricks from the clinker, as the cost is too high as compared with the price of Fletton bricks.

Town Planning Schemes.—The Local Government Board have given authority for the preparation of four further town planning schemes under the Housing, Town Planning, &c., Act, 1909, for Bournemouth, Halifax and Southport. In the case of Southport, the scheme is to extend to an area of about 2,848 acres. In the case of Halifax, two schemes are to be prepared for the Ovenden and Warley districts of the borough, and they comprise about 880 acres and 756 acres respectively.

PERSONAL.

Mr. A. M. Ker, deputy borough surveyor of Warrington, has had his salary raised by £50 a year.

Mr. F. W. Greig, surveyor to the Chertsey Urban District Council, who has been indisposed, is making progress towards recovery.

Mr. R. S. Macmillan, of the burgh surveyor's office, Leith, has been appointed chief assistant to the burgh engineer, surveyor, and master of works of Clydebank, out of eighty applicants.

Mr. A. B. McDonald, city engineer of Glasgow, is to retire in November, but will continue to give his services to the corporation in a consultative capacity. His retiring allowance will be two-thirds of his salary (£1,000).

Mr. W. H. Eley, surveyor to the Haverhill Urban District Council, has been appointed surveyor, sanitary inspector, and inspector of explosives to the Newmarket Urban District Council, at a salary of £210 per annum. There were 114 applicants.

Mr. A. J. Hardwick has been appointed architect for two semi-detached cottages and one detached cottage at the sewage disposal works of the Surbiton Urban District Council, the cost of the buildings not to exceed £900; and Mr. E. R. Babbs has been instructed to prepare the quantities.

Mr. H. T. Mather, surveyor to the Surbiton Urban District Council, has been appointed, with the clerk and three members of the council, to represent that body at a conference to be held with the Surrey County Council's surveyor (Mr. A. Dryland) and the chairman of the County Highways and Bridges Committee as to the plans of the proposed new loop road, which will affect Surbiton, Esher and the Dittons, and the Maldens and Coombe. The two last-named districts will also be represented.

Mr. P. J. Lynam, county surveyor of Louth, died recently, we regret to state, after a long and painful illness. Mr. Lynam, who had passed his sixtieth year, was educated at Queen's College, Galway, and in due course joined the Indian Civil Service, in the discharge of the duties of which he spent some years in Ceylon. Returning to Ireland some thirty years ago, he was appointed county surveyor of Mayo, and subsequently county surveyor of Louth under the Grand Jury, since superseded. Among the important works which he carried out was the building of the new courthouse at Drogheda. Latterly he did everything in his power to improve the county roads by means of steam rolling, which is not yet general in Ireland.

Mr. J. W. B. Blackman, the city engineer of New Westminster, British Columbia, was born in Kent, in 1878, and was educated at Highbury House College, St. Leonards-on-Sea. His early professional training was received at the hands of Mr. G. F. Miller, M.I.MECH.E.; and later he studied at the Brighton College of Engineering and Science, where subsequently he held a mastership. For six years he practised at Brighton, and frequently contributed to the technical journals. In 1907 he accepted an appointment in Vancouver, and remained there until 1909, when he was elected to his present appointment. He is a Professional Associate of the Surveyors' Institution, a member of the Society of Architects, and an associate member of the Canadian Society of Civil Engineers.

Sand Drifts on Roads.—Certain roads in the eastern portion of the Pontefract Rural Council's district have from time immemorial given trouble to the authorities by becoming "choked" by sand blown from adjoining lands. Hitherto the council have removed the sand in carts lent by the farmers, who have now objected to share what they contend is a public liability. At a recent meeting of the council the surveyor (Mr. J. P. Senior) stated that for 135 yds. the road in Eggborough township was covered with fine sand to an average depth of 18 in., while in the hedgerows it was 5 or 6 ft. deep. He calculated that in that distance there was at least 800 tons of fine red sand. It was decided that if the farmers persisted in their refusal to provide team labour the council's men should level the sand uniformly over the highway and leave the users of the road to work out their own salvation.

TORQUAY'S NEW PAVILION.

COMPLETION AND OPENING.

The public opening of the new pavilion which has been erected by the Corporation of Torquay in the Princess Gardens took place on Saturday last, and the crowd that filled the structure were delighted with everything they saw.

The architect, Mr. H. A. Garrett, the borough engineer, was publicly congratulated upon the success of his efforts, and, in reply, he said that a pavilion for Torquay had been near and dear to him for the past eighteen or twenty years, as he considered it putting the finishing touch to their beautiful sea-front.

The total area of the ground covered by the pavilion is 19,377 super. ft., and the building comprises a main, or central, hall 140 ft. long by 60 ft. wide, and is considered to be the finest in the West of England at least. In the central part it is 98 ft. wide. The grand tier, or balcony, is constructed on the three sides of the central portion of the building, approached by a double flight of ornamental cast-iron stairs. The building is entered through a vestibule from the Vaughan-road, on each side of which there is a box-office, and thence into a crush-room 27 ft. long by 16 ft. in width. The approach to the main hall is again through three sets of double bevel-edged glass swing doors.

The general café and tea rooms are at the sea end of the hall, a splendid view of the water being obtainable. The recess taken by the stage is 36 ft. wide by 20 ft. deep, with retiring-rooms on either side. Outside the building, facing the Princess Gardens, for an average width of about 16 ft., and also facing the harbour, there is an open asphalt promenade, this being reached from the interior of the building at the balcony level by two flights of steps. The four corners of the pavilion are surmounted by an octagonal open frame shelter constructed on the principle of a bandstand, and can be used as such when required.

The roof of the building is solid—double-lined on the outside of the steel framework flooring, overlaid with roofing felt, and externally covered with zinc, the interior being of decorated fibrous plaster work. This method, it is claimed, will make the building cool in summer and warm in winter. The central portion of the building is surmounted by a dome 45 ft. high, at the apex of which is a copper figure of Britannia, given by the mayor. There are two smaller domes on each side of the main entrance, these having copper figures of Mercury at the summit.

The interior walls are in beautiful designs and panels of ornamental fibrous plaster work, with a dado of Australian oak panelling. The walls are 14-in. brickwork, the whole of the interior being faced with imitation marble. The floor is a double one, the finished surface being of maple. The building proper has cost £17,000, the work having been well carried out by Mr. R. E. Narracott, contractor, of Torquay.

The gardens in which the new pavilion stands originally formed part of the foreshore. They are formed of some 20 ft. depth of sand filling, dredged up from the new harbour area and filled in behind the new sea-wall, the consequence being that the erection of a pavilion on such a site necessitated a foundation of special design. Upon examination the sand filling was found to be well consolidated, and the borough engineer accordingly recommended the construction of a Portland cement reinforced-concrete foundation "raft" covering the whole area of the site. The principle upon which this raft has been constructed was fully described in our issue of March 31, 1911 (p. 465).

FOR OTHER ADVERTISEMENTS
See End of Paper.

BOROUGH OF BATLEY.

BOROUGH ENGINEER AND SURVEYOR'S DEPARTMENT.

APPOINTMENT OF JUNIOR ASSISTANT.

Wanted, in the Borough Engineer's Office, a Junior Assistant. Salary £80 per annum.

Applications, in candidate's own writing, accompanied with not more than three copies of testimonials, to be sent to Mr. J. H. Craik, Town Clerk, Batley, not later than Tuesday, the 10th of September, 1912, endorsed "Assistant."

OSCAR J. KIRBY,
Borough Engineer.

August 21, 1912.

HAVERHILL URBAN DISTRICT COUNCIL.

APPOINTMENT OF SURVEYOR, INSPECTOR OF NUISANCES AND EXPLOSIVES INSPECTOR.

The above Council will, at their meeting to be held on the 16th September, 1912, proceed to the appointment of a Surveyor, Inspector of Nuisances and Explosives Inspector for their district.

The combined salary will be £131 1s. per annum divided as follows:—

Salary as Surveyor	£40	0	0
Salary as Inspector of Nuisances	90	0	0
Salary as Explosives Inspector ...	1	1	0
	£131	1	0

The appointment as Inspector of Nuisances will be subject to the approval of the Local Government Board.

Candidates must have a thorough knowledge of the duties of the offices, and be competent to keep the books and accounts applicable thereto.

The person appointed will be required to devote the whole of his time to his duties, and to give security in the sum of £200.

The appointment will be subject to one calendar month's notice on either side.

Applications, in candidate's handwriting, stating age, present and previous occupation, and accompanied by copies of not more than three testimonials of recent date, endorsed "Application for Surveyor," must be addressed and sent to me not later than 10 a.m. on the 9th day of September, 1912.

(By order)
THOMAS BATES,
Clerk to the Council.

Haverhill, Suffolk.
August 21, 1912.

CARSHALTON URBAN DISTRICT COUNCIL.

GRANITE AND STEAM ROLLING.

Tenders are invited as follows:—

1. For the Supply of 300 cubic yards of 2-inch and 1,100 cubic yards of 1½-inch Granite, either Cleehill, Quenast, Penmaenmawr or Guernsey (no others will be considered), delivered at Mitcham, Hackbridge, Sutton and Wallington Stations, as required, before 31st March, 1913.
2. For the Hire of a Steam Road-Roller, fitted with an approved patent attachment for Watering the Wheels and the Road, of not less weight than 10 tons, for a period of about 90 days, as may be required, during the year ending 29th October, 1913.

Particulars in each case may be obtained on application to the Council's Surveyor, Mr. W. Willis Gale, A.M.I.C.E., at this office.

Sealed Tenders, addressed to the Chairman, and endorsed "Tender for ——," should be delivered at this office not later than 12 noon on Wednesday, 11th September, 1912.

The Council do not bind themselves to accept the lowest or any Tender, and the persons whose Tenders are accepted, will be required to enter into the usual contract and bond, which may be seen at this office.

(By order)
C. P. LOVELOCK,
Clerk.

District Council Offices,
The Square, Carshalton.
August 21, 1912.

LEATHERHEAD URBAN DISTRICT COUNCIL.

SURVEYOR'S ASSISTANT.

Applications are invited for the post of junior assistant in the Surveyor's office. Salary 12s. per week.

Applications, in candidate's own handwriting, stating age and experience, together with copies of three testimonials, to be delivered to the undersigned by the 31st inst., endorsed "Assistant."

Preference will be given to one who has been used to drawing, and who has had experience in a Surveyor's office.

SIDNEY R. DRAKE,
Surveyor.

Council Offices,
Leatherhead.
August 21, 1912.

INSECTS AND DISEASE.

THE MECHANICAL AND BIOLOGICAL METHODS OF TRANSMISSION.

[Extracts from an article contributed to *Scientific American* by W. C. Rucker, M.S., M.D., assistant surgeon-general, United States Public Health and Marine Hospital Service.]

The idea of the transmission of disease-producing organisms to man by insects is no new thing. It is only within recent years, however, that scientific workers have been able by the use of the microscope and other instruments of precision to trace the course of the seeds of disease through the body of the insect and into the body of man.

In order intelligently to approach the consideration of this latter-day scientific development it is necessary to understand the way in which the insect acquires the organisms which produce disease, the changes which these organisms undergo within the body of the insect, the way in which they are introduced into the human body, and the developmental changes which take place in them in the course of their attack upon the human victim.

Broadly speaking, there are two general methods by which this process is accomplished. These are the mechanical and biological methods. In the mechanical transmission of disease germs by insects we find the insect in question coming accidentally in contact with disease-producing organisms and carrying them into the body of man either directly by biting or indirectly as by infecting food. It is not necessary for the life of the germ in question that it be carried by any particular insect. No developmental changes which are of any account occur in the organisms during the period of this transportation to man, and therefore we may find many different insects of totally different habits acting as vectors for a given germ. As an example of the mechanical method of transmission, in contradistinction to the biological method of transmission, we have the carriage of typhoid bacilli from infected excrement by flies. In this instance the fly smears his feet, proboscis and wings with the discharges of a person who has typhoid fever, and then, alighting on foodstuffs, there deposits the germs to be taken by some unsuspecting person. In this instance no change whatever has been undergone by the bacilli, and they could quite as well have been carried by a cockroach which might similarly infect food. In the case of the transmission of tuberculosis by flies, the mechanical method of transmission still obtains, but it has been determined by experiments that, in this instance, there may be an actual multiplication of the tubercle bacilli within the body of the fly, and that living bacilli may be discharged in the fly's excreta. In the case of the transmission of plague by the flea, another example of mechanical transmission, it is not necessary that any particular species of flea act as the vehicle. The flea becomes infected by biting an animal which has the germs of plague in its blood. The flea imbibes this pest-laden material and subsequently bites a human being. It is not by the act of biting, however, that it transmits the germs of this disease. The flea has the habit of depositing his excrement at the time of biting. A person who is bitten naturally suffers some irritation and rubs or scratches the bitten place. In doing this the germs of the disease are rubbed into the skin, which they penetrate and thus gain entrance to the body. . . .

Flies may carry the germs of typhoid fever, cholera, dysentery and tuberculosis, and it may be that these ubiquitous household pests may carry other diseases as well. Two varieties are commonly met with in this country, the *Musca domestica*, or common house fly, and the stable fly, or *Stomoxys calcitrans*. Both are bred in manure, and it has been recently estimated that each pair of flies surviving the winter may be the ancestors of 8,000,000 living flies during the summer. Flies are omnivorous in their habits, and will eat filth of almost any kind. The first thing to do to get rid of flies is to exclude them from the home of man, and this may be accomplished by the use of screens, both as to doors and windows. These should fit accurately, and should be constructed of some permanent non-corrosive material, such as bronze wire. Inasmuch as screens are also intended to exclude mosquitoes, the screening should have a mesh of at least 18 to the inch. After this has been done, it remains to destroy the breeding places of the flies and get rid of those things which attract them. Stables or other out-buildings should be well screened. The manure should be stored in watertight metal-lined boxes which are emptied at least once in ten days. The frequent addition of chlorinated lime, or soaking with kerosene oil will also prevent breeding. Stables should be maintained in a cleanly condition. The unsanitary garbage can is the fly's paradise. The watertight metal garbage can with a tight-fitting lid will feed no flies. If the remainder of the premises is kept clean few of these pests will be seen therein. . . .

Reference has already been made to the *rôle* of the flea in the transmission of plague. This is of extreme importance, because plague is primarily a disease of rodents, and secondarily and accidentally a disease of man. Almost every fur-bearing animal has fleas which may be easily infected by the ingestion of infected blood. Thus it is found that the rat flea, the ground squirrel flea, and the tarbagan flea have all been convicted at one time or another of having transmitted bubonic plague. The remedy is obvious. If the animal carrying the flea which bridges the space between the infected rodent and the healthy human being be excluded from the home of man there need be little fear of bubonic plague. Therefore the work which was carried on in California for the eradication of plague was directed very largely at the extermination of rodents. This may be accomplished by a simultaneous attack upon the home and the food supply of the rat and by killing them by the use of poisons and traps. Plague is out upon its march around the world, and for the past five years has been making a steady advance up the Spanish main. Very recently it has appeared in Porto Rico, and for all we know it may now be smouldering in the rodent population of some of our large Atlantic seaports. If a survey of these rodents is made now and the foci of infection stamped out much money and many lives may be saved in the future. This is a measure of immediate necessity if we would protect our sanitary and commercial interests.

Stone-breaking Machinery.—The call for the patent Acme stone-breaker is an ever-increasing one, and among other numerous and recent buyers, the following councils have placed their order with Messrs. Goodwin, Barsby & Co., Limited, St. Margaret's Ironworks, Leicester, during the past few months—*viz.*: Donegal County Council (two machines), Blaenau Festiniog Urban District Council, Kerry County Council, Queen's County Council, and Tredegar Urban District Council. All these orders are for the firm's patent Acme special portable stone-breaker, with patent portable and lifting screen. Still further, Wigtownshire County Council and Monaghan County Council have given orders for the patent Acme portable automatic stone-breaker, both of these being repeat orders. It may be mentioned that in order to cope with their increasing business, Messrs. Goodwin, Barsby & Co. are now being compelled to make further additions to their works, the additions they are now making in two places being the fourth and fifth they have been obliged to arrange during the past few years.

Problems in Engineering.*—This reprint from the popular students' section of our contemporary consists chiefly of questions that have been set at the examinations of the Institution of Civil Engineers and of the Institution of Municipal and County Engineers. There is no index to the work, but the matter is classified under the heads of Mechanics and Hydrostatics, Strength and Elasticity of Materials, Theory of Structures, Surveying and Levelling, Water Supply and Hydraulics, Sewerage, Sewage Disposal, Road Making and Tramways, Building Construction and Materials, Law, and Miscellaneous. This book is calculated to be of considerable use to students in these subjects, but it would have been an advantage if the source of the questions could have been stated. The answers have in general been given rather more fully than would be the case at an examination, with the object of explaining the principles to a student without his having to refer to a text-book for them. The price brings the work within the reach of all students, and there is so much useful matter compressed into a small space that even the best-prepared candidate cannot afford to be without it.—*Sanitary Record.*

* "Problems in Engineering, with Solutions." Being Questions and Answers reprinted from the Associateds' and Students' Section of The Surveyor and Municipal and County Engineer. First Series, 1900-10. Edited by Sydney G. Turner, Assoc.M.Inst.C.E. Price 5s. nett. London: St. Bride's Press, Limited, 21 Bride-lane, E.C.

Municipal Work in Aylesbury.*

By W. H. TAYLOR, Engineer and Surveyor to the Urban District Council.

Aylesbury is situated in the centre of Buckinghamshire, about 40 miles from London, on the London and Banbury road. It is the county town of Bucks, and gives its name to the large and fruitful Vale of Aylesbury, long celebrated for verdure and fertility. The town was incorporated and made a Parliamentary borough by a charter from Queen Mary in 1553-54, but having by neglect lost its charter it is now under the control of an urban district council of eighteen members.

STATISTICS.

Area of urban district, 3,300 acres; population, 1901, 9,244; 1911, 11,048; rateable, £53,979; number of inhabited houses, 2,740; birth-rate, 20·01; penny rate produces £203 to the General District Fund; levels above ordnance datum, 240 ft. to 304 ft.

HIGHWAYS.

There are 8 miles of main roads and 6½ miles of other roads, and the county council pay the urban council the sum of £1,403 per annum for the former. In respect to several of the principal other roads the county council pay the urban council one half the cost of materials per annum. The surface of the roads over the railways and the approaches are repaired by the railway companies. Except several roads in the centre of the town, which are paved with setts, the main roads are all surfaced with granite, and below is a detailed cost of repairing High-street last year:—

	£	s.	d.
135 tons of 2-in. granite, at 10s. 8d.	66	13	4
31 tons fine gravel, at 4s. 3d.	6	11	9
3,700 gallons water, at 1s.	0	3	8
Labour, spreading granite, gravel, and sweeping for roller	4	9	7
Carting granite, gravel and water, for rolling	7	1	8
Steam rolling	6	11	8
	£91	11	8

Area coated 2,044 super. yds. = 10·75d. per super. yard.

With the exception of three or four, the other roads and side streets are surfaced with flints, and the following is the cost of repairing one last year:—

	£	s.	d.
97½ cube yards flints, at 6s. 10d.	33	6	3
15½ tons fine gravel, at 4s. 3d. ...	3	5	11
2,600 gallons water, at 1s. ...	0	2	7
Labour, spreading flints, gravel, and sweeping for roller	2	18	0
Carting flints, gravel, and water	4	15	0
Steam rolling	3	15	0
	£48	2	9

Area coated 1,260 super. yds. = 9·17d. per super. yard.

Tarmac, &c.—In 1908 two short lengths of roads were laid down, one with Tarmac and the other with Tarvia binder. Both these roads are subject to heavy traffic, and for three years stood without any repairs being necessary. The cost was as follows:

TARMAC.

	£	s.	d.
92¼ tons Tarmac, at 14s. 11d. ...	68	19	10
Labour, spreading, &c.	3	2	4
Carting	4	17	4
Steam rolling	4	14	6
	£81	14	0

Area coated 1,050 super. yds. = 18¼d. per super. yard.

TARVIA BINDER AND GRANITE.

	£	s.	d.
36¾ tons binder	41	13	9
17½ barrels Tarvia	11	3	7
53 tons 1 cwt. 2-in. granite	28	16	5
9 tons granite chippings	5	17	0
Labour spreading, &c.	7	17	11
Carting	6	13	11
Steam Rolling	3	10	6
Sundry materials	0	6	5
	£105	19	6

Area coated 1,355 super. yds. = 18¾d. per super. yard.

The section of road laid down with the Tarvia binder included a top-dressing of Tarvia and granite chippings, and it being a little further from the station than the Tarmac section, the carting was a little more costly.

Tar-painting.—In 1909 and 1910 only the main roads in the inhabited area were treated, but last year the whole of the main roads and several other roads were done, and it is proposed this year to do the same. The tar is carted from the local gasworks in slop carts and applied to the road by means of a small spreader attached to a 50-gallon copper. The tar, after being applied to the road, is well brushed in by hand and clean Leighton sand sprinkled on the surface. Last year the cost was as follows:—

	£	s.	d.
20,231 gallons tar, at 1½d.	126	8	9
256 tons 9½ cwts. sand	43	15	1
7⅞ tons granite chippings	4	19	6
Brushes, fuel, &c.	9	9	5
Labour	91	13	3
Carting	21	18	6
Depreciation of tar boilers, &c.	5	15	6
	£304	0	0

Area treated 97·524 super. yds. = 0·748d. per super yard.
Length 8·72 miles = £34 17s. 2d. per mile.

The author has found treating the roads with tar not only prevents the dust nuisance to a considerable extent, but also prolongs the life of the road very considerably.

Private Street Works.—The Private Street Works Act, 1892, has been adopted, and several streets have been made up under this Act during the last two years. The cost of these streets was 9s. 7d. per lineal foot, including soil sewers, manholes, gullies, 6 in. of hard-core and 6 in. of flints on carriageways, sett channelling on lime concrete, 5-in. by 10-in. stone kerb on lime concrete, and 3-in. tar-paved footways on 6-in. brick rubble. The average cost of these works was as follows:—

	£	s.	d.
Soil sewers, 9 in. diameter, 6 ft. deep, per lineal foot	0	1	11
Gully pans, iron frame and grating, including connection to sewer, each	3	18	0
Manholes in 9-in. brickwork, 5 ft. by 2 ft. 6 in., and 6 ft. 6 in. deep, with covers complete, each	9	17	0
5-in. by 10-in. stone kerb, on 4 in. lime concrete, per lineal yard	0	4	0
4 in. by 4-in. stone sett channel on 4 in. lime concrete, per super. yard	0	8	6
4-in. by 4-in. stone sett crossings on 6 in. lime concrete, per super. yard	0	9	1
6 in. thick stone hardcore hand packed, per super. yard	0	1	0
6 in. thick flints, including rolling, per super. yard	0	1	8
3 in. thick tar-paving	0	2	3

Concrete Kerb and Channel.—The author has experimented making concrete kerb and channel blocks in wood moulds. They turned out very satisfactorily, and one length has been laid. The kerb and channel blocks were made with Portland cement and ¼-in. to dust Clee Hill granite chippings 1 to 3. The kerbs are 5 in. by 10 in., 3 ft. long, and the blocks 9in. wide slightly dished, 15 in. long and 4 in. thick, and cost to make 5d. and 3d. per foot respectively. When laid complete on 4 in. of cement concrete and the blocks protected by one row of 4-in. by 4-in. setts, the cost worked out as follows:—

	s.	d.
5-in. by 10-in. concrete kerb on 4 in. cement concrete, per lineal foot ...	0	10½
9-in. by 4-in. concrete channel block, on 4 in. cement concrete, including one row of 4-in. by 4-in. setts, per super. yard	8	9

Highway Yard and Depot.—The town's yard is in Cambridge-street, in a very central position and comprises stabling for eight horses, steam roller, cart and material shed, flint stores, workshop and messroom for workmen. The land, 1 acre, together with two small cottages, cost £700, and the buildings, &c., £1,893; total £2,593. Six horses are owned by the council at the present time, and team labour can be hired for 6s. 6d. per day for horse and driver. The

* Paper read at the recent annual meeting of the Institution of Municipal and County Engineers.

cost of keeping the council's horses last year was as follows:—

	£	s.	d.
Fodder	190	14	2
Shoeing	12	19	11
Repairs to carts, harness, &c.	71	13	2
Rent of field	21	12	0
Rent of stables (say)	40	0	0
	£336	19	3

Average number of horses 5·67.
Cost per horse per week = £1 2s. 10d.

Street Lighting.—The street lighting is carried out by the council, and the cost last year worked out as follows:—

	Flat flame burner.			No. 4 Kern burner.			Large incan. burner.		
	£	s.	d.	£	s.	d.	£	s.	d.
Gas	1	13	4	1	15	0	4	0	0
Mantles		—		0	1	4½	0	3	1
Globes		—		0	0	6	0	3	7
Sundries ...	0	1	0	0	1	8½	0	1	8½
Lighting and extinguishing ...	0	8	9	0	8	9	0	8	9
Labour for repairs	0	3	0	0	4	0	0	4	0
Cost per lantern per annum	£2	6	1	£2	11	4	£5	1	1½
Number of mantles used per lantern per ann.							7		7
Number of globes " " " "							3·1		3·2
Cost of gas 3s. 4d. per 1,000 cub. ft.									
Number of hours lanterns burning per annum							1,792		

The lanterns on the outskirts of the town are fitted with Gunning's automatic lighting and extinguishing apparatus, and give every satisfaction. The lanterns have been gradually converted from flat flame burners to incandescent burners, out of current rate.

PUBLIC BATHS.

The public baths are situated in Bourbon-street, and were presented to the town in 1895 by the late Baron Rothschild, of Waddesdon Manor. They are open only during the summer months, and consist of a swimming bath, 60 ft. by 20 ft., and nine private slipper baths. The price of admission to the swimming bath varies from 3d. to 1d., according to the day, and the slipper baths 3d. first-class and 2d. second-class. Last year the swimming bath was used by 11,375 persons, and the slipper baths by 4,334 persons; total, 15,709; and the loss on the year's working was £136.

SEWAGE DISPOSAL WORKS.

The sewage disposal works are situated about 1¼ miles north of the town, consisting of a screening chamber, five open settling tanks, twelve contact beds, two storm-water filter-beds, 12 acres of land, and pumping and sludge pressing plant.

Flow.—The lowest flow during the hot summer of 1911 was 226,000 gallons in twenty-four hours.

Tanks.—The five tanks have a total capacity of 305,000 gallons, three 35,000 gallons each, and two 100,000 gallons each. Two small tanks and one large one are used during the day, one small tank being kept for the night flow and the remaining large tank is kept empty in case of a storm.

Contact Beds.—During fine weather the beds are used on the double contact system, and each have a working capacity of about 25,000 gallons. The media averages 3 ft. deep, and consists of 1 ft. of fairly large clinker, and 2 ft. of coke breeze and clinker, 1 to 1½-in. gauge.

Storm-water Filters.—The two storm-water filter-beds were constructed for contact beds, but they are used as continuous filters, and hold 50 000 gallons each. The media is burnt ballast, average 3 ft. 6 in. deep.

Land.—The bed effluent is pumped on the land, which is divided into six sections, and fed by a channel running the whole length of the field. The land is not underdrained, and the subsoil is clay.

Pumping Plant.—The bed effluent and storm water gravitates to the pump-house, and is pumped on to the land and storm beds by means of centrifugal pumps driven by gas engines.

Sludge Pressing.—The sludge gravitates from the settling tanks into a well in the pump-house, and is then lifted by means of a 5-in. Tangyes' sludge into a large tank on the top of the building. Ground greystone lime is then added, and the sludge pressed by two Manlove, Alliott & Co.'s sludge presses. The cake is carted away from the works by farmers, but during the summer it is difficult to dispose of.

Bed Washing.—The contact beds are washed every three to four years. The washing is done by means of a portable engine, and one of Messrs. Hughes & Lancaster's revolving washers. The cost of emptying, washing, and refilling, including new clinker, and a certain amount of new coke breeze, works out at 4s. per cube yard.

Effluent.—The result of the last analysis made by the county analyst, Mr. W. W. Fisher, is as follows:—

EXPRESSED IN GRAINS PER GALLON.

Total solid matter in suspension	Negligible.
Total dissolved solid matter	49·0
Chlorine as chlorides	6·0
Ammonia free and saline...	0·756
Albuminoid ammonia	0·053
Nitrogen as nitrates and nitrates ...	0·21
Oxygen absorbed by organic matter in 3 hours	·497

LEEDS SEWAGE DISPOSAL.

THE KNOSTROP WORKS.

[A few interesting and useful data extracted from the annual report of the sewerage engineer for the year ended March 31st last.]

Total volume of sewage treated in tanks from April 1, 1911, to March 31, 1912, 6,326,137,000 gallons.

Average daily volume, 17,331.882 gallons.

Average per head of population per day, 40½ gallons.

About 20 per cent of the total average dry-weather flow was derived from trade sources.

Steam power plant for pumping and other purposes evaporated 6·9 lb. of water per lb. of coal consumed; price of coal 10s. per ton.

Cost of pumping was 4s. 1d. per 1,000,000 gallons lifted 12 ft. high, or 4·083d. per 1,000,000 gallons per foot of lift.

Amount of garbage removed from the sewage by the screens was 4·3 cwt. per 1,000,000 gallons of sewage treated.

Cost of screening sewage was 1s. per 1,000,000 gallons treated.

Amount of grit or detritus deposited in pits at entrance to tanks was 3·4 cwt. per 1,000,000 gallons treated.

Total cost of tank cleaning process was 3s. 3d. per 1,000,000 gallons of sewage treated.

Total cost of chemical precipitation was 3s. 5d. per 1,000,000 gallons of sewage.

Volume of liquid sludge deposited in tanks (the average water content being 91·85 per cent), was 4,343 gallons per 1,000,000 gallons of sewage. After pressing just under 6 tons of sludge cake was produced per 1,000,000 gallons of sewage. The total cost of sludge pressing was 10s. 8d. per 1,000,000 gallons of sewage treated, or 1s. 9d. per ton of cake produced.

Sludge cake to the amount of 14,264 tons was consigned to farmers for manurial purposes, but the income received from this source was only £189 17s.; 24,704 tons of sludge cake was tipped on low-lying lands to an average depth of about 6 ft., and covered with a layer of soil.

The total cost of sludge removal after deducting the above-mentioned receipts from sale of cake amounted to 4s. 8d. per 1,000,000 gallons of sewage, or 9d. per ton of cake produced.

BY-PRODUCTS.

Experiments have been conducted with a distillation plant for testing the practicability of recovering by-products in the form of ammonia liquor and grease from the pressed cake, but up to the present the process has not yielded any satisfactory results. Another patented process for the treatment of the liquid sludge produced in the tanks has been considered, but the experiments conducted upon the Leeds sludge have not convinced the committee that this process can be satisfactorily adapted for their sludge.

The total working costs (exclusive of interest and sinking fund) amounted to £1 19s. 1d. per 1,000,000 gallons of sewage treated, as against £2 1s. 8d. for the previous year.

"The results obtained from the present precipitation process show that the dry-weather flow of sewage is being efficiently clarified, but that the impurities which are contained in solution render the effluent liable to putrefaction."

It is impracticable to improve the quality of the present precipitation effluent, until the bacteria beds, which are embodied in the sewage works extension, are constructed.

The total average daily volume of liquid trade wastes discharged into the sewers was estimated at 3,550,794 gallons from 147 connections.

"There are now in operation 91 settling tanks for preliminary treatment upon manufacturers' premises, and 54 of this number are now under the control of the corporation in so far as the regulation of flow is concerned by means of manholes fitted with locked inspection chamber covers, the keys of which are kept in charge of the sewerage department."

EAST SUFFOLK ROADS.

COUNTY SURVEYOR'S REPORT.

At the recent meeting of the Roads and Bridges Committee of the East Suffolk County Council, the chief county surveyor, Mr. W. Jervis, presented his report on the main roads of the county during the past financial year. This stated that the roads were severely tested by the long continuous drought, and the roadmen were heavily taxed in endeavouring to keep the surface intact. Despite the attempts that were made, unavoidable and rapid disintegration of the surface took place on some roads, and material had to be transferred and all efforts concentrated in repairing and strengthening such sections.

Following the exceptional conditions obtaining in the summer, the continuous wet weather had a disastrous effect on the roads. The trying circumstances were further aggravated by falls of snow, with intermittent frosts of the severest kind experienced for years. In fact, but for the determined and zealous work of the committee in formulating a scheme to deal effectually with certain sections of road which in winter could not better be described than by the word "quagmire," it was difficult to imagine what would have been the result on some roads had not the small reconstruction scheme been approved and sanctioned. Fortunately, the Road Board came to their assistance, and the year marks an epoch in the history of the council's work, firstly, by the introduction of a new Government Road Department, and, secondly, by the strenuous efforts made by the committee in taking the first step to raise to a better standard the important lines of communication in the county. The reconstruction of the Ipswich-Norwich road and a portion of the Ipswich-London road were works of a very important nature, and special attention had to be given to the organisation of the work, having regard to the fact that simultaneously with the concentration of all available funds on the work referred to, sufficient material had to be purchased and used to maintain the remaining mileage of roads sufficient to check any latent defects and to give the necessary stitch in time. It was gratifying, however, to report that all difficulties were surmounted and the work completed within the estimated cost, and the grants received.

The report concludes with a tabulated statement of the mileage, materials used, and the cost (excluding salaries) of the main roads maintenance directly by the county council for the past twenty-two years. This showed that, in 1891, the mileage was over 171¼ miles, the cost £4,589, giving a rate per mile of £26·72, while in 1912 the mileage was 306, the total cost £36,480, a rate per mile of £119·23. The average rate per mile during the twenty-two years was £47·68.

MUNICIPAL TRAMWAYS ASSOCIATION.

ANNUAL CONFERENCE, WEST HAM: PRELIMINARY NOTICE.

The annual conference of the Municipal Tramways Association (Incorporated) will be held in West Ham on September 25th, 26th and 27th next. De Keyser's Hotel, Victoria Embankment, E.C., has been selected as headquarters for delegates, and the following programme has been arranged:

September 25th.

10.15 a.m.—Reception by the Mayor and West Ham Council.

10.30 a.m.—Presidential address by Mr. H. E. Blain, tramways manager, West Ham.

Paper: "Tramway Administration by Municipalities: A Retrospect and a Forecast," by Mr. Councillor S. C. T. Neumann, deputy-chairman Bradford Tramways Committee.

1 p.m.—Luncheon.

2 p.m.—Proceed to Tramways Depot, Greengate-street, Plaistow, by special cars.

2.15 p.m.—Discussion on the interim report of the Corrugation Committee.

3.30 p.m.—Inspection of depot and of the Exhibition of Tramway Appliances, &c.

7.30 p.m.—Corporation reception at the town hall.

September 26th.

10 a.m.—Paper: "Tramway Fares and their Basis," by Mr. W. J. McCrindle, tramways manager, Hull.

12.15 p.m.—Luncheon.

1.15 p.m.—Proceed by special cars to tramway depot.

1.30 p.m.—Meeting of managers' section.

1.30 to 3 p.m.—Inspection of depot and Exhibition of Tramway Appliances.

3 to 5 p.m.—Garden party in West Ham Park.

7 for 7.30 p.m.—Association dinner at the Liverpool-street, Hotel, E.C.

September 27th.

9.45 a.m.—Annual business meeting at De Keyser's Hotel.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. Thomas, M.Inst.C.E., County Surveyor, Buckinghamshire.

EXAMINATION.

The October, 1912, examination will be held in Birmingham on the 10th, 11th and 12th of that month.

Thomas Cole,
Secretary.

11 Victoria-street, S.W.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

HIGHWAY SURVEYOR.—August 24th.—Watford Urban District Council. £150—£180.—Mr. W. Hudson, clerk.

CLERK IN HEALTH DEPARTMENT. — August 26th.—Corporation of Burnley. 21s. per week.—Mr. P. Thomas, town clerk.

ASSISTANT INSPECTOR.—August 26th.—Depwade Rural District Council.—£60 a year.—Mr. A. E. Scarlett, clerk, Pulham Workhouse, Harleston.

ASSISTANT SURVEYOR.—August 26th.—Ilkley Urban District Council. £70 per annum.—Mr. F. S. Eckersley, clerk.

CLERK OF WORKS.—August 26th.—Southport Education Committee. £2.—Mr. J. Ernest Jarratt, town clerk.

GENERAL WORKING FOREMAN.—August 26th.—Milton Regis Urban District Council. 27s. per week.—Mr. J. Dixon, junr., clerk.

ROAD FOREMAN.—August 29th.—Barnstaple Rural District Council. 25s. per week.—Mr. R. E. C. Balsdon, clerk, 109 Boutport-street, Barnstaple.

INSPECTOR OF NUISANCES.—August 29th.—Barnstaple Rural District Council. £100 per annum.—Mr. R. E. C. Balsdon, clerk.

ASSISTANT WATERWORKS ENGINEER.—August 31st.—Corporation of Madras. £26 13s. 4d. per mensem, and allowance for motor bicycle.—Messrs. James Mansergh & Sons, agents, 5 Victoria-street, Westminster, London, S.W. Envelopes to be superscribed "Waterworks Assistant."

SURVEYOR.—August 31st.—Bishop's Castle Town Council. £80 per annum.—Mr. E. Griffiths, town clerk.

SURVEYOR AND INSPECTOR.—August 31st.—Barton-on-Humber Urban District Council. £90—£100.—Mr. G. H. Nowell, clerk. Envelope to be endorsed "Inspector and Surveyor."

JUNIOR ASSISTANT.—August 31st.—Corporation of Bolton. £70 per annum.—Mr. Samuel Parker, town clerk.

ASSISTANT ENGINEER.—August 31st.—Darjeeling Municipality, India. 150 rupees monthly.—The Chairman.

SURVEYOR.—September 2nd.—Holme Cultram Urban District Council.—Mr. J. H. Gibson, clerk, Wigton. Applications to be endorsed "Surveyor."

ARCHITECTURAL ASSISTANT.—September 2nd.—Hereford County Council. £150 a year.—Mr. G. H. Jack, county surveyor.

ASSISTANT BOROUGH SURVEYOR.—September 4th.—Douglas Town Council. £100 per annum.—Mr. Alexander Robertson, town clerk.

CLERK OF WORKS.—September 5th.—Corporation of Abergavenny. £3 3s. per week.—Mr. W. H. Hopwood, town clerk.

CHIEF ENGINEER AND COUNTY SURVEYOR.—October 7th.—London County Council. £2,000.—Sir Laurence Gomme, clerk.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

GOOLE.—September 1st.—Competitive designs and estimates for municipal offices, for the urban district council. Two premiums (£30 and £15).—Mr. R. Tyson, clerk.

CHORLEY.—September 9th.—Designs for a school, for the corporation.—Mr. J. Mills, town clerk.

LLANELLY.—September 30th.—Competitive designs and estimates for school buildings for over 1,000 children, also domestic subjects centre, for the Education Committee.—Mr. G. E. Halliday, F.S.A., F.R.I.B.A., Castle-street, Cardiff, will act as assessor and award premium.—Mr. I. W. Watkins, clerk, Education Offices, Coleshill-terrace, Llanelly.

WANDSWORTH.—October 14th.—Competitive designs for public swimming bath at Balham.—Mr. P. Dodd, borough engineer, 215 Balham High-road, S.W.

GLASGOW.—October 29th.—Preliminary sketch designs are invited by the corporation for the extension of the municipal buildings. Honorariums of 100 guineas to five selected designs.—Mr. John J. Burnet, A.R.S.A., 239 St. Vincent-street, Glasgow, is assessor.—Applications to the clerk, Mr. J. Lindsay, town clerk.

HUDDERSFIELD.—October 31st.—Designs for laying out certain areas as a town planning scheme, for the corporation. Premiums of 100, 50, and 25 guineas.—Mr. J. Henry Field, town clerk.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

Buildings.

ERPINGHAM.—August 24th.—For the construction of two automatic flushing chambers, for the rural district council. Mr. J. T. Willis, deputy clerk, Cromer-road, Sheringham.

MANCHESTER.—August 24th.—For repairs to various bridges, for the corporation.—Mr. Thomas Hudson, town clerk.

PORTSMOUTH.—August 26th.—For the erection of a store, for the Education Committee.—Mr. A. H. Bone, surveyor, Cambridge-junction, Portsmouth.

DUBLIN.—August 26th.—For the erection of stables, for the corporation.—City Architect.

NELSON.—August 26th.—For the erection of sanitary conveniences, for the corporation.—Mr. W. Shackleton, borough engineer and surveyor.

POOLE.—August 26th.—For the erection of a disinfecting building, and alterations to laundry at isolation hospital, for the corporation.—Mr. S. J. Newman, borough surveyor.

GATESHEAD.—August 26th.—For the erection of entrance lodge at cemetery, for the corporation.—Mr. N. P. Pattinson, borough engineer.

CONSETT (Durham).—August 27th.—For alterations at the town hall, for the urban district council.—Mr. J. J. Eltringham, architect and surveyor, Derwentstreet, Blackhill.

KEIGHLEY.—August 27th.—For the erection of a cubicle isolation pavilion to contain twelve beds, for the Joint Hospital Board.—Mr. N. Clarkson, clerk, 40 North-street, Keighley.

NEWPORT (Mon.).—August 27th.—For the erection of a shop, for the corporation.—Mr. A. A. Newman, town clerk.

BUILTH WELLS.—August 28th.—For the erection of a fire station, for the urban district council.—Mr. T. Smith, town surveyor.

ALFORD (Aberdeen).—August 28th.—For additions to a school, for the School Board.—Mr. J. Reid, clerk, Brainley, Alford.

ESSEX.—August 28th.—For widening St. Stephen's Bridge, at Coggeshall, for the county council.—Mr. Percy J. Sheldon, county surveyor.

ESSEX.—August 28th.—For widening Springfield Bridge, at Chelmsford, for the county council.—Mr. Percy J. Sheldon, county surveyor.

GLAMORGAN.—August 28th.—For the erection of a school at Bettws, near Bridgend, a school at Blaengwrach, near Neath, a school at Pontlliw, near Pontardulais (removal of temporary building from Gorseinon and foundations for same), a mixed school at Trebanos, near Pontardawe, and other works, for the county council.—Mr. T. Mansel Franklen, clerk.

CHELMSFORD.—August 28th.—For the extension of the fire engine station, for the corporation.—Mr. W. Smith, town clerk.

BRANDON AND BYSHOTTLES.—August 29th.—For the construction of concrete walls and the erection of a steel footbridge, for the urban district council.—Mr. A. A. Luxmoore, 5 North Bailey, Durham.

BARNET.—August 29th.—For pulling down premises and clearing a site, for the urban district council.—Mr. H. W. Poole, clerk.

HERTS.—August 29th.—For alterations and additions at a public school, for the Education Committee.—Mr. Urban A. Smith, county surveyor.

GLASGOW.—August 29th.—For the erection of public baths, for the corporation.—Mr. J. Lindsay, town clerk.

NORTHWICH.—August 29th.—For the erection of baths and wash-houses, for the urban district council.—Mr. J. A. Cowley, clerk.

WELLINGTON.—August 29th.—For taking down and rebuilding a bridge, for the rural and urban district councils.—Mr. W. Sydney Price, clerk to the rural district council, Wellington, Somerset.

PORTLAND.—August 29th.—For the erection of a pumping station and cottage, for the urban district council.—The Clerk.

KIRKCALDY.—August 30th.—For extensions to generating station, for the corporation.—Mr. W. L. Macindoe, town clerk.

STAFFS.—August 30th.—For the erection of a school, for the Education Committee.—Mr. G. Balfour, County Education Offices, Stafford.

TIPTON.—August 31st.—For building engine and boiler house, for the urban district council.—Mr. S. O. Stephenson, engineer, Gasworks.

SWINTON.—August 31st.—For the construction of a wall across a reservoir, for the urban district council.—Mr. W. T. Postlethwaite, clerk.

HYDE.—August 31st.—For building public hall and police courts, for the corporation.—Mr. J. Diggle, borough surveyor.

MINEHEAD.—September 1st.—For building a convenience and cloak-room, for the urban district council.—Mr. L. C. Webber-Incledon, clerk.

MIDLOTHIAN.—September 2nd.—For works at new police station, for the county council.—Mr. A. G. G. Asher, county clerk, County Rooms, Edinburgh.

ABERDEEN.—September 2nd.—For the extension of the fish market, for the corporation.—Mr. W. Dyack, burgh surveyor.

MALDENS AND COOMBE.—September 2nd.—For the extension of the mortuary, for the urban district council.—Mr. R. H. Jeffes, clerk.

COTTINGHAM.—September 2nd.—For the erection of a parish hall, for the urban district council.—Mr. J. S. Moss-Blundell, clerk.

BARNET.—September 3rd.—For building twenty-two cottages, for the urban district council.—Mr. H. W. Poole, clerk.

MERTHYR.—September 3rd.—For the erection of girls' school and domestic subjects block, for the Education Committee.—Mr. E. Stephens, clerk.

JARROW.—September 3rd.—For the erection of a public convenience, for the corporation.—Mr. J. S. Weir, borough engineer.

CARMARTHEN.—September 3rd.—For extensions to a school, for the Education Committee.—Mr. W. Vincent Morgan, county architect, County Education Offices, Carmarthen.

KENT.—September 4th—21st.—For the erection of a school, for the Education Committee.—Mr. W. H. Robinson, architect, Caxton House, Westminster.

WEST RIDING.—September 6th.—For the erection of two new schools, for the Education Committee.—Mr. Francis Alvey Darwin, clerk, County Hall, Wakefield.

HACKNEY.—September 12th.—For extension to electricity works, for the borough council.—Mr. W. A. Williams, town clerk.

BRADFORD.—For constructing new staircase at town hall, for the corporation.—Mr. F. Stevens, town clerk.

Iron and Steel.

BLACKBURN.—August 24th.—For the supply of castings and valves, for the corporation.—Mr. W. Stubbs, borough engineer.

MANCHESTER.—August 24th.—For the supply of one Lancashire boiler, with superheater, mechanical stoker, fuel economiser, and steam and feed pipes, and two sets of vertical steam pumping engines, for the corporation.—Mr. Thomas Hudson, town clerk.

SWINDON.—August 24th.—For the supply of wrought-iron fence, gate and posts, for the corporation.—Mr. R. Hilton, town clerk.

CHELMSFORD.—August 28th.—For laying water mains, for the corporation.—Mr. W. Smith, town clerk.

ROTHERHAM.—August 28th.—For the supply of cast-iron mains, for the Gas Committee.—Mr. C. L. Des Forges, town clerk.

SUNDERLAND.—August 29th.—For the supply of smith's work, including staircases, handrails, and chequered plating, for the corporation.—Mr. F. M. Bowey, town clerk.

LEICESTER.—August 31st.—For the supply and erection of steel roof trusses, lattice girders and columns for the extension of the main car depot, for the corporation.—Mr. E. George Mawbey, borough engineer.

BLACKPOOL.—August 31st.—For the supply of Sandberg steel tramway rails, for the corporation.—Mr. J. S. Brodie, borough engineer.

Roads.

BURNLEY.—August 24th.—For paving and making up, for the rural district council.—Mr. H. Prichard, surveyor.

SWINDON.—August 24th.—For making up with tarred stone and asphalt, for the Hospital Board.—Mr. G. Adams, clerk, 4 Crickdale-street, Swindon.

PRESTWICH.—August 24th.—For private street works, for the urban district council.—Mr. L. A. Orford, clerk.

EDINBURGH.—August 24th.—For granite-sett paving work, for the corporation.—Mr. T. Hunter, town clerk.

NELSON.—August 24th.—For work in several streets, for the corporation.—Mr. W. Shackleton, borough engineer and surveyor.

HARROGATE.—August 26th.—For drainage and road-making works at the cemetery, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor.

ALTOFTS.—August 26th.—For the construction of a new footpath, for the urban district council.—Mr. A. E. Greaves, clerk.

CHESTER-LE-STREET.—August 28th.—For making up several streets, for the urban district council.—Mr. J. Gray, clerk.

FELLING-ON-TYNE.—August 28th.—For making up a macadam road, for the urban district council.—Mr. C. W. Hall, surveyor.

SOUTH SHIELDS.—August 28th.—For repaving certain streets with granite setts, for the corporation.—Mr. Leslie Roseveare, borough engineer and surveyor.

BASINGSTOKE.—August 28th.—For work of steam road-rolling, for the rural district council.—Mr. H. Wills Chandler, clerk.

NEWHAVEN.—August 29th.—For the supply of flake granite or broken Kentish ragstone, for the rural district council.—Mr. H. W. Coupe, clerk.

CHICHESTER.—August 29th.—For making up with granite macadam about 10,000 super. yds. of London-Portsmouth road, for the corporation.—Mr. J. W. Loader Cooper, town clerk.

CASABLANCA.—August 29th.—For the improvement of several roads, for the Special Committee of Public Works.—The President, Comité Special des Travaux Publics, Dar En Niaba.

ALFORD.—August 29th.—For the supply of 700 tons of broken granite and screenings, for the urban district council.—Mr. T. N. Loy, clerk.

SALTASH.—August 29th.—For works of making up and widening, for the urban district council.—Mr. F. E. Cleverton, town clerk.

EAST BARNET.—August 29th.—For the supply of broken granite, gravel, hoggin, Portland cement, stoneware pipes, tar-paving materials, oats, hay, straw, horse hire and cartage, for the urban district council.—Mr. T. A. Buckley, clerk.

WALTHAMSTOW.—August 30th.—For the supply of Trinidad asphalt macadam and Trinidad Lake bitumen, for the urban district council.—Mr. E. Morley, surveyor.

CLAYTON-LE-MOORS.—August 31st.—For granite kerbing and paving, for the urban district council.—Mr. A. Dodgeon, surveyor.

DORKING.—August 31st.—For surfacing with slag tar-macadam, for the urban district council.—Mr. W. A. Clegg, borough surveyor.

BLAYDON-ON-TYNE.—August 31st.—For making up a road, for the urban district council.—Mr. H. Dalton, clerk.

CASABLANCA.—August 31st.—For the construction of public roads, for the Moroccan Adjudications Commission.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

LITTLEHAMPTON.—August 31st.—For the supply of Guernsey or other granite, for the urban district council.—Mr. H. Howard, surveyor.

SAFFRON WALDEN.—August 31st.—For the supply of granite macadam, for the corporation.—Mr. A. H. Forbes, borough surveyor.

SUTHERLAND.—August 31st.—For reconstruction and improvement of county roads, for the county council.—Mr. A. Argo, county clerk, Golspie.

LOUGHTON.—August 31st.—For the supply of granite, gravel and hire of steam roller, for the urban district council.—Mr. H. White, surveyor.

SANDWICH.—September 2nd.—For the supply of granite, granite chippings and channelling, for the corporation.—Town Clerk.

BOLTON-UPON-DEARNE.—September 2nd.—For street-making work, for the urban district council.—Mr. J. L. Hawksworth, clerk.

SUNBURY-ON-THAMES.—September 2nd.—For steam rolling and scarifying, for the urban district council.—Mr. H. F. Coales, surveyor.

CAERPHILLY.—September 2nd.—For the supply of 1,000 tons of 2-in. granite, for the urban district council.—Mr. O. H. Harpur, clerk.

BROMLEY.—September 2nd.—For the hire of a steam roller, for the rural district council.—Mr. Edward Haslehurst, clerk.

BROMLEY.—September 2nd.—For the supply of road materials, carting and team labour, for the rural district council.—Mr. Edward Haslehurst, clerk.

MIDDLETON.—September 3rd.—For making up a road, for the corporation.—Mr. W. Welburn, borough surveyor.

SOUTHAMPTON.—September 3rd.—For private street works, for the corporation.—Borough Engineer.

HOVE.—September 4th.—For paving and other works, for the corporation.—Mr. H. Indacott, town clerk.

SKIPTON.—September 4th.—For the construction of a roadway, for the urban district council.—Mr. Prichard Wilson, clerk.

SOUTHEND-ON-SEA.—September 6th.—For road and formation works in connection with the construction of a boulevard 1¾ miles in length and 100 ft. wide, for the corporation.—Mr. H. J. Worwood, town clerk.

HANWELL.—September 7th.—For wood paving a portion of Boston-road, for the urban district council.—Mr. Percy Scott, clerk.

BEDLINGTON.—September 9th.—For making up a certain street, for the urban district council.—Mr C. D. Forster, 24 Grainger-street West, Newcastle-on-Tyne.

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

Points from the Road Board's Report.

The extracts from the Road Board's annual report which appeared in our issue of last week were sufficient to show in broad outline the great importance of the matters which are engaging the Board's attention. The report contains, however, a large amount of matter which does not lend itself either to quotation in "chunks" or to broad generalisations. The Road Board is a central department dealing in a very direct manner with intimate matters of road administration and maintenance. The result of this condition is that single and apparently small points in the Board's annual report may be of far-reaching significance and importance. One of the most interesting matters engaging the attention of the Board during the past year has been a statistical comparison between two periods, during both of which there was an increase in the cost of road maintenance. The figures reveal, however, a condition of affairs which is hardly what one might expect from recent statements with regard to the increase in the cost of road maintenance due to motor traffic. The figures to which we allude are these: In the period from 1890 to 1902 the average increase per cent in the annual cost of maintenance of urban roads was 9·5, while in the period from 1902 to 1909 it was 1·85. These figures may, perhaps, be sufficiently explained by a general advance in the public demand for improved street conditions and better road accommodation generally in urban and semi-urban areas. The same cannot be said, however, as regards rural roads. On these roads the average increase per cent per mile in the annual cost of maintenance was 5·75 in the former period and only 2·42 in the second period from 1902 to 1909, though this may be called the period of motor traffic during which, it is usually assumed, the increased cost of road maintenance has mainly been felt. The point is so important that we defer it for further consideration, only noting in passing that a large amount of the recent increase in the cost of road maintenance is certainly due to motor traffic.

Other figures which might at first sight convey an erroneous impression if read without taking other matters into consideration are those giving the cost of roads per £ of assessable value and per head of population. The rate per £ in extra-Metropolitan county boroughs was, in the year 1909, 5·58 pence; while in the administrative counties it was 14·2d. in the same year. Allowing for Exchequer contributions, and assuming that these amount to 50 per cent in the counties and about 11 per cent in the boroughs, the expenditure per head of population was about 24d. in the boroughs and 36d. in the counties. At first sight this seems unfair on the counties, but we have only to go back to the essays which we all wrote on this subject when at school to realise that the advantages and disadvantages of living in a town or in the country result in some things costing more and others costing less; and a scattered population necessarily pays more for its roads, just as the condensed population pays more for its houses. The summaries of traffic returns from the counties of East Sussex and Kent are extremely interesting, and if studied in connection with a map of each county should furnish employment for the leisure moments of surveyors for some weeks to come, if surveyors have any leisure moments. The motor traffic varies from about 7 to 91 per cent of the total in East Sussex, and from 8 to 75 per cent of the total in Kent, and further study of the returns themselves shows that there are many spots in these counties where the proportion of motor traffic exceeds 40 per cent, and not very many where it is less than about 14 per cent. These figures convey information of some little value, but they are not worth much in comparison with the information which will be derived from studying a considerable number of the actual entries with a map showing not only the position of the station with respect to the towns and villages in the county itself, but also its position with respect to those lines of through traffic with their many small deviations radiating from London to the coasts of Kent and East Sussex. These figures show something of the nature of the traffic in the area lying between London and those portions of the South Coast which are thickly dotted with towns considered to rank high as health resorts and offering attractions as pleasure resorts, every one of them lying within a day's trip of London, there and back, by motor car. Doubtless the Road Board will receive information which will make it possible to publish in future annual reports, or better still, in special reports, similar traffic tables for areas beyond the ebb and flow of London's motor cars, and representative of conditions in counties which are intersected by great main roads, as well as those in which the proportion of through traffic is small.

We cannot allow the occasion to pass without expressing our appreciation of the skilful manner in which really important facts and figures have been selected for inclusion in a report of moderate length and of much more than ordinary vitality. We do not see eye to eye with the Board with regard to the use of bituminous binder, which is referred to in the report as though it had proved successful generally on roads of many different classes, and all over the country. We also deprecate the use of the expression "recoating" with a context which suggests an attitude towards the improvement of

the road bed which is very far from that really taken up by the Board. The suggestion that road crusts on heavily trafficked roads should be bound "not with mud but with bituminous materials" is one which we much regret to see in this generally well conceived and very valuable report. If it is the opinion of the Board that these roads should be forthwith bound with bituminous binder, or as occasion for recoating arises, there is no reason against this being made a recommendation in their report; but the expression "not with mud" is hardly justified, having regard to the ordinary practice of road surveyors in the British Isles.

* * *

Wiltshire Roads: Matters of Engineering.

The sharp changes which occur when a road passes from a chalk or limestone subsoil into softer strata like those of the weald clay and greensand have furnished Mr. Powell, to whose interesting annual report we made some references in last week's issue, with opportunities for making valuable comparisons. The differences, he finds, may amount to 30 or 40 per cent *less*, which we understand is measured against 100 per cent in the case of the higher cost, implying that the more costly roads involve an expenditure of from 43 to 66 per cent *more* than those on the favourable subsoils. We direct the attention of the committee on Communication 9 (Road Congress) to these figures, and hope that Mr. Powell may be able to give some actual cases of the kind desired by the committee, and, if the data are available, to estimate what reduction of the excess cost could be brought about by some definite expenditure per mile of capital spent on reconstruction.

We welcome the term "enveloping" as expressing very neatly that position and nature of hedge growth which results in the hedges "shading and excluding wind and sun" from the surface of a road, but we would suggest that the best measure of the height of a hedge is that given by some angular elevation measured from the edge or middle of the carriageway; a 4-ft. hedge close to the carriageway cuts off drying currents more than does an 8-ft. hedge beyond a 10-ft. margin. A very good practical point, referred to by Mr. Powell, is the importance of the surface drainage of a clay subsoil. The importance of draining a really stiff soil by surface grading is often overlooked, and another point that does not receive sufficient attention is the significance of the different capacities for the absorption of water exhibited by different kinds of "stiff" soil. We recently compared weald clay with a red marl, and we are glad to find that the matter had already received attention from Mr. Powell, who compares an impermeable clay with a retentive but also absorptive silt.

Probably the most generally interesting passage in the report, at any rate as far as surveyors in the flint-bearing areas of the South are concerned, is that relating to the substitution of flint road crusts for those previously made with limestone. Mr. Powell states the advantages of a flint crust fairly enough, and if it lasts as long as the limestone crust the saving is about £50 per mile on secondary or tertiary roads of an ordinary width. If the crust be renewed every two and a-half years, say, the saving is £20 a year. But what about the wear and tear of boot leather and bicycle tyres and tubes? In some kinds of wet weather the flint road is a very reliable and safe one for cycling, but we fancy that most cyclists would, on the score of expense, vote for limestone in preference to flint roads.

* * *

The Ottawa River Survey.

The sanitary survey of the Ottawa River made by Mr. James O. Meadows on behalf of the Board of Health of the Province of Quebec is described more fully elsewhere in the present issue. This report is a further example of the excellent work which is being done by the Quebec Board of Health. There can be no question as to the practical utility and need of surveys of this kind. The Ottawa river is typical of many others, which in their original state afforded safe sources for domestic and municipal water supplies, but the very fact of houses and towns being built upon the banks of the rivers means that the rivers will be polluted, and that if care is not taken this pollution is very likely to reach the waterworks intake and cause trouble. The report brings forward very clearly the fact that the water in a river may be perfectly pure above and below a township and of enormous volume compared with the flow of sewage from that township, yet, as shown in the case of the Ottawa River, serious epidemics of typhoid are likely to occur and recur unless care is taken to keep the waterworks intakes well away from that portion of the river which is polluted with the town's sewage. The fact is no doubt obvious enough after it has been pointed out, but one can see how easily and insensibly a dangerous condition arises, owing to the growth of a town, to its better drainage and to unsuspected river currents and eddies. We are told that where epidemics of typhoid have occurred each municipality has polluted its own water supply while the intervening stretches of the river have remained pure. The pollution has in these cases been purely local, but the water has happened to be drawn from the polluted section.

This sanitary survey should be an object lesson to many places, and it emphasises the importance of continual vigilance with regard to all sources of water supply. Pollution of all kinds must increase with the population, and no source can ever be considered absolutely safe from the possibilities of contamination in the future. Watchfulness and prompt action in case of need would save many lives, and if a greater factor of safety were allowed in all cases it would be advantageous. Both at home and abroad it is customary to wait until the water actually shows signs of pollution before steps are taken to improve the quality of water. This is quite inexcusable, seeing that it is possible to purify the worst water. The recommendation that mechanical filtration should be generally adopted is to be commended, as this would introduce a proper safeguard, while it is of course the obvious duty of the various authorities to see also that they obtain their water from as pure a source as possible.

Electrolytic Disinfectant.

We have been favoured with a copy of the annual report for the year 1911 of Dr. F. W. Alexander, the medical officer of health to the metropolitan borough of Poplar, and a perusal of this very interesting volume reveals a year's steady work and progress in regard to the public health services in a peculiarly difficult district. The public health department of this borough has acted as a pioneer in respect of the use of electrolytic disinfecting fluid for various purposes, and it may be within the recollection of our readers that we have from time to time recorded in these columns the success which has attended the use of this inexpensive and efficient disinfectant. During the year 1911 the total output of the fluid amounted to 53,063 gallons, the cost of materials being only £108. This quantity is sufficient not only for the use of the public health department and the various institutions under the control of the council, but it also allows an unlimited amount of the fluid to be supplied free of charge to the institutions of the Managers of Sick Asylums and the Board of Guardians. One of the most interesting uses to which the fluid is put is that of purifying the water of the swimming baths. The testimony of bathers is that the addition of the electrolytic disinfectant in such a quantity as to produce one part of chlorine to 2,000,000 parts of water imparts a freshness which is entirely lacking in ordinary swimming-bath water. The bath superintendents, too, repeat their statements that the addition of the fluid prevents the formation of slime in the water, and that when the baths are emptied for cleansing there is no objectionable deposit or

offensive smell. The importance of this result is manifest when it is remembered that any scum or deposit which forms in a swimming-bath forms a very favourable breeding-ground for many kinds of disease germs. The use of the electrolytic fluid was commented upon some time ago by Dr. J. Graham Forbes in a paper on the serious evils and dangers lurking in swimming-baths which he read before the Association of School Medical Officers. Dr. Graham Forbes expressed surprise that after the electrolytic process of manufacturing hypochlorite of magnesium has stood a successful trial of six years in the borough of Poplar adverse criticisms have not ceased to be made. The experience gained in this trial would appear to be a conclusive proof of the practical value of the process, and we cannot help thinking that when the lurking evils of the public swimming-bath are fully realised many other boroughs will profit by the enterprise of Poplar and will avail themselves of a remedy which has been demonstrated to be both efficient and economical.

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Irish and Scottish Roads. Owing to the fact that the Grand Juries had no powers to buy road machinery or plant, the only steam rolling done in Ireland before the institution of county councils in 1899 was that which was carried out with hired rollers in a few important counties. There has been, moreover, very strong local opposition to the use of the steam roller—an opposition which is now giving way before the evidences of good work performed by this valuable machine in those counties which have adopted direct labour, as well as in others in which the old contract system has been modified to an important extent. In Scotland the steam roller was strenuously opposed for a time, but all districts, even in the remote Highlands, have now fallen into line, and a very great improvement in the roads has been effected. An important impetus was given to roadmaking and improvement by the passing of the Road and Bridges Act of 1878, before which nearly all the main roads of Scotland were turnpike roads. The above facts are among those set forth in two interesting papers submitted to the annual meeting of the Institution of Municipal and County Engineers, "Some Notes on Road Maintenance in County Armagh," by Mr. R. H. Dorman, M.Inst.C.E., county surveyor, and "Scottish Roads," by Mr. Allan Stevenson, county road surveyor, Ayr.

Mr. Dorman's contributions to the general stock of knowledge in highway engineering are as conspicuous for the clearness with which they are presented as for the value of their subject-matter, and we trust that none of our readers will make the mistake of supposing that in the present case the paper may be passed over as though it applied only to Irish conditions. Similarly in Mr. Stevenson's paper on "Scottish Roads" it will be found there is a good deal that is of general interest. Space does not allow of discussion of the matters dealt with in these papers, but we may in passing note as highly significant the fact that traction engines may be taken all over Scotland without a licence and on any highway, however unsuitable it may be for such traffic; and we may note, too, that Mr. Stevenson raises a point which is of considerable importance in remarking that motor vehicles, which are only allowed by law to travel at 5 miles an hour, are frequently driven in excess of that speed.

* * *

A Year's Work in Johannesburg. The last annual report of Mr. G. S. Burt Andrews, M.Inst.C.E., the town engineer of Johannesburg, shows that the phenomenal growth of this interesting town has not yet been arrested. The number of buildings erected during the past year is the greatest for any year since 1905, which may be regarded as the height of the boom in building in the town. The buildings which are now being constructed are frequently of a modern substantial type, and there is a gratifying tendency to abandon the erection of wooden houses. The increase in the number of substantial business premises which are being erected away from those thoroughfares in which the principal trade of the town has been carried on hitherto is specially noticeable. This development of building enterprise has created fresh problems for Mr. Andrews and his staff. In regard to road construction, for example, it is being found that the increase of heavy motor and general vehicular traffic is such as to bring upon the old highways a burden which they are not fitted to bear, and it is evident that the council will soon have to embark on a scheme for the creation of a more substantial class of roadway in the central area of the town. This scheme is necessitated by two circumstances. In the first place the cost of maintaining the existing roadways is becoming prohibitive, and in the second place the comfort and convenience of the public demand a class of highway which can be kept in a condition more fit for general use than is practicable at the present time.

Another section of Mr. Andrews' report, some account of which will be found in another column, deals with the water supply of the town, which is derived in bulk from the Rand Water Board and supplied to customers by means of the council's mains. The problem of waste has in the past been one of some difficulty, and it is satisfactory to observe that the percentage of wastage has been considerably reduced by a thorough system of night inspection by means of waste-water meters. British municipal engineers will thoroughly appreciate the difficult nature of Mr. Andrews' task in supervising the growth of such an important town as Johannesburg, and will continue to watch with interest the development of the various public services for the administration of which he is responsible.

* * *

Indian Students. The recent appointment by the Government of an official whose special duty will be to watch over the interests of Indian students in this country affords a fresh reminder that an English education confers considerable prestige upon the practitioner in any profession in the Eastern Empire. The number of Indians studying in England at the present time is enormous, as will be shown at once by a visit to any of our great centres of learning. In the engineering profession the need for practical training and experience to supplement the theoretical work of the college has led to a desire on the part of many of these students to complete their education in this country by serving articles under an English engineer. The ambition of most educated Indians is to obtain a Government or civic appointment, and it is evident that a term of service in the office of a municipal engineer is the most appropriate training for those who wish to get engineering posts of this kind. It is not surprising therefore that applications are frequently received from Indian students requiring attachment to municipal engineers for the purpose of gaining practical knowledge in municipal engineering generally, and in many cases with the special purpose of passing the examination of the Institution of Municipal and County Engineers. That body is accordingly taking steps to bring together such students and those municipal engineers who have works in construction and who are desirous of taking a pupil. To this end a circular letter (which was referred to in THE SURVEYOR of August 9th, p. 217) has been sent to the members inviting them to communicate with the secretary on a form which is attached to the circular, and on which particulars of the premium, the period of articles, and the nature of the works in hand are required to be given. The Institution are to be commended for taking up the matter, and it is to be hoped that the result of their action will be the mutual benefit of the members and the students concerned.

Sanitary Survey of the Ottawa River.

QUEBEC BOARD OF HEALTH'S OBJECT-LESSON.

The seventeenth annual report of the Board of Health of the Province of Quebec contains a description of the sanitary survey of the Ottawa river recently made by Mr. James O. Meadows, engineer to the Board. It is based upon the results of the survey and also upon data obtained from previous local studies. The discharge of sewage, trade wastes and refuse into the river at points above waterworks intakes has been specially considered, and their relation to typhoid fever and to the public health generally is discussed.

In order to secure the analytical data necessary, two trips were made down the river from Pembroke to Montreal. The important municipalities were visited, and information was secured as to their sanitary condition, while steps were also taken to obtain similar information from the other towns bordering on the Ottawa river.

The Ottawa river has its source in lakes. It is 700 miles long, and has a total watershed area of 56,000 square miles. The upper part of the river flows through a granite plateau, and the country is low and marshy. Below this area the river falls rapidly. There are many lakes, having a total area of several hundred square miles, in the upper area. From Pembroke to Ottawa the river is a series of lakes separated by rapids. The total population of the watershed is estimated at about 500,000. Within a radius of 10 miles at Ottawa are the municipalities of Aylmer, Hull and Ottawa, having a total population of over 100,000. Only about 20,000 of the remaining population of the main river have sewer outlets, while the urban population on the tributaries is small, and very few of the municipalities discharge sewage into the rivers.

RIVER POLLUTION.

It is argued therefore that the great percentage of the urban pollution occurs at or near Ottawa. The maximum recorded flow of the Ottawa river is 76,000 cub. ft. per second, and from this it is calculated that the flow of the stream, as compared with the flow of sewage from the population of Ottawa and the vicinity is 760 cub. ft. per second for each 1,000 of the population. With a minimum flow the comparison is 150 cub. ft. per second for each 1,000 of the population.

The chief manufacturing plants on the banks of the river are for making pulp, paper, sulphite and matches, and the combined waste from these is very small when compared with the volume of the river. The principal industries are lumbering and agriculture.

It is shown in the report that in several cases those towns which have the most polluted water supplies and the highest typhoid death-rate have done nothing yet to improve the quality of their water supplies. The water at Pembroke, Ottawa, Westmount and Montreal is purified with calcium hypochlorite, while at Verdun pressure filters are in use. The quantity of water consumed per head by the population actually using the water varies considerably at the various cities and villages. For instance, the amount consumed per head per day is 128 gallons at Pembroke, 46 at Arnprior, 75 at Aylmer 249 at Hull, 181 at Ottawa, 25 at Rockland, 75 at Hawkesbury, 246 at Lachine, 100 at Westmount, 34 at Verdun and 86 gallons per head per day at Montreal. Speaking generally, the largest cities have the largest supplies per head, but it is to be noted that Pembroke, with 4,700 consumers, and Lachine, with 10,150 consumers, use far more water per head than Montreal with its 450,000 consumers.

UPPER AND LOWER REACHES COMPARED.

The Ottawa river from Pembroke to Ottawa receives the domestic sewage from a combined population of not over 15,000, and the towns discharging sewage between these two points are well separated, and the nature of the river makes purification by natural agencies possible. The germ content of the river above Ottawa is comparatively low, except where polluted for a short distance by local sewers, and in most cases B. coli were absent in 1 cubic centimetre. Bacterial examinations were made. With regard to the severe typhoid epidemics which have occurred at Pembroke, Hull and Ottawa, the report states that these were due to each municipality infecting its own supply.

Below Ottawa the germ content of the river increases perceptibly owing to the sewage of Ottawa and the vicinity entering the river. The population being over 100,000, the amount of pollution must be considerable. The increased germ content of the river water is present below Ottawa all the way to the Lake of Two Mountains, but this lake acts as a natural settling basin, and a decided decrease in germ content is noted after the river water has passed through it. It is to be observed also that several municipalities below Ottawa discharge their sewage into the river. With regard to the sterilising plants installed at Pembroke, Ottawa and Montreal, we are told that these are temporary in character, and have been installed to treat the water till more permanent works are constructed. The result of this sterilisation has been to reduce the typhoid fever rates at these places materially. The city of Montreal is constructing filtration works of the double filtration type, while Mr. Allen Hagen has recommended a supply of water from McGregor Lake for Ottawa, or filtration of the river water, and Pembroke has extended its water intake 7,000 ft. to take water from mid-stream. It is hoped in this way to escape the eddies which were held responsible for the severe epidemic of 1909. Interesting diagrams are given which show how the bacterial content of the water was reduced to practically *nil* at Montreal by means of hypochlorite, and how it was reduced to something like from ten to fifty on an average per cubic centimetre at Verdun by pressure filters, although it is to be noted that in the month of April this figure rose to over 200. The need for the purification of water is shown in a table of typhoid death-rates in the year 1910, which in two cases are as high as 100 and 116 per 100,000.

CONCLUSIONS.

The conclusions are to the effect that the river above Ottawa is pure, except where polluted for a short distance by municipal sewers. Each town seems to have polluted that part of the river from which it drew its supply. Further, it is considered improbable that the amount of pollution of this upper section of the river will increase perceptably for a considerable period of time.

Ottawa and Hull pollute the river for a considerable distance below, so that the section from Ottawa to St. Anne de Bellevue is unfit for use in its raw state.

Mechanical filtration is recommended owing to the high colour content of the river water, in order to secure a water of good appearance and bacterial purity. It is recommended that the sewage of Ottawa and Hull should be purified. The amount of manufactory waste entering the river is too small to create any nuisance, and is not likely to increase. It is expected that the construction of the Georgian Bay Ship Canal will have a considerable effect on the river. In some cases additional pollution is likely to occur, but it is probable that by equalising the flow of the river the maximum pollution which occurs at low stages of the river will be prevented. The Ottawa river, being an interprovincial stream, is outside the jurisdiction of either province, and this suggests federal authority and sanitary control over waters which do not lie entirely within the limits of one province.

Refuse Destruction at Cromer.—A new refuse destructor at Cromer has recently been completed, and was used for the first time last week. The method of disposal at Cromer has hitherto been to tip the refuse into a disused clay pit at Felbrigg. A convenient site for the new plant has been obtained. The destructor and chimney have cost £1,146, and with the tip roadway, fencing of site, laying on of a water service, and other incidentals, the whole cost will not exceed £1,500, which is the amount of the loan sanctioned. The furnaces are of the front-feed type, and are capable of burning 6 tons in ten hours, more than sufficient for all requirements during the season. The contractors for the work were Messrs. Dawson & Manfield, of Manchester.

Institution of Municipal and County Engineers.

ANNUAL GENERAL MEETING IN LONDON.

The second day's proceedings in connection with the recent annual meeting of the Institution of Municipal and County Engineers included the consideration of the following paper:—

SOME NOTES ON ROAD MAINTENANCE IN COUNTY ARMAGH.

By R. H. Dorman, M.Inst.C.E.,
County Surveyor.

In this paper the author desires to give some account of the rate of progress in respect to road maintenance, and to describe briefly some of the methods adopted for the improvement of the roads in recent years in County Armagh. Previous to the passing of the Local Government Act (Ireland), 1899, the road authority for each county in Ireland was the Grand Jury, which body was empanelled twice a year for the consideration of criminal and fiscal business, but after transacting the business laid before them they were discharged and had no further jurisdiction until called together again at the next assizes, the sole authority in charge of the roads in the interval being the county surveyor. The Grand Juries, not being corporate bodies, had no power to purchase road machinery or plant of any sort; as a consequence, until the duties of the Grand Juries in respect to road maintenance were taken over by the county councils under the Local Government Act, little progress could be made in matters of road maintenance, and it is not therefore surprising that the roads in Ireland were generally in a very indifferent state previous to the passing of the Act. In a few important counties a little steam rolling had been done by hired rollers, and in a few counties in which the traffic was light, and suitable material was available, it was possible to make fairly good roads, but as a rule the roads were bad, and among the worst were those in County Armagh. In this county, as in every other county in Ireland, the roads were farmed out to contractors, who took over the whole responsibility for their maintenance, but who, being for the most part quite ignorant of the best methods of maintenance, and having no rollers or other appliances, naturally failed to make any improvement in their condition, and in many cases, instead of improving them, let them go from bad to worse.

Unfortunately, the Local Government Act did not provide for any system of road maintenance except by contract, but in a year or two after the Act came into force a Provisional Order was passed authorising the adoption of direct labour. From the year in which this Order became law dates the first signs of rapid improvement in the condition of the roads in Ireland. Not that everything then was plain sailing, because the strongest opposition was offered to any change by the road contractors, who up to this period had a monopoly of the roads, and by many of the rural district councils in the country, which bodies are for the most part extremely conservative in matters of road maintenance, and view with suspicion any change from existing methods. A number of county councils, however, taking a broader and more comprehensive view of the subject than the rural district councils, succeeded in overcoming their opposition, and in introducing direct labour on the roads; other county councils, while not abolishing the contract system, modified the old system in many respects and introduced steam rolling and other modern methods; the remaining county councils, while still following the old lines, cannot fail to see the better condition of the roads effected by improved methods, and it is therefore only a matter of a little time before every county will have adopted better and more up-to-date methods of maintenance.

DIRECT LABOUR.

The County Council of Armagh was one of the first bodies to recognise the advantages of direct labour, and in 1907 they adopted the system for all the first-class roads in the county, and since then there has been a rapid and continuous improvement in their condition, with practically no increase in expenditure. The results have, indeed, been so satisfactory that some of the rural district councils are now eager to adopt methods of maintenance more in accordance with modern principles for their second and third class roads, and the county council has just purchased light rollers at the request of two of these councils for use on the by-roads in their districts. As soon as the first rollers and scarifiers were purchased in County Armagh, the author proceeded to scarify and reform the roads so as to bring them into shape, to a proper camber, and to a suitable width in each case. In some places the roads were hog-backed; in others they were concave; in some places too wide, in others too narrow. The hog-backed parts were scarified, sometimes 12 in. to 18 in. deep, and the road widened out and rolled; if there was any surplus material it was screened and utilised for filling up concave parts of the same road or an adjoining road.

Where the roads were too narrow, they were cut back, a little hard material put in along the sides and rolled, while where too wide, a sod kerb was laid along the existing surface to define the proper width, and some soil packed behind to form a margin. This work could only be accomplished by degrees as funds became available, and as the author succeeded in collecting and training a sufficient staff of foremen, surfacemen and labourers. At the end of five years, however, most of the first-class roads, embracing about 450 miles, had been more or less reformed. During this period no great effort was made to obtain material of the best wearing properties, the chief object being to get the roads into shape, and to roll in any fairly hard material, so as to form a sub-crust for a surface coat of harder material. Over a large portion of the county the only local stone available is a very soft limestone, but this, when broken to a 2½-in. to 3-in. ring and rolled in a thick coat from 4 in. to 5 in., makes a very compact sub-crust, and for light traffic it makes by no means a bad surface, if kept clean and not allowed to track. The roads having been got into some sort of shape, more attention had to be paid to the quality of the material provided and to the opening up of quarries containing suitable material. Not much difficulty was experienced in this matter, although in parts of the county it is impossible to obtain good stone of any sort locally; still, in other parts there is an ample supply of whinstone, hard slatestone, &c., so that the difficulty resolves itself into a question of transport over distances seldom exceeding 15 to 20 miles. In some cases also a large proportion of the stone can be conveyed to within carting distance of its destination by rail or barge, so that, for the most part, suitable stone can be laid down on the roads without the aid of a traction engine or motor. Whinstone usually costs from 2s. 6d. to 3s. 3d. in the quarries, and hard slatestone 2s. to 2s. 6d., and, when laid down on the roads, from 3s. to 6s. a ton, so that the cost of material cannot be considered excessive. In one large quarry, owned by the county council, consisting of hard slatestone, the [illegible] broken to 10¼ in. rings by hand to a 2¾-in. ring for 1s. 2d., run down a short length of tram line and loaded into railway trucks for 2d. a ton, then railed to Armagh, a distance of 10 miles, for 1s. 3d. a ton, making a total cost of 3s. 3d. a ton for the stone at 10 miles from the quarry.

In those parts of the district in which only soft limestone is available locally, a proportion of the stone is now being treated with a preparation of tar, and [illegible] a special plant was laid down for the treatment of the stone, and during the [illegible] were dealt with. This plant consists of a crane for lifting the stone from the quarry floor to a platform, from whence it is tipped into an open inclined channel, the floor of which is formed of iron plates, beneath which is the flue, extending from the furnace built at the lower end of the incline for the purpose of heating the stone. From the channel, after being sufficiently heated and dried, the stone passes into the mixer. This mixer is cylindrical in shape, and has tee-irons riveted on the inside at an angle, so that the stone, as it drops from the tail of the shoot into the mixer, is passed along the mixer as it revolves from the upper to the lower end, where it discharges into barrows, and is then conveyed to the stacking ground close at hand. As the stone passes through the mixer, the preparation of tar and pitch is added in the requisite proportion from a tap

attached to a pipe leading from a tank in which the preparation is stored. The mixer is actuated by gearing after the manner of a threshing mill and driven by a pair of horses. This method of gearing and working the mixer is very simple and economical. A pair of light horses are quite able to drive the machine, and when not working they can be immediately detached and put to other work. The plant was designed by Messrs. Goodwin & Barsby, of Leicester. No difficulty is experienced in working the plant, and it is, on the whole, very satisfactory. The total cost of the plant, including erection, amounted to £230. From 35 to 40 tons of stone can be treated per fine working day of ten hours, at an average cost of treating the stone of 3s. 2·4d. a ton, made up as follows:—

	£	s.	d.
Labour, 16 men at 2s. 2d. a day ...	1	14	8
1 foreman at 4s. a day		4	0
Horsework, 2 horses at 4s. 6d.		9	0
Oil			3
Coal, 5 cwt. of Scotch coal		5	0
Tar, 266 galls. of gas tar at 2d. per gall.	2	4	4
Pitch, 6½ cwt., at £2 10s. a ton... ...		16	3
Cartage of tar and pitch to quarry ...		5	0
Total cost of treating 37 tons of stone	£5	18	6

MATERIAL.

The author is a little sceptical about any great advantage to be derived from specifying that the material for the surface crust shall consist of stone of varying sizes, such as 60 per cent of 2½-in. gauge, 30 per cent of 2¼-in. gauge to 1¼-in. gauge, &c. He considers it of much more importance that the stone should be broken cubical, and instead of having a large proportion of fine stone, he would like all the stone spread off for the roller to lie between 1¾-in. and 2¾-in. Stone of this size, of average hardness, spread off in a 4-in. coat, on a lightly scarified surface, rolls in very tight, and no apparent voids will be found in the coat.

QUALITY OF MATERIALS.

The principal varieties of stone available for road metal in County Armagh are whinstone, slatestone, and limestone, of varying degrees of hardness and toughness; but coarse-grained granite, elvanite, and felstone, &c., are also to be found in places. In the southern portion of the county stone is to be found, probably of Silurian origin, but which has apparently been subject to metamorphic action, so hard and tough that it is only raised with extreme difficulty and cannot be broken by hand except in small quantities. This stone, if broken to a small gauge, would doubtless make a very perfect and durable road, but when broken to a 2½-in. to 2¾-in. gauge, and rolled in, it wears into a very rough surface, very unpleasant to travel over. The same remark applies to coarse-grained granite when broken to a large size; but this material when broken fine, although it makes a smooth, even surface for very light traffic, is quite unable to carry heavy traffic, and wears very quickly. For ordinary purposes of comparison, the relative values of Armagh limestone, slatestone, and whinstone may be taken as one, two, and three—that is to say, average samples of these several varieties may be selected, and it will be found that they will, when used as road metal, approximately wear in the proportion of one, two, three. Of course, it will be found that a hard slatestone will wear better than a soft whinstone, and a good limestone better than a soft flaky slatestone; but the figures given above are fair average values. It does not follow, however, that in all cases a stone should be chosen for road metal because it seems to be the most economical when considered on the basis set out above; for instance, the price of whinstone on a particular road may be 9s. a ton and limestone 4s., or it may be only 2s. 6d. a ton, but it should not therefore be assumed that whinstone should be selected in the first case and limestone in the second, there are many other factors to be considered in each case besides wearing properties, for example, in strengthening and making up a bad road in the first instance, it will generally be economy to use a large quantity of a cheap and poor kind of material to put body into the road rather than a small quantity of material of better quality; on the other hand, no practical man would think of coating or repairing a whinstone road with soft limestone, no matter what the relative prices. Other factors to be considered in the selection of a stone are the traffic over the road on which it is to be used, the amount of mud and dust created, the road foundation, the subsoil, the drainage, the situation, and the gradients. A few examples will suffice to show why these items should be taken into account. On a heavily trafficked road, a hard wear-resisting material is, of course, required even if the cost is out of propotion to inferior material. In populous districts and roads carrying motor traffic the creation of mud and dust has to be carefully avoided. In the case of a bad foundation or a weak subsoil, cross breaking and shearing of the weak surface crust is liable to occur, so that a material which will roll down into a close compact mass, and will resist cross breaking better than a substance like hard slatestone, which has little binding properties in itself, should be used. On the other hand, on a badly drained road, soft limestone would wear out very rapidly, while the increased wear of slatestone in such a position might be hardly noticeable. Again, considering the situation and gradients of a road. On a high, wind-swept road, or a hard, steep gradient, a road coated with a stone possessing little binding properties would rapidly break up and go to pieces in dry weather, while a limestone, if used, would probably be hardly affected by these circumstances. The matter of foothold is another item which has to be taken into consideration in selecting material, and one on which a whole paper might be written.

STEAM ROLLING.

The Armagh County Council now own eight rollers, and a ninth has been ordered. Five of these rollers weigh 10 tons each, one weighs 12 tons, and two 7 tons each, these latter being for use chiefly on bog roads and on second and third class roads. The 10-ton rollers have been found heavy enough for the work required from them up to the present, but as the roads are becoming stronger and a better class material is being provided, it is found that better and tighter roads can be made with heavier rollers, and therefore when the present 10-ton rollers are worn out the author hopes to see them replaced by 12½-ton rollers on the leading roads, except, of course, when a special binder is used, which can be better treated with a light roller.

In Ireland the use of special binders is only in the experimental stage, and it seems probable that for some years to come, in order to save initial expenditure, the majority of the roads will continue to be water-bound except in or adjacent to the larger towns or on some of those roads towards which a grant in aid is made for improvement by the Road Board. The author will therefore direct his remarks chiefly to the steam-rolling of water-bound roads, referring only incidentally to such roads under his control as have been treated with special binders. There is a vast difference between a rolled road which has been reformed, coated with hard metal of uniform quality, well dry-rolled, bound with a small proportion of clean road scrapings, and finished off with screened chippings, and an ill-formed road on which a coat of indifferent metal is thrown, smothered with mud, and finished off any way; but it is remarkable how much of this bad work is carried out in many places. This sort of work is frequently to be found in Ireland on roads in the hands of contractors, who are insufficiently supervised, the chief object of a road contractor being, of course, to save expense by getting the roller which he has hired from the county council off a road as soon as possible, and so he lumps down the stone in a heavy coat, half dry-rolls it, flings a quantity of mud over it, and washes it in, no attempt having been made to reform and bring the existing surface to a proper camber in the first instance. Another cause of bad rolling is the incapacity of those in charge of the rolling operations. A capable assistant or foreman who knows his work will insist on a road being properly finished off, but too often the man in charge, while he thinks he knows all there is to be learnt about steam rolling, really knows very little about it; he has not mastered the little details which are the essentials of good rolling. To ensure good rolling, it is generally necessary to more or less reform the existing surface of a road before spreading on any stone. Sometimes the necessary work will entail heavy scarifying, reforming, screening and/or the renewal of the old material; most times only a little light scarifying and reforming is necessary, occasionally only a little picking here and there. As a rule, it is advisable to reform the old surface to bring it to the same camber as the finished surface, the sides to the same level, and to lightly dry-roll before spreading off the new coat.

The thickness of a new coat of unrolled stone

should not exceed 4½ in. or 5 in. at the outside; such a coat when rolled in will be from 3½ in. to 4 in. thick. When the new coat has been spread off it should be thoroughly dry-rolled, and as any slacks or depressions show they should be made up and the whole surface brought to a uniform camber of 1 in 30. This cross fall should not be judged entirely by the eye, but should be checked by means of a template and spirit level. After the stone has been thoroughly dry-rolled a very small quantity of clean road scrapings should be spread off, watered, and swept in, a quantity of chippings (about 1 ton to every 12 tons of stone), when available, should then be applied, and the rolling continued until a firm, hard, and tight surface has been obtained. After the operation of rolling has been completed the author has been in the habit in many cases of spreading off a quantity of screened chippings on the finished surface; these chippings prevent the surface breaking up after being rolled should very dry weather occur, but as they are quickly swept away by rapid motor traffic, and are also injurious to rubber tyres, he is discontinuing the practice.

Some short lengths of roads have been laid down with tar-macadam in County Armagh, and some experiments have also been made of grouting surfaces of newly-laid stone which have been dry-rolled with Tarvia, and from the experience so far gained the author is entirely in favour of tar-macadam over grouting with tar; he is, however, decidedly opposed to the finishing off the surface with a veneer of tar; undoubtedly this practice may result in roads of greater wearing properties, and which are practically dustless, as compared with roads without this veneer, but it can never give a satisfactory foothold in all conditions of weather.

No preparation has yet been introduced which makes an ideal binder for roads, and it is questionable if a perfect binder will ever be produced. A road possessing the rigidity of cast-iron is not a perfect road for traffic, while there must be set up in any road crust of broken stone bound with a substance possessing a certain amount of resilience or elasticity more or less internal stresses and friction under the jar of traffic, which will result in ultimate disintegration. The author, however, looks on a road crust composed of broken stone set in a firm but slightly elastic binder, and with the stones showing on top, as the nearest approach that can be obtained to a perfect surface, and which most nearly meets the requirements of traffic on ordinary county roads.

ROAD BOARD WORK.

Before concluding, the author would like to give a brief description of the work carried out in County Armagh, with the assistance of grants in aid from the Road Board, and his appreciation of the very great benefits to be derived from these grants. His only regret is that the total annual grant to Ireland, which contains a mileage of roads far out of proportion to other portions of the United Kingdom, and where the roads are the chief, and in many places the only, means of communication, should be so small. Last year the amount allotted to County Armagh was £2,700, and the county council, after setting aside £200 for work in the urban districts, applied the balance to the following works of improvement.

No. 1. To reconstruct, widen and steam roll 66½ perches of the road from Dublin to Derry between Armagh and Moy, £2,533 5s. 3d.

No. 2. To scarify, reform and make up 400 perches of road from Dublin to Belfast between the county Louth and Newry, £529 2s. 3d.

No. 3.—To render the drainage complete, scarify, reform and roll 200 perches of the road from Belfast to Armagh between Portadown and Armagh, £533 6s. 8d.

These several works have been carried out by direct labour and completed in a satisfactory manner, and are permanent works of improvement, which it is probable would never have been attempted by the county council and the district councils concerned without the assistance of the Road Board. The most important of these works—that is, the reconstruction of the Armagh to Moy road—involved the lowering and strengthening of a bog rampart, and was a difficult and troublesome piece of work. In order to test the relative values of tarred local limestone, whinstone and slatestone, this length of road was divided into three sections, one section coated with tarred limestone, and the other two with whinstone and slatestone respectively untreated. No appreciable difference is yet noticeable in the wearing properties of these several materials, but it will be interesting to note their ultimate values on this road.

For the current year the Road Board have allotted £1,400 towards works of improvement on the scheduled roads in County Armagh, and of this sum the county council have approved of £1,200 being expended on the following works:—

No. 1.—For draining, scarifying, reconstructing, strengthening and coating with whinstone and slatestone, 300 perches of the road from Armagh to Belfast, at an estimated cost of £1,172.

No. 2.—For widening the metalled portion of carriageway, strengthening and surfacing with whinstone, and draining 200 perches, also of the Armagh and Belfast road. Estimate, £768.

No. 3.—For strengthening, surfacing with slatestone, improving gradients, draining and reforming footpath on 88 perches of the road from Newry to Dublin. Estimate, £619.

These several lengths of roads will be finished with water-bound macadam, except in the case of No. 1, a portion of which will be treated with Rocmac, and a smaller portion which it is proposed to try with another proprietary article as an experiment. It may be asked why the county council are not treating the whole of these lengths of roads with tar or some other special binder. The answer is that the author has advised his council to render the drainage of the roads complete, to strengthen the foundations, and to improve the gradients of the roads where necessary before going to great expense in putting on an improved surface coat; and also to experiment to some extent in the first instance, and ascertain definitely by trial what is the best and most economical material and system to adopt before launching out into any particular method of resurfacing on new lines, which might not eventually prove satisfactory.

DISCUSSION OF MR. DORMAN'S PAPER.

Mr. E. Purnell Hooley (Notts), in proposing a vote of thanks to Mr. Dorman, said he did not know whether all the members were aware of some of the difficulties they had in Ireland in connection with roads. If not it might interest them to know that many things which were perfectly simple here were sources of great difficulty there. It was quite within recent years that it was illegal to use a steam roller in Ireland, and when he read in the paper that Mr. Dorman had nine rollers he realised the struggle he must have had to persuade his council to purchase them. They had not had the steam traction engine there yet, however. If they saw Mr. Dorman's roads they would agree they were roads to be proud of; they were, indeed, excellent. Mr. Dorman had faced the situation with courage, and it was greatly to his credit that he should come to England to show how things were being done in Ireland. Mr. W. H. Leete (Bedfordshire), seconding the vote of thanks, said he had the pleasure of attending the first road conference held in Ireland, and it was interesting to learn from that that the Irish road surveyors had only just begun to use the steam roller.

The President (Mr. R. J. Thomas) put the vote of thanks, and it was carried. Adding his personal thanks to Mr. Dorman, Mr. Thomas said it was always interesting to know what other people were doing, and they had there an example of what could be done with very small funds. This was rendered possible to a very large extent by the extraordinarily low prices of material. They found that in Ireland material was delivered at 2s. 6d. and 3s. 6d. per ton which in England cost 19s., 20s. and 22s. per ton. That was a great contrast, and he noticed also that the price of labour was most extraordinary—2s. 2d. per day. The price of horse work, too—he presumed a horse and man was meant—was 4s. 6d. per day. It was fortunate for those in Armagh that they had these conditions, and were thus able, with a comparatively small amount of money, to effect the improvements they had had described to them. Some of the roads in Armagh were excellent, but the roads in Ireland generally were very much behind the times, owing to the old-fashioned administration which had hitherto prevailed. But at the Road Congress one had been able to understand the enormous amount of energy which the Irish surveyors had put into their work, and it was the duty of English engineers to help them all they could to make up for the defects of the past.

Mr. Dorman, in replying, said he might say that his first knowledge of road making was acquired in Middlesex, where he served under the present city

surveyor of Manchester. In Ireland he had a very uphill battle, as they all did there, but he found if they persevered with their work and pegged away, in the end the district councils and county councils had confidence in them, and instead of opposing everything would begin to support them and back them up.

The following paper next came before the meeting:—

SCOTTISH ROADS.

By Allan Stevenson.
County Road Surveyor, Ayr.

This subject is a wide one, and the author must deal with it in very general terms. The variety of the physical features of Scotland demand provision of roads suitable for the traffic of each district—on the one hand numerous manufacturing industries and large centres of population, and on the other hand large areas sparsely populated with no industry except agriculture. Notwithstanding the extensive system of roads which the country possesses, due in a great measure to its mineral resources, the roads would be altogether inadequate now to meet the requirements had not the railway system come into existence in the first half of last century.

Prior to 1878 the main roads were nearly all turnpikes, one or two counties excepted. These turnpike roads were maintained from the revenues of the turnpikes or toll bars, but as soon as the railway system extended, the traffic on the roads, except for short distances, decreased, and the revenue for their maintenance diminished. In the author's experience of turnpike roads the varying quantities of traffic and revenue produced an irregular and inefficient system of maintenance, there being sufficient revenue from some tolls to maintain the roads from which it was raised, but more frequently their revenue was altogether inadequate to maintain them. A system such as this could not make for uniformity in upkeep; hence a few roads were in a good and the remainder in a poor condition.

In every county there were also a large number of roads of secondary importance, maintained by what was termed "Statute labour," but these roads were only kept in such repair as to be passable, and so as not to draw away the traffic from the toll bar. About the middle of last century "Statute labour" was abolished, and an assessment levied in each parish instead. These times are now passed, and the abolition of turnpike and "Statute labour" took place on the passing of the Roads and Bridges (Scotland) Act, 1878. The revenue for the maintenance of all the highways throughout Scotland is raised by assessment, one half payable by the owner and the other half by the occupier. For the management of the highways, councils are elected in each county, and these councils are again subdivided into district committees where the counties are large. The rates of assessment vary in each county and district according to its requirements and the importance of the highways. As surveyors, we have no concern regarding the finance but only in the expenditure, and our aim should be to do the best we can with the revenues at our disposal and to meet the requirements and demands of the times in which we live.

The first means of locomotion to cause more attention being given to road surfaces were the bicycle and road locomotive—the one light and easy, the other the reverse. In nearly all counties in Scotland at this period the metal was spread upon the roads in beds in a loose manner in the autumn season, and the traffic during winter consolidated it into the road surface, so that in spring it was fairly smooth if it had been properly attended to. This system practically prohibited bicycle traffic during the autumn and winter, and counties, through the voice of public opinion, had to find other methods for consolidating the new-laid road metal. The introduction of the steam road roller brought a great and beneficial change in road maintenance, giving at once a smooth and finished surface and an improved and comfortable road for the traffic. In many districts the steam roller was strenuously opposed for a time as being a waste of material by crushing it in the process of rolling, &c., but all have fallen into line, even in the remote Highland districts. From the introduction of road rollers onwards immense improvement had been made in the general condition of highways. The recent introduction of the motor car has, however, completely altered the whole of the system of road maintenance, and counties have now, in order to meet this traffic, to face the question of bringing up the standard of all the roads, more particularly through main trunk roads, to carry traction engine and motor traffic of various kinds by widening, draining, strengthening, selection of better material for maintenance, consolidation of the new surfaces, binding material, and last, but not the least difficult, the laying of the dust.

While it is undoubted all these works, properly carried out, will lengthen the life of and bring the highways into a much better condition for all traffic —particularly motor car traffic—there is a very restraining element to contend with—namely, the cost of attaining this ideal—as the average ratepayer has a strongly rooted objection to contributing to any increased cost for a traffic with which he has no sympathy.

So long as counties are responsible for the maintenance of the roads, and one county has a high assessable value and another a low assessable value, the improvement of the roads will not proceed in a uniform manner. So far, however, as circumstances permit, the desire for improvement of the highways is, the author thinks, general all over Scotland. Ever since the Road and Bridges Act, 1878, came into operation in this county, numerous improvements have been made in cutting hills and levelling up hollows to improve gradients, widening portions of highways, opening out curves, widening and rebuilding bridges, &c. This work all tends to the comfort of the users of the road, but a great improvement still remains to be carried out. This applies to all counties.

The largely increased cost necessary to maintain the main trunk roads in a state to suit the motor traffic of different kinds must at no distant date become acute, and the necessity of considering some means whereby a contribution for direct maintenance be made from those creating the increased cost appears only fair and reasonable. From what source this is to be obtained the author does not stop to inquire.

Every district in Scotland for the past few years has been experimenting with materials for laying the dust and increasing the life of the road treated, but in only a few counties has a bituminous binder been applied on an extensive scale, the cost in most other instances being the deterrent.

Although all this work is in an experimental stage at present, there is no doubt statistics will shortly be available to show that by the adoption of certain methods certain results will follow. Everything is being carried out to the advantage of the user of the road by self-propelled traffic; some provision is also being made for the humble individuals who have been compelled in a measure to forsake the highway, by the provision of footpaths for their use. Many new and improved footpaths are being laid in populous places, and these add to the comfort of the inhabitants.

Since the Imperial Road Board was created and grants given towards various works for the improvement of main trunk roads, such as draining, widening, strengthening of the crust, improving of the corners, &c., a good deal has been done in many counties. It was thought by many in Scotland these grants should be made by the Road Board to cover the entire cost of any of the above or other approved improvements, but the board have decided that the counties must contribute a proportion of the cost. Much can be said in favour of this method as stimulating a more active interest by counties in seeing the grants are judiciously employed in making real improvements; but, on the other hand, it forms a seriously increased expenditure if the improvements are extensive.

Around large cities and burghs with large populations the counties are strengthening and improving the surface of the road by the use of tar-macadam, tar-grouting, tar-spraying, and in various other ways. In villages and on other main roads in the country districts similar improvements are being carried out, all for the purpose of extending the life of the roads and the laying of the dust.

On account of the climatic conditions in Scotland, there should be experiments made all over the country and careful statistics prepared with the view of obtaining a better knowledge of the best materials to use under given conditions. These experiments, if carried out by the Road Board, would educate and encourage counties in dealing with the question of maintenance in an economical manner and bringing the road surfaces into good condition.

While giving all attention to the improvement of road surfaces, another form of traffic arises to destroy them viz., motor char-a-banc and commercial motor

traffic. These means of locomotion will, with the improved roads, increase in number, and the life of the maintenance of the highways be correspondingly shortened. Since the introduction of motor car traffic the life of the ordinary maintenance without special treatment of trunk roads has been reduced from a life of eight to ten years to a life of four to five years, and in some cases less. The rate of expenditure has increased in this county during the last ten years by fully 30 per cent, and the experience of other counties in Scotland is similar. If this special traffic increases in the same ratio as it has done in the past, county rates cannot maintain the roads in good condition without obtaining some relief from the burden thrown upon them of providing for a traffic they do not create. The traffic was until recent times comparatively local and circumscribed, but in these times it may be in the South of Scotland to-day and in the North of Scotland to-morrow. Formerly the traffic was slowly driven, now it is driven at a legalised speed of 20 miles an hour, and, be it observed, the speed is frequently very much greater. The same remarks apply to motor traction with the legalised speed of 5 miles per hour.

In one district in Ayrshire motor wagons with a load of 6 to 8 tons are a regular traffic. In damp or wet weather, or after frost, this traffic in a few days destroys the surface of the road, upon which a very heavy expenditure is annually made. This traffic is carried on in competition with railways. The latter have to purchase land and equip their own road under Acts of Parliament, whereas the traffic by motor wagons, although legalised on the highways, does not contribute to their maintenance, and the county is therefore contributing to the profits of the owners and bearing the cost of the highway maintenance. Contributions should come from this traffic towards the additional cost incurred by the use of the highway, and the same remark applies to all heavy self-propelled traffic.

Traction engines are not licensed in Scotland, and can move to any part in one county and from one county to another without a permit, and also on any highway, however unsuited to carry that traffic.

The author trusts some points may arise from these notes which may be the means of a little profitable discussion.

DISCUSSION OF MR. STEVENSON'S PAPER.

Mr. W. NISBET BLAIR (St. Pancras), in proposing a vote of thanks to Mr. Stevenson, remarked that there were a number of points in the paper which would appeal to the sympathy of them all, especially the reference to the influence of motor traffic and the cost of attaining the ideal road to accommodate it. The paper pointed to the fact that the increased cost of upkeep was due to motor traffic, which, though something was now paid through the petrol tax, some of them got nothing out of. London, for instance, had not received a cent from the Road Board fund. However, they were hoping that something might be put aside to go towards the cost of the enormous highways, east, west, north and south, which were to cost so many millions each. Gentlemen in the provinces did get some share of the petrol tax, but they had to charge their rates with more than would be the case if they did not receive it. Some argued that this was an unfair condition; on the other hand, some said it was a wise provision, as it showed that the authorities were spending the money, and, on the whole, it was perhaps not unreasonable.

Mr. W. HARPUR (Cardiff), seconding the vote of thanks, expressed sympathy with Mr. Stevenson in the matter of the objection of the ratepayers to paying for the increased cost of road maintenance due to the new methods of traffic. A good many people did not appreciate the difference in the cost of maintaining roads now and in former times. At the same time, there could be no question that motor traffic of one kind or another had come to stay. They had roads to keep in proper condition for that traffic, and it was a pity that local authorities were slow to see the necessity for that.

Mr. A. H. CAMPBELL (Edinburgh), in supporting the vote of thanks, said he had been rather hopeful of hearing some of the English county surveyors on this question of highways construction. In Scotland they regarded Mr. Stevenson as probably their leading exponent of county highway construction and maintenance. Some commiseration had been exercised for Ireland, but he had not yet heard the voice of sympathy for their position in poor old Scotland. Those who shouted the loudest usually got the most, and if they had in the "gasworks" a little further along the road as much patriotism as regarded Scotland as they had for Ireland, then he thought Scotland would get more than she did. Undoubtedly, the problem was as acute in Scotland as it was in Ireland, and perhaps more so, for this reason. Ireland was divided by the sea from the rest of the British Isles, and that kept motors out, whereas only a bridge divided Scotland from England. What was the condition of things in that connection? They had the Highland glens sparsely populated, and the Lowland valleys where nothing but sheep could find a living; yet these were the great highways of communication between North and South. There were many miles without a house, and so what rateable value had they for the support of main roads in such places? And what had the roads to carry—what local traffic was there? A farmer's cart once a day, occasionally a milk cart; occasionally a farmer's wagon with potatoes—nothing at all in proportion to the through traffic. Yet these were the very conditions which Mr. Stevenson so well knew were a handicap on the efficiency of the maintenance of the highways—indeed, no subject was of such essential importance to Scotland as that of the recognition of the national character of the great trunk highways. It was a pity that Sir George Gibb had left the meeting. They were wishful to give him an opportunity of hearing some faint echo of the complaints from Scotland, and they hoped to draw from him, not only a word of sympathy, but promises of cash in aid of Scotland's highways.

Mr. E. J. ELFORD (Southend-on-Sea), commenting on Mr. Campbell's complaint of Parliament's apparent neglect of Scotland, suggested that that must be Scotland's fault, having regard to the fact that we were ruled by Scotsmen. (Laughter.) Mr. Campbell had referred to the character of the traffic on Scotch roads; but he made no mention of the vehicles which carried the national beverage. To speak seriously, he sincerely sympathised with the Scottish surveyors in regard to the unrestricted use of traction engines. Motor traffic did not contribute a substantial sum to the roads of the country, and for the life of him he could not understand why petrol-driven vehicles should contribute and steam vehicles get off scot free, for they were a great source of expense, especially in the rural districts.

Mr. J. S. BRODIE (Blackpool) said, as one who spent his annual holiday in the Highlands, he could bear testimony to the excellent state of the roads considering the limited funds at the disposal of the surveyors.

The PRESIDENT (Mr. R. J. Thomas) said they in England could sympathise with Scottish surveyors because they had similar troubles to face. He had traversed some admirable roads in Scotland. With all deference he submitted that Scotland depended very largely on the alien tourist, and when he went away he left his contribution towards the upkeep of the Scottish roads. In this world it was always a case of give and take, and in the matter of motor traffic they must not forget that, after all, in a tourist country they must allow that in proportion as they had better roads and better accommodation the tourist traffic increased. Scottish surveyors did their work thoroughly well, and with credit to themselves and to the admiration of everyone.

The vote of thanks was passed, and Mr. STEVENSON, in replying, said he was old enough in experience to have had the management of roads under the old turnpike system, and could recollect how absolutely insufficient was the amount of money which was derived from the toll bars for the purpose of keeping the roads in decent repair. He knew what it was to be without the aid of a steam roller, but county councils and other authorities were now very much more willing to provide mechanical appliances for the proper administration and maintenance of the roads, and they had also largely taken advantage of the Road Board grant. The result had been a great improvement in the roads. It had been remarked that when the motorist went to Scotland he left a contribution behind, but that was not rated, and in the sparsely populated districts, which were often those most favoured by the tourist, the ratepayers got no advantage from the contribution. Inns and shooting lodges contributed, but not in sufficient proportion. He was very pleased to have the sympathy of the English surveyors; he could only say that in Scotland they were trying to do all they could for the money that was available.

(To be continued.)

SOME RECENT PUBLICATIONS.

British Rainfall, 1911. Price 10s. London: Edward Stanford.

The fifty-first annual volume published by the British Rainfall Organisation makes a peculiarly appropriate appearance at the present time. The purpose of the work is to present to all who are interested in the subject as full an account of the rainfall of the British Isles for the year in question as it is possible to produce with the data and funds available. The organisation is entirely of a voluntary character, and the thoroughness with which the large staff of observers perform their self-imposed task is shown by the fact that for 1911 some 5,300 rainfall returns were received, of which some were incomplete, and a few obviously erroneous; but no fewer than 5,000 gave satisfactory figures of monthly rainfall, and 3,253 were complete as regards daily rainfall also. The greater part of the annual volume before us is occupied by the discussion of these data rather than mere tabulation. The book begins with the report of the director to the trustees of the British Rainfall Organisation. Following this there are three special articles illustrated by diagrams and maps, the third of which deals with the arrangement of rainfall stations, and is of great interest. The area of every river basin in Scotland and Ireland has been measured, and the areas of the portions lying in each county are given, similar information in regard to England and Wales having appeared in last year's volume. Then follows a statement of evaporation observations at twelve stations, and in this connection it is interesting to observe that, as was to be anticipated, the evaporation in London was greater in 1911 than in any previous year since the observations began.

The second part of the work commences with observers' notes on the days and on the year 1911 dealing chiefly with rainfall in its relation to other meteorological conditions and to agriculture. Much space is then occupied with the discussion of heavy rains on individual days, and detailed maps are given showing the distribution of rain on eleven occasions; this includes the calculation of the total volume of water which fell upon the land of the British Isles on several occasions, and some relationships with the meteorological conditions are pointed out. It is evident that the statistics which have been collected and so ably digested and commented upon in this volume will be of the greatest possible interest and value to those municipal engineers who are concerned with water supply undertakings, and we confidently commend it to their notice.

Ventilation of School Buildings.—New schools at [illegible] are being equipped with Shorland's patent exhaust roof ventilators by Messrs. E. H. Shorland & Brother, Limited, of Failsworth, Manchester.

WORKMEN'S DWELLINGS AT THETFORD, NORFOLK.

Through the courtesy of the architect, Mr. Stanley J. Wearing, A.R.I.B.A., of 15 Upper King-street, Norwich, we are able to give an illustration of fifty cottages which the Thetford Town Council are about to erect in Bury-road, Thetford, under the powers conferred by the Housing of the Working Classes Act.

About 3 acres of land has been purchased and forms an excellent site, the cottages, some of which face the main road, and the remainder grouped round the new roads, being so arranged and planned that the living-rooms will obtain the sun at some time during the day. The walls are to be built of 9-in. brickwork, rough casted outside, and the roofs covered with pantiling. The accommodation in every case will be as follows: Entrance lobby, out of which the stairs lead, a living-room about 14 ft. by 12 ft., kitchen, store, larder, coals, closet, and three bedrooms 12 ft. by 11 ft., 11 ft. by 8 ft., 7 ft. by 8 ft. 6 in., and store on first floor. There will be no outbuildings with the exception of closets, thus leaving as much space as possible for gardens. A cooking range will be fitted in the living-room, and in the kitchen a sink, heater stove, and copper over, over which a patent hood will be fixed for conducting steam into a flue.

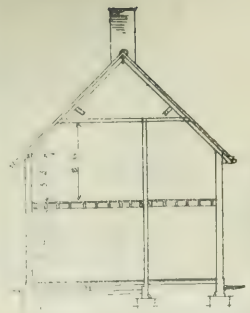
Each cottage will have an enclosed yard and garden at the rear, the fronts being formed with grass margins between the road and cottages.

Tenders for the work have been received from sixteen builders, and the lowest, that of Mr. E. Clarke, of Melton Mowbray, has been accepted. The cost per cottage works out at about £135, which includes the roads, sewers, drains and fences, paths, but not land, and after allowance for repayment of loans, insurance, repairs, empties, and so forth, in accordance with the Local Government Board's schedule, the scheme will be self-supporting at an average rental of 5s 8d per week.

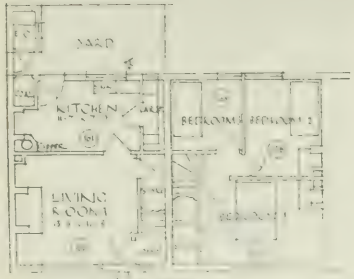
Correction of Advertisement.—By an error which arose in the preparation of the notice sent to us, the age limit of intending applicants for the position of architectural assistant in the office of the county surveyor of Herefordshire—advertised in our issues of the 16th and 23rd inst.—was stated as 30 years, whereas the limit actually decided upon was 40 years.

Asylums and Prisons in Rural Districts.—"R.D.C. Surveyor" writes: Will you kindly allow me to enquire through THE SURVEYOR the names of any rural districts in which there is a Government asylum or prison? Perhaps the surveyors of any such districts will be good enough to send their names to you for me, and I will be much obliged to all concerned. Upon receipt by me of any letters I will acknowledge them direct.

Front Elevation.



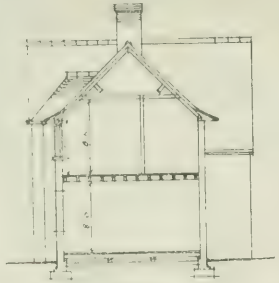
Section.



Ground Floor. First Floor.

TYPE "A."

Front.



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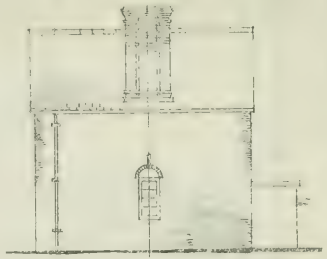
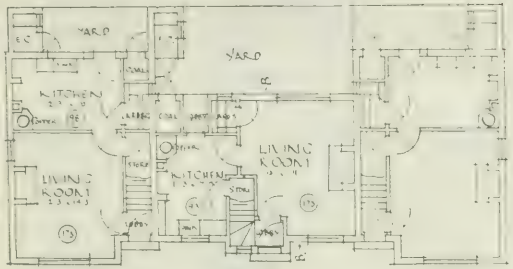
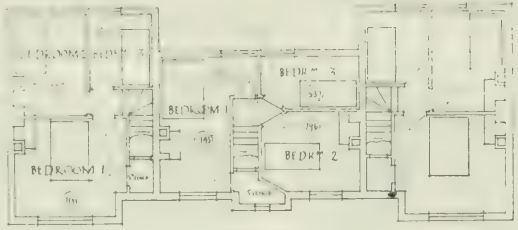


Side.

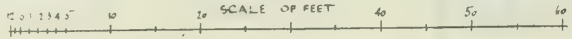


Ground Floor. TYPE "B." TYPE "C."

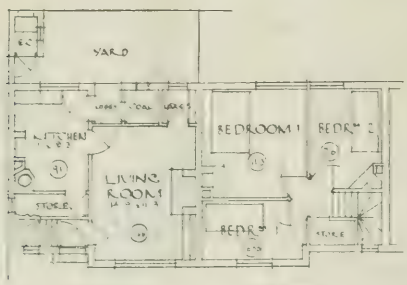


First Floor

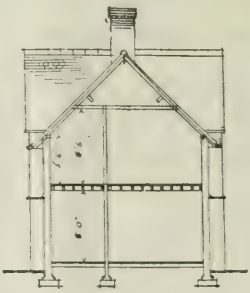
Front of Single Houses.



THETFORD PROPOSED WORKMEN'S DWELLINGS.



Ground Floor. First Floor



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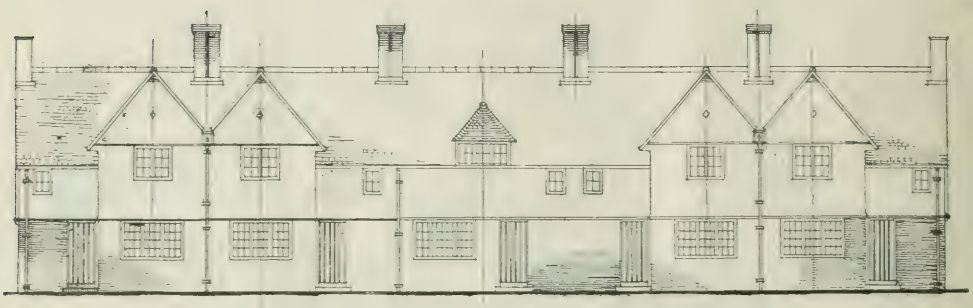
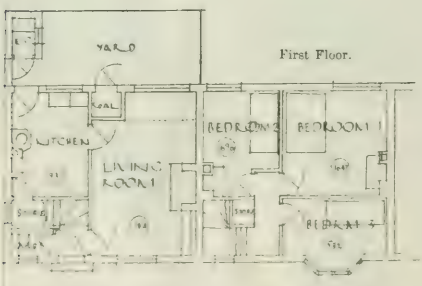
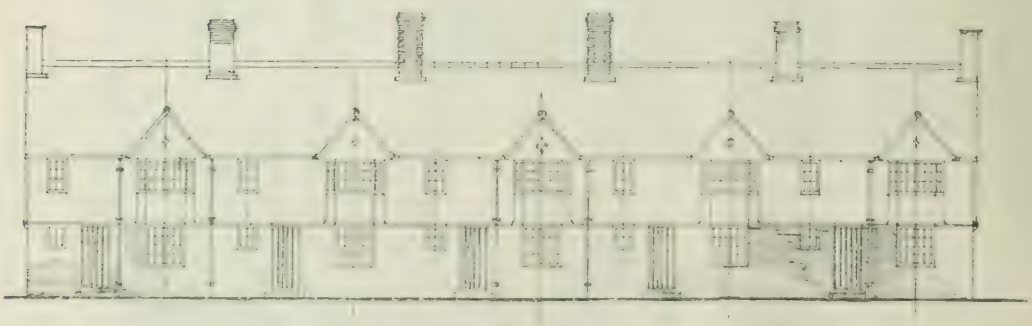


Front Elevation.

TYPE "D."



Section DD.



Front Elevation.

TYPE "E."

SCALE OF FEET

THIRTY-SIX PROPOSED WORKMEN'S DWELLINGS.

Royal Sanitary Institute Congress at York.

ENGINEERING AND ARCHITECTURE SECTION.

Among the papers considered at the first sitting of the Engineering and Architecture Section of the Royal Sanitary Institute Congress at York was the following:—

THE PHYSICS OF AIR IN RELATION TO VENTILATION.

By A. Saxon Snell, F.R.I.B.A.

The movements of air and its behaviour under varied conditions have been patiently observed and recorded by scientists. As the results of intricate and costly experiments they have discovered definite laws, and expressed them in algebraic and mathematical formulæ of fearsome length and complication. Others (calling themselves "practical" scientists) have invented systems based more or less upon those laws. In this way their work, too, is not without value; but too often they are handicapped by a curious blindness to the defects of their systems, which seems to affect those who attempt to encompass things which are in their nature elusive. Many of these systems have been evolved as the result of concentration upon one or more of the laws which govern the movement of the air. Under given conditions they may act well, and can be proved by tests to supply air better, or at any rate freer from impurities, than that which is so bountifully supplied by Nature. But conditions vary, and ordinary people with a passion for fresh air suggest that purity (according to tests) is not the only essential quality in air.

The movement of air is affected by so many conditions and circumstances that it is, perhaps, impossible to design a system of ventilation which will automatically adjust itself at all times and under all circumstances. The most we can do is to provide the means (and they should be as simple as possible) for adjustment to meet all conditions, and to leave those occupying the building to make reasonable use of these means. . . . The object of this short paper is to draw attention to certain simple laws which govern the movement of the air, and to suggest that the best ventilation is secured by making the fullest use of them. . . .

HEATING.

We cannot treat ventilation and heating apart; they must always be considered as two parts of one subject. Within limits it is so; but we must beware lest acceptance of the proposition without qualification leads, through misconception, to error. Heating should be used first and foremost as a corrective to the effects of ventilation on temperature, and on occasion as an aid or stimulant to movement of air. . . . Given any volume of air, a change in temperature in one part immediately produces movement. The colder part being the denser at once descends by the force of gravity, and in so doing pushes up the warmer and lighter air. This is called the "law of convection," and, Dr. Shaw points out, it is the dominant physical law of ventilation. He emphasises it by several illustrations, showing how much more powerful it is than any movement induced by mechanical means. Realisation of this law is absolutely essential for any proper understanding of the process of natural ventilation.

CHANGES IN TEMPERATURE.

Changes in temperature may be produced in a room by many causes. When the air is heated it expands, though not to any great extent; and in so doing in a closed space causes a state of "plenum." With an outlet available the extra volume is released and equilibrium restored. The air left behind is still lighter than the outer air, and if an opening is made in the wall between them, the latter will by force of gravity enter and displace the former. Thus we have two natural forces to assist us in the removal of heated air. I take no account of a third, the action of the wind, because the problem of ventilation should not depend upon so variable a force. Necessarily, with one opening only, both incoming and outgoing air will be considerably throttled and the interchange slow. With two openings, one at the top and one at the bottom, the lower one would act as an inlet, and the upper mainly as an outlet. There would then be comparatively little throttling, and we should obtain something approaching continuous movement of air in the room. But cold air at the floor level and warm air above would mean for the occupants of a room cold feet and hot heads. The reverse is to be preferred, but the law of convection forbids. We can, however, effect a fairly successful compromise by placing inlets between the top and the bottom of the room (in practice about 7 to 8 ft. above the floor line), sheltered with hoppers to give an initial upward current to the air. The momentum of the incoming air is sufficient to direct the stream towards the ceiling, until it is overcome by the force of gravity, when it falls gently through the warmer air. In its fall it is met by the rising warm air, through which it filters downward, absorbing in its passage a little of the heat of the rising current. It will gather more heat from the bodies of the occupants. Every such accession of heat, of course, retards the tendency to fall, and in time reverses the current. Indeed, as Dr. Shaw found by interesting experiments, the current is almost immediately reversed upon coming in contact with warm bodies. Nevertheless, the bulk of the air will, in the absence of heat, at or about the floor line, continue to fall. Arrived at the floor line it will spread laterally. Theoretically, there it should remain in the absence of any access of temperature sufficient to cause it to rise again. That is not desirable, but, on the other hand, it should not be allowed (or at any rate be forced) to ascend again, because in doing so it would have a tendency to carry with it fine particles of dust gathered at the floor level. Therein lies one of the virtues of the ordinary open fire, which induces a strong current of air at or about the floor level.

OPEN FIRES.

We all know and have suffered from that strong drag of air along the floor, so powerful is the action of an open fire, and to counteract this a separate supply of air is often brought in at the fireplace to feed the fire, a practice which appears to me to be of doubtful value. It must be remembered that these distressing floor draughts are not caused by the air which is drawn down from the ventilators, but come direct from the outside of the room under doors and at window openings. The remedy is to close up these direct inlets at the floor level and to open the ventilators or windows wider.

Notwithstanding the powerful drag of an open fire, a certain part of the air will rise when its temperature is raised by contact with warm objects in the room. In larger rooms, too, it is necessary to supplement an open fire with radiators round the walls, and there also warm the air and thus lift it from the floor level; but I doubt the advantage of placing ventilating openings behind them.

Now let us follow up that part of the air which is expelled from the lungs and given off from the bodies of the occupants heated and contaminated. . . . If it is not drawn off at a sufficient rate, part of it comes in contact with the comparatively cool surface of the outer walls or windows, and as a consequence loses so much heat that the current is reversed downwards and close to the walls. Dr. Shaw suggests that under these circumstances air outlets should be provided at the level of the window sills. With all respect to so undoubted an authority, I cannot help thinking that in practice the system would not work. Under conditions which obtain more often than not in this country, these outlets would become inlets. Perhaps the best method of counteracting this tendency is to have an arched ceiling with the highest part at or along the centre, with an aspirating flue or flues at the highest part. I have adopted this system with the best results in hospital sick wards.

OUTLETS.

I have a great reliance upon an effective extraction shaft, and by "effective" I mean one which can be relied upon to act as such at all times. Only too often the ordinary short flue or the ornamental cowl either fails to act without the assistance of the wind, or it is overpowered by a more powerful draught in some other direction. A most satisfactory extraction shaft can be obtained in connection with a good and continuously used smoke flue. Another method is to have cross-ventilation by opening windows in

opposite walls. With these we obtain perflation, or a current of air travelling right across the room at a height which will not inconvenience the occupants, and which is generally powerful enough to sweep away the rising contaminated air in its course. Such currents of air are not entirely dependent on wind (indeed, air should not be driven across the room from one side to the other by the force of wind). They are due, I think, rather to the fact that there is always a difference in temperature (greater or less according to circumstances and aspect) between one side of a building and the opposite. It may be that the sun has warmed the walls one side more than the other at a given time, or that there is, for local reasons, a quicker movement of the air on one side or the other; or, again, that a strong current, blowing towards the building, may cause a slight vacuum on the opposite side. But, whatever the cause, the perflation thus secured is a valuable ally in ventilation.

Throughout I have dealt with conditions which obtain in cold weather, but, of course, ventilation is equally necessary in summer or warm weather. It is, or should be, a much simpler matter, because it is not complicated by the need of heating. On the contrary, we want at such times to keep the air in our rooms as cool as possible. It might be interesting to discuss the effect of the physical laws we have already considered under these different conditions; but the limits of this paper forbid. I need only remind you that we have the greater opportunities of flushing out our rooms by means of widely opened windows; and I may add a hint received many years ago from an old lady—*viz.*: "Close the windows on the sunlit side of the house, open widely those on the shaded side, and keep the chimney flues clear."

Perhaps inevitably I have been led to discuss methods of ventilation instead of confining myself to the physical laws which govern them; but these methods, regarded as illustrations of the effect of laws, help to explain them. In conclusion, I suggest to you that there are natural forces governing the movement of air upon which we can draw to an unlimited extent, and without cost, and that problems of ventilation will best be solved by studying these forces and making all possible use of them. I am firmly convinced that all attempts to secure ventilation by worrying and driving the air in neglect of or in opposition of those forces must fail in the end; or, if they succeed, it is at the expense of quality in the air. That, at any rate, is the lesson I read between the lines of Dr. Shaw's interesting notes of experiments and his electrical analogies, and of the lucid pages lightened here and there with the dry humour of Dr. Billings's work on "Ventilation and Heating."

DISCUSSION OF MR. SAXON SNELL'S PAPER.

Dr. Evans (Swansea) said the paper dealt with causes and not with results. It was air starvation that the people were suffering from. In the private Bill which the Swansea Corporation brought before Parliament two years ago they had a clause requiring that every building used for public purposes should be properly ventilated. He got little help from the committee, however, because the Local Government Board advised that the clause should be cut out, and as a matter of fact he was not allowed to give evidence.

Mr. S. H. Davies (York) said he approached the question from the point of view of the chemist, and in York he had had the opportunity of making a large number of air tests in connection with schools and factories, and he did ask that architects should be generous with regard to their testing of air. Architects had to design rooms not simply from the point of view of ventilation, but there were other considerations which governed them, and he would like to ask Mr. Saxon Snell what he would do with deep rooms which could not be dealt with by window ventilation. If they trusted entirely to window ventilation in a big room, especially in a factory, they were bound to have a very extensive heating area. They knew that many schools had been designed which were ventilated by windows only. In the Staffordshire type, for instance, they got cross-ventilation, but there were many schools built in which they could not get that cross-ventilation. One means adopted for ventilating was to use the heated air shaft. He thought architects ought to come and see these things afterwards, and find out how they worked, and very often they would find the air flowing in the opposite direction. In the case of a York school he had suggested putting a reversible fan at the base of the chimney, thereby absolutely promoting a forced draught. There was also the Plenum system, and he had found in rooms he had tested that from the CO_2 point of view they did get an advantage from the mechanical system. But in the Plenum ventilated school if a window in a classroom were opened there was a direct loss of air in every other room; but by having flaps over the inlets and outlets in the room in which the window was opened they could get over that difficulty. He thought that architects should co-operate with chemists in this matter.

Mr. Saxon Snell, in reply, said he cordially agreed that the architect and doctor and chemist should co-operate in such a matter. The great trouble where there were so many complaints about defective ventilation was that only one had been consulted. The architect, who thought he knew all about such things, put them in without understanding the seriousness of the matter. He was afraid that in many cases the doctor, with little knowledge of construction, but with many fine ideas about ventilation, would make equal failures. His advice to younger members of his profession had always been that the person who was going to live in a house was the person who knew what he wanted, and in the same way if he were designing a school or a public building he would go to the people who had to administer it. The great thing was to understand what the actual requirements were. In all these technical questions of ventilation and light they wanted the co-operation of men who had studied them, and certainly with regard to ventilation the chemist's knowledge was very desirable. He was asked what he would do in the case of a factory building, and he had already said that abnormal buildings required abnormal treatment. He would include a badly designed building as abnormal. He was not saying that mechanical ventilation was not good, but his view was that they should not design buildings which required mechanical ventilation. In the Staffordshire schools the point was dealt with. In the old central hall type of schools they could not ventilate properly, and the Plenum system was tried with a good deal of success. But do what they would with mechanical ventilation, it could not be so good or so economical as natural ventilation.

(To be continued.)

THAMES NEW SUBWAY.

WOOLWICH TUNNEL NEARING COMPLETION.

The new foot passenger tunnel under the Thames at Woolwich, which has cost the London County Council £86,000, will be opened to the public in October.

The scheme was first discussed by the council ten years ago. The ferry service, which had cost the old Board of Works £200,000, was often suspended in the winter owing to fog, with the result that men living on one side of the river and working on the other lost time and wages. The fogs in the winter of 1908 so seriously affected the ferry service that on one occasion it was entirely suspended for 112 hours, and numbers of men were thrown out of work. In the following summer it was decided to go to Parliament for power to build a tunnel.

The work was begun by the contractors early in 1910, and is now almost ready for opening, the construction having taken a shorter time than was anticipated.

The tunnel is 11 ft. 9 in. in diameter, is 500 yds. long, and passes under the river at the point where the free ferry crosses. A hundred and twenty-nine steps lead down from the surface on the north side to the tunnel, and about 100 on the south. As the work of climbing the stairs would be arduous, the council have installed lifts, at a cost of £5,000.

At first it was proposed to build the tunnel 30 ft. below low water, so as to allow a free passage for big ships. The Port of London Authority tried to compel the county council to drop it another 10 ft., which would have cost an extra £10,000. The council, however, decided to increase the depth by 3 ft., leaving 33 ft. of the river to be dredged above the crown of the tunnel.

The opening of the tunnel will considerably lighten the work of the free ferry, which carries vehicular as well as passenger traffic.

The maintenance of the tunnel and lifts will cost the council about £2,500 a year, but there will be a considerable saving by the curtailment of the ferry service.

The Surveyor

And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
A Year's Work in Johannesburg	287, 301
Alleged Damage from Tarred Roads	307
Appointments Vacant	307
Assistants' and Students' Section	300
Bituminous Road Materials	299
Correspondence	299
Electrolytic Disinfectant	286
Indian Students	287
Institution of Municipal and County Engineers:—	
Annual General Meeting in London	289
Notices	307
Institution of Municipal Engineers	307
Intercepting Traps in House Drains: Departmental Committee's Report	306
Irish and Scottish Roads	287, 289, 292
Kent Main Roads	306
Local Government Board Inquiries	302
Meetings	312
Municipal Competitions Open	308
Municipal Contracts Open	308
Municipal Engineering in South Africa	287, 301
Municipal Tramways Association	307
Municipal Work in Progress and Projected	304
Personal	306
Physics of Air in Relation to Ventilation	297
Points from the Road Board's Report	285
Recent Publications	294
Resurfacing a Carriageway on the "Chadwick" System of Bituminous-bound Macadam	299
Royal Sanitary Institute Congress at York:—	
Engineering and Architecture Section	297
Sanitary Survey of the Ottawa River	286, 288
Some Notes on Road Maintenance in County Armagh	289
Scottish Roads	292
Tenders for Municipal Works or Supplies	310
Thames New Subway	298
Wiltshire Roads: Matters of Engineering	286
Workmen's Dwellings at Thetford	294

CORRESPONDENCE.

"*Be calm in arguing; for fierceness makes Error a fault and truth discourtesie.*"
GEO. HERBERT, "*The Temple*"

BITUMINOUS ROAD MATERIALS.

To the Editor of THE SURVEYOR.

SIR,—With regard to the particulars published in your last issue of the discussion of Mr. Brodie's paper, "Suggestions towards a Standard Specification for Bituminous-bound Carriageways," which was considered at the annual meeting of the Institution of Municipal and County Engineers, might we be permitted to say that we thoroughly agree "as to the loose way in which the word 'bitumen' is being used"? As, however, nearly all the natural bitumen deposits in the world are known, it is, of course, a simple matter to distinguish between the real article, *viz.*, natural bitumen—and those produced artificially from the distillation of oil. It is possible to recognise—partly by analysis—any of these natural bitumens, and even if the situation of the deposit is not disclosed it is not difficult to ascertain if any particular bitumen is natural or artificial.

We venture to suggest that a list of countries where native and natural bitumen and asphalt occur in commercial quantities should be published for the guidance of those who are not acquainted with them, and if the analysis together with other distinguishing characteristics are also given with each we feel sure that this would largely assist in putting a stop to the loose way in which both the words "bitumen" and "asphalt" are being used.

It may also be as well to bear in mind that the terms "bituminous" and "asphaltic" do not denote origin or necessarily mean that materials so classified contain any portion of either bitumen or asphalt.—Yours, &c.,

THE DUSSEK BITUMEN COMPANY.

Canal Bank,
Deptford,
London, S.E.

August 26, 1912.

Street Corner Mirror at Beckenham.—A mirror about 3 ft. high, which shows the approaching traffic, has been placed on a signpost erected at the junction of four roads at Beckenham, Kent.

RESURFACING A CARRIAGEWAY ON THE "CHADWICK" SYSTEM OF BITUMINOUS-BOUND MACADAM.

By C. T. CHADWICK,
Assistant Borough Surveyor, Maidenhead.

The following is a description of the method employed by the author in resurfacing over 5,000 sq. yds. of carriageway on main roads in a borough in the South of England.

It may be mentioned that 4,000 sq. yds. of this has been done on the main street to the station, with a minimum width of 17 ft. Nearly all the traffic from the goods and passenger stations passes over this road, including traction engines, motor and steam lorries, and so forth. There are at times as many as 1,000 horse and petrol driven vehicles per hour over one portion of the road.

The road to be recoated is first of all scarified to a depth of 5 in. or 6 in. below the finished contour of the road. In no case must any part of the old surface be left unscarified. The surface is then shaped to the required contour (to allow for a 3-in. finished coat of stone), all the larger stone being raked towards the centre of the road to fill up where necessary. Having shaped the surface, it is watered with the water cart to the extent of 1 gallon to 1 sq. yd. of surface.

Having obtained a rough surface, but on a solid foundation, the surface is to be coated with about 5 in. to 6 in. (unrolled) of 2-in. granite. The stone is then watered sufficiently to wash all dirt and dust off the stone, and rolled immediately. It is well consolidated, so that it is impossible to see a crease after the roller has passed over it. The stone must be watered again when rolled, so that the top stone is left quite clean.

The stone should be left to dry and become warm by the heat of the sun before the binder is applied. Should the weather not be favourable for drying the stone, one of the road-drying machines now on the market should be used for this purpose.

The stone when thoroughly dry is then grouted with Tarvia "A" (grout grade), by means of a tar-spraying machine (Llewellin & James' machine was used by the author with success) to the extent of about 1 gallon to 2½ sq. yds. The surface is then evenly covered with ¾-in. granite chippings (cubical as possible). Having rolled it all over once, the surface is brushed lightly over, filling up the interstices as much as possible. It is rolled over once more, and all loose chippings swept off into the channel. The surface is then sprayed over again with Tarvia "A" and "B," in equal proportions, to the extent of 1 gallon to 4 sq. yds. This is then covered with ¾-in. cubical granite chippings. The chippings are then swept evenly over the surface, and the whole rolled again about three times over.

It is as well to run the roller over the finished work once or twice the next day in the early morning.

If the road is recoated early in the year it is advisable in the summer to tar paint the surface to the extent of 1 gallon to 7 sq. yds., in order to render it absolutely waterproof. Instead of using the ¾-in. chippings after the second grouting, the author has found that fine asphalt spread thinly over the surface, well brushed into the interstices, rolled, and then sprinkled with ¼-in. chippings, will render the surface of the road absolutely waterproof. By doing this, it saves the painting of the surface of the road later in the year, which is necessary when using chippings after the second grouting.

The advantages of this method of recoating the road over the water-bound method are claimed by the author to be as follows: (1) Practically noiseless; (2) dustless, consequently a great saving in watering and scavenging; (3) waterproof. In addition, this road possesses the following advantages over the asphalt macadam or tar-macadam roads; (1) Good foothold for horses in any weather; (2) does not present as slippery a surface in winter; (3) the macadam being granite, the road will wear better than asphalt-macadam roads, in which the aggregate is either limestone or slag, as one can rely more upon the evenness of quality of granite as compared with either of those materials. Another advantage of this method is that as good a wearing and waterproof surface is obtained as by the "Gladwell" method, without the use of the tarviated chippings as a matrix for the bed of macadam, and therefore with a corresponding saving in this respect. The cost of the road recoated in Maidenhead worked out at aproximately 6d. per sq. yd. extra above the cost of water-bound macadam.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, assoc.m.inst.c.e.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

Mr. Wm. Duff, of Dudley, to whom the premium for July was awarded, has selected the following books:—

"Public Health Law," by Sydney G. Turner (St. Bride's Press).

"The Drainage of Town and Country Houses," by G. A. T. Middleton (B. T. Batsford).

"Structural Iron and Steel," by W. Noble Twelvetrees (Whittaker).

These have been duly forwarded to him.

QUESTIONS.

This week answers are invited to the following questions:—

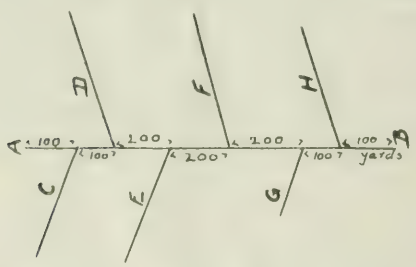
267. Road Making.—Will some reader kindly give the heads of a specification for the conversion of a macadamised into a wood paved road? ("Inquirer.")

269. Masonry Arch.—Draw the line of least resistance in a stone segmental arch of 10 ft. span with a rise of 2 ft. 6 in., the voussoirs having an equal thickness of 12 in. and each being equally loaded. (A.M.I.C.E.)

270. Traverse Surveying.—Shortly describe and explain the method of plotting a traverse survey by the method of co-ordinates. ("Surveyor.")

271. Bending Moments.—If a straight prismatic baulk of timber floats in a horizontal position with a weight of 4 cwt. hung to each end, what will be the bending moment at the centre of its length?

272. Surface-Water Drainage.—State, showing the method of working out, the sizes of pipes necessary to take the surface water from streets as per sketch.



Streets are 36 ft. wide, and tar paved; all the houses are drained on the combined system, so that no surface water from the forecourts, &c., need be reckoned. Rainfall ¼ in. per hour.

Street.	Length.	Fall.
A–B	1,000 yds.	1 in 40
C	200 ,,	1 in 20
D	300 ,,	1 in 10
E	200 ,,	1 in 20
F	500 ,,	1 in 30
G	100 ,,	1 in 15
H	150 ,,	1 in 50

(F. H. S., *Sheringham.*)

REPLIES TO QUESTIONS.

266. Surveying.—Describe in detail the operation of measuring a horizontal angle with a theodolite. ("Surveyor.")

It is assumed that the general construction of a theodolite is familiar, but a sketch of an instrument is given in Fig. 1 for the purpose of convenience of reference.

Let it be supposed that lines XY and XZ in Fig. 2 are part of a survey, and it is required to determine the magnitude of the angle θ formed by them.

If the survey is important, pegs should be driven in at the points X, Y and Z; these pegs should be of wood, with a nail in the centre for field work, or iron pins for good work. The theodolite is set up at point X, and ranging rods are held perfectly upright at Y and Z in turn, either on the nails or on the centres of the pins.

The instrument must now be "planted" over point X, so that the plumb bob A, suspended from the tripod, hangs directly over the nail in the peg or the centre of the iron pin, as the case may be. Having "planted" the instrument, and before levelling it up, clamp the upper or vernier plate D to the lower plate C, by means of the clamping screw G, with the arrow on the vernier exactly against zero of the "primary" scale on the lower plate. It is advisable at this stage to adjust the eye piece of the telescope so that the cross wires in the diaphragm are quite distinct, and so that there is no "parallax." The instrument is now levelled up by means of the levelling screws BBB and the spirit level K.

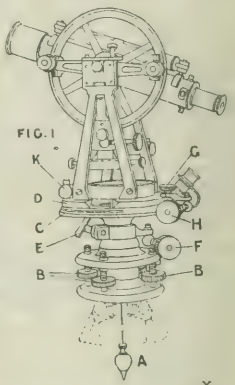


FIG. 1

Now focus the telescope upon the ranging rod at Y, which should be brought as nearly as possible into the centre of vision. Clamp the lower plate by tightening screw E, and by means of the tangent screw F adjust the line of sight so that the *bottom point* of the ranging rod corresponds exactly with the point of crossing of the wires of the diaphragm. Now release the upper plate by loosening screw G, and turn and focus the telescope upon the ranging rod, which has been removed to point Z. Clamp the upper plate to the lower plate, and adjust in the same way as was done before, so that the intersection of the cross wires exactly cuts the bottom point of the ranging rod at Z.

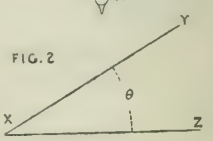


FIG. 2

The angle through which the instrument has been moved will be indicated on the primary scale by the arrow on the vernier. The number of degrees and subdivisions of degrees are now read off on the lower plate, and the number of minutes and subdivisions on the vernier, the total reading being the magnitude of the angle θ required. (I. W. S., *Clapham Junction.*)

The first step is to fix up the tripod and instrument exactly over the point at which the angle is made. This is usually done by hanging on a hook under the tripod head a cord with a plumb bob, and the tripod must be so arranged that this plumb bob hangs immediately over the station point.

The second step is to level the instrument; this is done in exactly the same way as with the level.

The third step is to clamp the horizontal vernier plate to its circle, so that the arrow mark on the vernier is exactly opposite the 360 deg. mark on the circle. Then turn the telescope, carrying with it the horizontal circle, which must be free on the spindle, so that the cross wires are exactly on a rod on one of the two lines at which the angle is made.

The fourth step is to clamp the horizontal circle to the spindle and release the vernier plate, and rotate the telescope (from left to right) until the cross wires are exactly on a point in the second line. (To get this fine adjustment the vernier plate should be gently clamped when nearly in position, and the cross wires brought on to the point by applying the slow motion.)

The fifth and last step is to read the angle. This latter is the arc described by the vernier arrow mark, which was at first 360 deg., in moving to the position which it has when the telescope is on the second line.

Note.—If the telescope has been turned from left to right, the figures on the horizontal circle opposite the arrow mark indicate the actual angle. If the telescope has been turned in the reverse direction this reading must be subtracted from 360 deg. —(W. D., *Dudley.*)

268. Text-books.—In what text-books can information be found in regard to (1) Theory of earth pressure suitable for reinforced concrete design; (2) Theory of elastic bridges; (3) Methods of taking float observations to ascertain the probable effect of tides on sewage discharged at different positions along shore? (R. W. T., *Gosport.*)

The theory of earth pressure suitable for reinforced concrete design is dealt with in "Handbuch für Eisen Bentonban," and in a paper by Mr. Meem in the "Proceedings" of the American Society of Civil Engineers, November, 1907. Vol. xxxiii.

The theory of elastic bridges is dealt with in "Design and Construction of Metallic Bridges," by Burr and Fack.

The method of taking float levels is described in "The Brighton Intercepting and Outfall Sewers," by J. G. Gamble ("Proceedings" of the Institution of Civil Engineers, vol. xliii.), and "Main Drainage of Torquay," by G. Chatterton ("Proceedings" of the Institution of Civil Engineers, vol. lxi.).

All these books and papers may be seen in the Patent Office library, Chancery-lane. (S. T., *Shepherd's Bush.*)

MUNICIPAL ENGINEERING IN SOUTH AFRICA.

JOHANNESBURG TOWN ENGINEER'S REPORT.

The municipal area of Johannesburg is, Mr. G. S. Burt Andrews, M.Inst.C.E., M.I.Mech.E., the town engineer, states in his report for the twelve months ended June 30, 1911, 20,530¼ acres in extent, there being altogether 106 townships, in which are 671¼ miles of streets and roads. The area controlled by the town council covers 81¼ square miles.

ROADS.

During the year nearly 17 miles of roads were constructed, being an increase of 4 miles on the previous year. Some 25½ miles of roadway were remetalled, 153,779 sq. yds. formed, and 620,990 yds. of roadway tarred.

Concrete kerbing and guttering in the central area of the town has been vigorously proceeded with, some 25,907 lin. yds. being laid. At the commencement of the year a scheme was submitted to the Works Committee for kerbing and guttering the streets in which underground storm-water drains have been laid outside the central area of the town. In this area there are nearly 36 miles of streets, in which approximately 9,600 yds. of kerbing and guttering are already laid. The approximate cost of the work was £100,500, which provided for the taking up and relaying the existing kerb and gutter. This scheme had unfortunately to be held over owing to the want of funds. The necessity for providing kerb and gutter in all streets where underground drains have been laid, in order to make the latter operative, has been pointed out on several occasions.

Mr. Andrews remarks that the continual increase in the building of more substantial business premises away from those thoroughfares in which the principal trade of the town was carried out in former years, in order to meet the demands of the ever-increasing population of this town, and the consequent increase in vehicular traffic, will sooner or later make it incumbent for the council to embark on a scheme for the creating of a more substantial class of roadway within the central area of the town, both from an economical point of view and for the comfort of the public. To be impressed with this fact, he says, one has only to take a cursory glance at the traffic (traction engines, motor cars, trollies, and so forth—on business days, closely examine the principal streets, especially at corners, and note the wear and tear the scrubbing action of the heavier class of fast motor cars being very perceptible on the class of material at present used by the department in the construction and maintenance of road work. Another item which Mr. Andrews considers the council will have to deal with in the near future is the absolute prohibition of heavy steam-traction traffic on the principal roadways. Strong attempts have been made to minimise this, but, unfortunately, with little good results. It is considered that this is a most undesirable means of locomotion within the principal area. The roadways are badly affected and when trailers are heavily loaded in wet weather, or when roads have been watered, incalculable harm is done to the streets, especially when chains are used under the wheels. There is also the nuisance caused by the smoke and noise, while not infrequently the coal boxes are opened, and the roadways strewn with ashes and coal.

SEWERAGE.

The most important drainage works carried out during the year was in the south-eastern urban drainage area. This was commenced during the latter portion of the previous year. The total area of the scheme is approximately 315 acres, of which about 187 acres have been sewered during the year under review. In addition to the mains, street connections were laid up to the stand boundaries of 790 private properties.

BUILDING OPERATIONS.

The acceleration in building operations which was reported in the previous year has been maintained, and there has been a steady increase in the number of buildings erected. Figures in the report show that the record of buildings is the highest since 1905, which can be regarded as the height of the boom in building. The most gratifying feature about this is the good class of dwelling which is being erected, a factor which tends to show that Johannesburg is becoming more and more the home of the people who have to work in it. There are fewer wood and iron buildings and more of those of substantial construction. From 1910-11 the value of new property approved was £1,438,895, the number of plans 3,297, and the number of buildings 7,422.

Although the building trade has been so vigorous for the past two years there is still no evidence to show that the town is being overbuilt. Many of the old and now dilapidated structures are being removed to make way for better buildings, and in addition the extension of the tramways to more distant suburbs has caused a considerable outward movement of population.

HOUSE DRAINAGE.

The council's scheme for assisting property owners to connect their premises with the sewers has been continued. A commission of 5 per cent is charged to the owners for executing the necessary work, and during the year a sum of £310 was earned in this way. The amount expended on contracts for the same period is £6,066. The total amount earned since the inauguration of the financial assistance scheme is £892. The total amount expended for same period is £15,442.

WATER SUPPLY.

During the year under review 848,445,600 gallons of water were purchased from the Rand Water Board; 706,957,600 gallons were supplied to customers connected with the council's mains. The quantity unaccounted for amounted to 141,921,945 gallons, or 16·68 per cent against 18·67 per cent in the previous year. From these figures it will be seen that the percentage of wastage has been appreciably reduced.

A comparative statement giving the monthly wastage for the past three years is submitted with the report, together with the progressive average for each year, and for the whole period from January, 1908, to date. This statement shows that there has been a gradual decrease in the progressive average from 20·26 per cent to 18·19 per cent for the whole period; but, if taken from the time waste-water meters were installed, say, from the end of the financial year ending June, 1910, it is seen that a marked improvement has been made. At the end of the period named the wastage was 18·70 per cent. During the first three months of the financial year ending June, 1911, the average dropped to 18·46 per cent, the next three months to 17·21 per cent, and the third three months, ending March last, to 16·01 per cent. Hitherto the allowance made for wastage has been 20 per cent, which has been reduced in the estimates for the current year to 18 per cent. A difference of 2 per cent on the present quantity paid for means 17,000,000 gallons per annum, which costs £531.

A thorough system of inspection at night has been carried out during the year in many of the districts where the meters registered a large overflow during the night. A good deal of preparation is required before any particular district can be tested, and when this has been completed the tests will be undertaken much more frequently. As an instance of the usefulness of these meters, it might be mentioned that a long length of 9-in. main was found to be leaking badly, which might not have been discovered for some time but for the waste-water meters.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Bath T.C. (August 15th. Mr. F. H. Tulloch).—£400 for the provision of a public sanitary convenience at the junction of Snow-hill with Myrtle-place, Walcot.—It was stated that many complaints had been made regarding the existing structure. The difficulty had been with regard to a site, but recently a suitable one had been purchased, and on this it was proposed to erect the new structure. The site was paid for out of the rates.

Birkenhead T.C. (August 21st. Mr. Edgar Dudley).—£990 for street improvements.—The money will be apportioned by the corporation as follows: For the purpose of a cottage in Well-lane and widening the thoroughfare, £159; for the purchase of a strip of land and works in Balls-road, £184; acquisition of a strip of land at the junction of Bedford-road and New Chester-road, £647. There was no opposition to the application.

Coventry T.C. (August 15th. Mr. R. G. Hetherington).—£67,000 for municipal buildings; £12,000 for surface-water drainage in Earlsdon and Chapel Fields districts; £1,477 for redemption of tithe and land tax on the sewage farm; and £280 for street improvements in Radford-road and Silver-street.—With respect to the loan for municipal buildings, the town clerk, Mr. G. Sutton, stated that the assessor, Mr. Guy Dawber, advised the council of the designs which he placed first, second and third. The figure of cost aimed at by the council was £50,000. The assessor was of opinion that a building according to the design placed first could be built for that sum, and that was one of the conditions upon which competition was invited. Owing to some extent to the alterations which had been made in the plan subsequently at the request of the council, and to the increase in the cost of labour and materials recently, the lowest tender was £60,375. Twenty-two tenders were received, and the tendering was in every way successful, because the figures were so close. They ranged from £60,000 to £63,000 or £64,000, with one or two exceptions. The council considered the lowest tender and the firm tendering (Messrs. Wilcox & Co., Wolverhampton) were satisfactory, and had provisionally entered into a contract, subject to the sanction to the loan being obtained. The surface-water drainage loan, the town clerk stated, was necessary for the prevention of floods. The other applications were more or less of a formal character.

Croydon R.D.C. (August 14th. Mr. W. O. E. Meade-King).—£4,443 for works of wood paving in High-street, Collier's Wood, and London-road, Mitcham.—The clerk, Mr. Gowen, gave particulars as to the proposed improvements. The works in London-road, Mitcham, were to cost £1,878, and those in High-street, Collier's Wood, £2,565. Both were main county roads, but the best terms which could be obtained from the county council were that the latter should pay two-thirds of the annual repayment of the principal and interest if the loan were sanctioned. Two lengths in both these roads had already been treated, the Local Government Board sanctioning the loan in 1911. The surveyor, Mr. R. Chart, said the council would like the loan as soon as possible, so that the work could be carried out before the winter months.

Doncaster R.D.C. (August 27th. Mr. A. G. Drury).—£12,225 for works of sewerage and sewage disposal at the new colliery village of Bentley.—Mr. Pye, clerk to the council, explained that the scheme, rendered necessary by the large building developments, was to provide main sewers and sewage disposal works for 198 houses already built, and for 764 houses proposed to be built, in the neighbourhood of the Old Toll Bar, where six estates are being laid out for new streets and buildings. The plans and particulars for the work had been designed by Messrs. D. Balfour & Co., civil engineers, Newcastle-on-Tyne. Mr. Balfour, who explained the scheme, said the proposed new works would be 385 yds. from the colliery houses, and 170 yds. from the Bentley Common-lane.

Kingstown U.D.C. (August 19th. Mr. P. C. Cowan).—£2,300 for the macadamising of certain roads.—Mr. Gerald Byrne, legal adviser to the council, stated that the loan was in respect of tar-macadamising the roads on the sea front from Longford-terrace, Marketown up to the People's Park, Sandycove. Kingstown was now a great resort for holiday-makers, and they had many complaints as to the dust nuisance. They had tried tar-spraying, but it had not been entirely successful. Mr. J. Berry, surveyor, gave evidence as to the proposed work.

Stockport T.C. (August 27th. Mr. Courtenay Clifton).—£3,371 for street improvements, and £800 for the provision of filtering, aërating and heating plant at the St. Petersgate Baths.—The town clerk, Mr. R. Hyde, stated that Dealstone-lane had become a main thoroughfare from Stockport to Marple, and it was proposed to widen portions of the road to an average width of 60 ft., the estimated cost being £1,796. It was also proposed to acquire land to widen Lower Hillgate, one of the oldest streets in the borough. The traffic down Hillgate was very heavy. It was also intended to widen Hardman-street from 25 ft. to 38 ft. The Road Board had not made any grants to the borough. The town clerk proceeded to explain that the water in the swimming baths was now changed twice a week in the summer and twice every three weeks in winter. By the new system of filtering there would be fresh water in the baths all the year round, and a considerable saving of water. The baths were used by 100,000 bathers in the course of the year.

APPLICATIONS FOR LOANS.

Brampton R.D.C.—£720 for a water supply at Talkin.

Darwen T.C.—£18,000 for a drainage scheme.

Easingwold R.D.C.—£8,657 for a water supply scheme.

Okehampton T.C.—£360, excess expenditure in connection with the new sewage scheme.

Rawtenstall T.C.—£8,700 for the provision of thirty-seven houses.

St. Helens (Isle of Wight) U.D.C.—£290 for tar-macadam surfacing.

Settle R.D.C.—£1,100 for a sewage disposal scheme for Airton.

Southend T.C.—£6,033 for making up certain streets.

Sunderland T.C.—£624 for school extension.

Ystradgynlais R.D.C.—£1,785 for the construction of two bridges.

LOANS SANCTIONED.

Bray U.D.C.—£10,000 for workmen's dwellings.

Brighouse T.C.—£5,000 for erecting public baths.

Camborne U.D.C.—£24,750 for the North Cliff sewage disposal scheme.

Okehampton T.C.—£800 for the purchase of land for a new town hall site.

Paignton U.D.C.—£397 for the purchase of land for a refuse tip.

Penrith T.C.—£2,000 for the purchase of the castle ruins and surrounding land.

Spilsby R.D.C.—£694 for sewage disposal works.

Thornaby T.C.—£4,300 for a municipal depot.

Wednesfield U.D.C.—£400 for rebuilding Pinfold Bridge.

FORTHCOMING INQUIRIES.

SEPTEMBER.

	£
3.—**Barnes.** For retaining wall and street works (Mr. A. G. Drury)	5,120
3.—**Cheltenham.** For paving purposes (Mr. R. G. Hetherington)	3,900
3.—**Guildford.** For street and surface-water drainage purposes (Mr. Courtenay Clifton)	1,200
3.—**Harrow-on-the-Hill.** For street works and additions to public offices (Major J. Stewart)	11,604
3.—**Hastings.** For works of paving (Mr. F. H. Tulloch)	2,181
3.—**Oswaldtwistle.** For the provision of recreation grounds and a bowling green (Mr. Edgar Dudley)	4,050
3.—**Soulby.** For the provision of a burial ground (Mr. R. H. Beckwith) ...	450
4.—**Brynmawr.** For the provision of public offices (Mr. M. K. North)	1,100
4.—**Epsom.** For sewage disposal purposes (Mr. A. G. Drury)	—
4.—**Sale.** For street and wharfage purposes (Mr. Edgar Dudley)	330

	£
4.—**Southampton.** For the purposes of the water undertaking (Major J. Stewart) ...	—
4.—**Spennymoor.** For the erection of public offices and market (Mr. R. H. Bicknell)	11,000
4.—**Stoke-on-Trent.** For the preparation of a town planning scheme (Mr. Thomas Adams)	—
4.—**Tiverton.** For water supply purposes (Mr. R. G. Hetherington)	—
5.—**Blyth.** For the provision of pleasure grounds (Mr. R. H. Bicknell)	900
5.—**Lees.** For street widening purposes (Mr. Edgar Dudley)	480
6.—**Luton.** For highway depot purposes (Mr. Edgar Dudley)	3,400
6.—**York.** For the provision of pleasure grounds (Mr. R. H. Bicknell)	3,030
7.—**Harrogate.** For pump-room and water supply purposes (Mr. R. H. Bicknell) ...	7,120
9.—**Ardsley.** For the extension of the cemetery (Mr. R. H. Bicknell)	450
9.—**Chelmsford.** For the provision of a gas engine, and sewerage and street works (Mr. M. K. North)	2,290
9.—**Todmorden.** For storm-water and street works (Mr. R. H. Bicknell)	9,546
9.—**Wood Green.** For the purchase of a site for a fire station (Mr. Edgar Dudley) ...	3,100
10.—**Bacup.** For works of paving (Mr. R. H. Bicknell)	17,148
11.—**Cheadle.** For sewer and street purposes (Mr. R. H. Bicknell)	2,268
11.—**Newport.** For the provision of a disinfecting station (Mr. Morgan J. Rees)	1,239
11.—**Yiewsley.** For the purchase of land for public offices (Mr. Edgar Dudley)	400
12.—**Chatham.** For the purchase of a site for a burial ground (Mr. M. K. North)	2,500
12.—**Luton.** For the preparation of a town planning scheme (Mr. Thomas Adams)	

Scottish Surveyor's Death.—Mr. John Stevenson, burgh surveyor of Johnstone, near Paisley, was killed early on Tuesday morning as the result of a fall from a London and North-Western express at Shilton, a few miles from Nuneaton. Mr. Stevenson and his wife were members of a party who had been spending their holiday in Germany. At midnight on Monday they left Euston on their return to Scotland. Near Shilton one of the ladies complained of a draught. Mr. Stevenson was closing the carriage window when the door flew open and he fell on the line. The wheels of the train passed over his legs.

"The Cate of Ireland."—This is the appropriate title given to the Kingstown Urban District Council's latest official publication, a booklet of 100 or more pages, which Messrs. Odhams, Limited, of Long-acre and Covent Garden, London, W.C., have printed for the local authority. The beauties of Kingstown are familiar to numberless travellers, but to the British holiday-maker its advantages as a health resort are, generally speaking, little known, and the admirably produced booklet we refer to, which has been compiled by Mr. John R. Eyre, and which has been placed on sale at the price of 3d., should do much to add to its popularity on this side of the water.

National Fire Brigades Union.—Ex-King Manoel of Portugal reviewed 600 firemen from all parts of the country at the Crystal Palace on Saturday in connection with the National Fire Brigades Union twenty-fifth annual camp which had been held there during the week. King Manoel presented the challenge shields, cups, bowls, and other prizes won during the week by the successful competitors. Among the winners of the principal trophies were the following brigades: Bampton, Bedford, Windsor, Southend, St. Albans, Sittingbourne, Leyton, Essex County Asylum, Harpenden, Torquay, Bournemouth, Metropolitan Water Board, Gillingham, and Peterborough. His Majesty afterwards witnessed a drive past of the horse and motor fire engines and other appliances, and christened a new Dennis-Gwyne turbine fire engine which has just been purchased by the Malvern Fire Brigade, and a duplicate of which is being specially made for Oporto.

KENT MAIN ROADS.

COUNTY SURVEYOR'S REPORT.

Mr. H. P. Maybury, M.INST.C.E., the county surveyor, in the course of his eighth report upon the maintenance and repair of the rural main roads of Kent, together with those main roads situate in non-retaining urban areas (Bexley, Chislehurst, Cheriton, Dover, Footscray, Whitstable and Wrotham), states that the actual cost of maintenance, tar-painting and improvement work carried on during the year ended March 31st last was £112,361, being £18,117 more than in the preceding year. Of this amount £36,205 was expended upon tar-painting, widenings, kerbing, channelling, paving and drainage works, representing £60·6 per mile. The cost of maintenance proper, therefore, was £127·6 per mile, being £14·8 per mile more than in the previous year.

The tar-painting bill alone came to £28,665, 1,146,634 gallons of tar having been used. The area treated was nearly 6,000,000 super. yds., the payment for tar alone representing £12,583. In addition, some 400 tons of pitch and bitumen were used, at a cost of about £900. In the urban retaining districts the county council actually paid to the several authorities £5,103 for tar-painting about 125 miles of road, representing 1,530,094 super. yds. Tar-painting, therefore, carried out in the county in the year under review represented no less a sum than £33,768.

The total quantity of material used upon the 596¾ miles of directly maintained roads was 131,667 tons or yards, being 14,641 tons or yards more than was required in the preceding year, and representing 220 tons or yards per mile of maintained road. This is the largest quantity which has been used upon the county roads in any one year. Of the total quantity, 47,849 tons was granite and 30,225 tons Kentish rag tarred-macadam, this latter being an increase of 17,696 tons over that used in the preceding year. The maximum number of men employed was 520, while the minimum was 400. The amount paid in wages was £29,232.

Notwithstanding the great increase in motor car and traction traffic during the year, the county surveyor is able to report that the roads have been maintained satisfactorily and are much stronger than they ever were before.

In order to meet the requirements of the Road Board a periodical census of traffic using the several main roads in the county has been taken. It is found in some instances that self-propelled vehicles represent no less than 75 per cent of the total recorded. "This great change still further necessitates the departure from old systems of construction and maintenance, and compels the extended use of natural and artificial bitumens and tars. As an object-lesson of wear, a water-bound surface, which formerly had at least a three years' life, is now completely destroyed in six months, as was exemplified upon one of the experimental lengths laid at Sidcup, which, completed in June of 1911, had to be reconstructed in January of the present year."

The whole of the urban roads, Mr. Maybury states, have been maintained in a satisfactory condition and at a cost comparable with that of preceding years.

As distinguished from works of maintenance, permanent improvements were carried out during the year at a total cost of £7,539.

Rats in a Town Hall.—The *Daily Telegraph* New York correspondent tells an amusing story of a certain municipal official who casually remarked a few days ago to a newspaper man that he wanted a good rat-trap with which to rid the town hall of its rodents. To-day, says the story, this official has a room filled with rat-traps of every description, sent from every part of the United States. The rat-traps, it is said, embrace every form of killing known to humanity. They kill by electricity, by guillotining, by drowning, by sneezing, and by suicide. The scheme of a genius, who declares that he can force the rats to take their own lives, is to sprinkle lye on the outside of the rat holes. The rats get the lye on their feet, and it will burn so much, he claims, that they will be glad to lick it off, and thereby poison themselves. Another trap, it is asserted by the inventor, catches the rat in a vice-like grip, and automatically flings the animal with terrific force against a wall 15 ft. away. The city official says he is sorry he mentioned rat-traps now, as he has so much embarrassment of choice that he cannot decide.

Municipal Work in Progress and Projected.

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The following are among the more important projected works of which particulars appear below: Buildings—Brighouse £5,000, Daventry £2,000; housing and town planning—Doncaster £29,000; roads and materials—Bognor £6,000, Llandudno, Stirling £15,000; sewerage and sewage disposal—Coventry £35,880, Goole £21,500, Halifax £24,000, Loughborough; water gas and electricity—Aberdeen £25,385, Easingwold £8,657, Newport (Mon.).—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

ADMINISTRATION.

Whitby U.D.C.—The council having inquired whether persons employed casually by the council in digging for sewers and hacking roads are required to be insured under Part 1 of the National Insurance Act, the Insurance Commissioners have decided that such persons are employed within the meaning of the Act, as, although their employment is casual, it is for the purposes of the business of the employing authority.

BUILDINGS.

Brighouse T.C. It was decided on Wednesday to commence at once the erection of public baths, sanction to the borrowing of £5,000 for which was lately received.

Cornwall C.C.—The new county council offices at Truro were formally opened last week.

Daventry U.D.C.—A proposal is being considered for the joint management of the isolation hospital with the town council. A sum of £2,000 is to be spent on new wards and offices.

Londonderry T.C.—It has been decided to purchase a site between Strand-road and the Quay for £3,740, for the purpose of a depot.

Newport (Mon.) T.C.—A sub-committee of the Parliamentary and Improvement Committee has been appointed to consider alternative schemes for an enlarged town hall—*viz.*, an extension on the present site or the acquisition of a new site upon which the whole of the municipal offices and law courts can be erected.

Retford T.C.—As a result of the serious outbreak of typhoid fever at Retford, it has become necessary to build a new isolation hospital for the town. The inspector who has visited Retford on behalf of the Local Government Board, issued a report on Saturday, in which he urges that the houses not already connected with the deep drainage should be connected with as little delay as possible, and that all contaminating sewers running into the becks should be abolished.

HOUSING AND TOWN PLANNING.

Chesterfield T.C. The draft of the Chester-street area town planning scheme has been submitted to the Local Government Board for their observations, and the borough surveyor, Mr. Vincent Smith, has meanwhile been authorised to proceed with the construction of the road from Chester-street to Ashgate-road, including the bridge over the Holme brook.

Doncaster T.C.—In connection with the rehousing scheme to which the corporation committed themselves in the Act of Parliament empowering them to construct the North Bridge-road over the old Marshgate level crossing, a contract for the building of 124 new houses has been let to Mr. A. Thompson, Town Moor-avenue. The work is to be completed in nine months. The contracts are as follows: For sixty houses of three different types at Balby, £12,530; for sixty-four houses in Carr House-road, Doncaster, £13,467. In each case the frontage on the main road is being reserved for a better class of property, and the value of the land to be built upon under the rehousing scheme is put down at 2s. 6d. per yard. This works out for the Balby section at £1,633, and for the Carr House-road section at £1,549, bringing the cost of the two sections for the rehousing of 124 families up to over £29,000.

Ellesmere Port U.D.C. The Local Government Board have expressed willingness to allow the council to prepare a town plan of an area, including the districts taken in at the last extension.

Newry No. 1 R.D.C.—It has been decided to advertise again for the building of twenty cottages, as only one tender had been received for one house in reply to advertisements already issued.

Steyning West R.D.C.—It has been decided to oppose the Shoreham Urban District Council's town planning scheme so far as it affects Lancing.

Wednesfield U.D.C.—A letter has been received from the Local Government Board calling attention to the unsatisfactory housing conditions at Wednesfield as disclosed by the report of the county medical officer of health, and asking what the council have been doing in the matter. Reports prepared by the medical officer of health and the surveyor, Mr. E. Rogers, are to be forwarded by the clerk to the Local Government Board.

Winchester R.D.C.—The plans of the housing scheme at Fair Oak have been approved.

PARKS AND OPEN SPACES.

Kirkley U.D.C. Portland Park, some 14 acres in extent, was formally opened to the public last week. The grounds have been leased to the council by the Duke of Portland for an annual rental of £5.

ROADS AND MATERIALS.

Aberdeen T.C.—The Streets and Roads Committee recommend the widening of Moberly-street at an estimated cost of £480.

Ayrshire C.C.—The estimated cost of the county roads for the ensuing year is £41,383, as compared with £38,768 last year.

Bognor U.D.C.—A scheme is under consideration for the widening of the Marine-drive and promenade, at an estimated cost of £6,000.

Bolton T.C.—A scheme for the improvement of Captains Clough-road, at an estimated cost of £2,716, is being considered.

Cosforth U.D.C.—Elmfield-road is to be improved, at an estimated cost of £2,230.

Heckmondwike U.D.C.—The tender of Mr. D. Brook, at £702, has been accepted for paving work in Bath-road.

Linlithgow T.C.—The burgh surveyor, at a recent meeting, submitted a report regarding the condition of the footpaths of the town, giving a list of some thirty properties where the pavements were defective and required relaying or improvement. It was agreed to call upon the proprietors to have the defects remedied.

Llandudno U.D.C.—A conference is to take place with the Conway Council as soon as possible with a view to considering the best means of improving the road communication between the towns of Llandudno and Conway. At the joint meeting two proposals will be considered—the widening of the existing road between Llanrhos and Tywyn, and the construction of a new direct road on the level, through Deganwy.

Northam U.D.C.—It has been agreed to contribute a fourth of the cost of making up certain roads at Westwood Ho! under the Private Streets Improvement Act. The roads in question provide the main access to the beach and front.

Petworth R.D.C.—Subject to its being placed in a proper state of repair, it has been decided to take over the road leading from Little Bognor to the main Fittleworth-road.

Stirling T.C.—A scheme has been adopted for the widening of St. Mary's-wynd, and the formation of a new street on the east side of the thoroughfare, at a cost, including the demolition of property, of £15,000.

Swanage U.D.C.—A letter has been received from the clerk of the county council, forwarding the report of the County Works Committee adopted by them to the effect that the Valley-road between Town's-end and Leeson, for a length of over 3 miles, should be taken over as a main road in exchange for an equal length of the higher road to be dismained, the road to be made of a uniform width of 18 ft. throughout and surfaced with granite, towards the cost of which

the county council were prepared to contribute £1,000.

Weobley (Hereford) R.D.C.—An additional grant of £200 has been made for road repairs.

SEWERAGE AND SEWAGE DISPOSAL.

Buckingham R.D.C.—The sanitary surveyor, Mr. L. Bell, has received instructions to prepare a sewage disposal scheme for Tingewick.

Coventry T.C.—The council have agreed to the recommendation from the Sewage Farm Committee that an extension scheme at the sewage farm should be carried out at a cost of £35,880. Mr. Bausor, chairman of the Sewage Farm Committee, explained that the scheme was one of bacterial treatment, which was a new departure for Coventry. The committee had experimented with bacteria beds for the past two years, and the results had been most satisfactory. The committee recognised that the further acquisition of land could not go on indefinitely. The bacteria beds would enable them to deal with 2,000,000 gallons of sewage a day, and would meet the needs of the city for some considerable time. It was proposed to spend £19,000 upon bacteria beds, and the remainder as became necessary.

East Ashford R.D.C.—The tender of Messrs. Hardy & Co., of Woking, at £2,347, has been accepted for the Oxenturn-lane drainage scheme.

Coole U.D.C.—Tenders have been accepted for the new sewerage scheme. The engineer's estimate was £22,500, but the two tenders accepted amounted to £1,000 less.

Halifax T.C.—The Highways Committee have accepted the tenders of Messrs. Stanton & Co., at £14,000, and Messrs. Bowers Bros., at £10,000, for pipes and excavation work for the Stoney-road sewerage scheme.

Loughborough R.D.C.—Steps are being taken for the provision of a scheme for the drainage and disposal of the sewage of Hathern.

Romford R.D.C.—The tender of Mr. B. H. Hale, at £197, has been accepted for works of surface-water drainage.

Ruthin R.D.C.—A letter has been received from the Denbighshire County Council intimating that it was the intention of the Public Health Committee of the county to proceed with the construction of a water supply to the village of Llanarmon and a sewerage scheme, and charge the expense to the district council, unless a satisfactory scheme was taken in hand and carried out without delay. The rural committee have in consequence appointed a special committee to visit the district and report.

Upton R.D.C.—The tender of Messrs. Law, of Kidderminster, at £4,088, has been accepted for carrying out a sewerage and sewage disposal scheme for Kempsey.

WATER, GAS, AND ELECTRICITY.

Aberdeen T.C.—The water reservoirs at Mannofield and Cattofield are to be covered at an estimated cost of £25,385.

Alnwick U.D.C.—An augmented supply of water for the town is to be obtained from Brizlee Springs, at a cost of £4,698.

Dudley T.C.—A committee that has been inquiring into the position of the electricity undertaking advises the council to sell the concern.

Easingwold R.D.C.—A new water supply scheme for the parishes of Coxwold, Crayke, Easingwold, Oulston, Stillington, Thornton Hill and Newburgh, is to be carried out at an estimated cost of £8,657.

Lossiemouth T.C.—It has been agreed to adopt electric lighting for the burgh, and Mr. J. Alexander Bell, of Aberdeen, has been appointed engineer and instructed to prepare plans and specifications.

Newport (Mon.) T.C.—Mr. Baldwin Latham has received instructions to prepare a scheme for a new reservoir at Pant-yr-eos.

Norton (Yorks) U.D.C.—Tenders have been accepted from the Malton Gas Company for supplying gas for pumping power at the town's waterworks, and for the lighting of the public streets, the first at £120 per annum for three years, and the second at £130 per annum for the same term.

Portland U.D.C.—Experiments which are being carried out in the Portesham Valley, where the council are about to construct waterworks, at a cost of several thousand pounds, have proved eminently satisfactory thus far. The machinery and pumps that have been installed at Portesham are only temporary, and they are not capable of dealing with the amount of water available in the borehole. The permanent plans will deal with 600,000 gallons a day.

MISCELLANEOUS.

Aberavon T.C.—A recommendation has been made by a committee for the purchase of a Morris fire engine.

Bradford T.C.—The Health Committee have decided to discontinue the use of horse-drawn disinfecting vans, and have arranged to purchase from the Tramways Committee two motor vans, and to provide new bodies for them, the corporation also buying a motor parcels van.

Stockport T.C.—The corporation have adopted the "Lloyd-Köhler" system of railless traction, which is in service at Bremen, Ludwigsberg, and elsewhere on the Continent, but is not otherwise installed in this country.

Wednesfield U.D.C.—The tender of Messrs. Marshall, Sons & Co., Limited, at £608, has been accepted for the supply of a traction engine with convertible parts to make a 9½-ton roller and wagon.

Ilkeston's New Sewage Disposal Works.—The mayor (Councillor Samuel Shaw) will on Wednesday, the 11th prox., at 3.30 p.m., perform the opening ceremony in connection with the new sewage disposal works which have been constructed at Ilkeston.

York Corporation and the Gasworks.—At a special meeting of the proprietors of the York Gas Company on Monday it was resolved to approve of the provisional agreement for the sale of the undertaking to the York Corporation, as embodied in the company's new Act of Parliament.

FOR OTHER ADVERTISEMENTS

See End of Paper.

CORPORATION OF MADRAS, INDIA.

CONTRACT M & M No. 16.

PIPES, SPECIAL CASTINGS, SLUICE VALVES, AIR VALVES, &c.

The Corporation of Madras invite Tenders for about 9,500 tons of Cast-iron Pipes and Special Castings, together with Valves and other Works required in connection with the Water Supply Distribution system prepared by J. W. Madeley, Esq., M.A., M.INST.C.E., M.AM.SOC.C.E., &c., Special Engineer to the Corporation. All the works to be delivered in good order and condition to the Corporation Stores or other appointed places within the Municipal limits of the City of Madras in India.

Contract Forms, with Drawings bound with them, can be obtained from the undersigned upon payment of £10, which will be refunded upon receipt of a *bonâ-fide* Tender, accompanied by all the documents.

JAS. MANSERGH & SONS,
Agents to the Corporation.

5 Victoria-street,
Westminster, S.W.
August 28, 1912.

SURVEYING ASSISTANT.—Wanted, in a Borough Surveyor's Office in the Manchester District, a Surveying Assistant, well experienced in private street work, quick and accurate, and good draughtsman; commencing salary Two Guineas per week.—Applications, stating age, particulars of training and experience, and accompanied by copies of not more than three recent testimonials, to be delivered to Box 1,182, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C., on or before Saturday, the 31st August.

ASSISTANT (22), three years Articles and Assistant in large Rural District, desires appointment as Assistant to Municipal Engineer; surveyor, leveller, neat draughtsman; sewage disposal, water supply, private streets, buildings, roads, good municipal experience, &c.; highest references.—"Desideratum," office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

PERSONAL.

Mr. J. Retallack, one of the road surveyors of the Truro Rural District Council, has resigned.

Mr. J. Cornall, surveyor to the Rishton Urban District Council, has had his salary increased by £20 a year.

Mr. H. J. Morgan, surveyor to the Loughborough Rural District Council, is, we regret to state, suffering from congestion of the lungs.

Mr. A. J. Blight and Mr. Carbis, surveyors to the St. Austell Rural District Council, have had their salaries increased by £20 a year.

Mr. F. C. Betts, surveyor to the Rothwell Urban Council, has resigned his post, having obtained an appointment under the Wantage Urban District Council.

Mr. Norman Smith, assistant surveyor to the Ilkley Urban District Council, has resigned his appointment with the intention of proceeding to one of the universities.

Mr. Robert Morham, who was for thirty-five years superintendent of works to the Corporation of Edinburgh, and who passed away recently, left property of the value of £10,769. Mr. Morham was seventy-three years of age.

Messrs. W. Hosken, assistant surveyor to the Hendon Rural District Council, and H. Criswell, assistant surveyor to the Chertsey Rural District Council, have been appointed district surveyors under Mr. H. W. Bowen, Assoc.M.Inst.C.E., county surveyor of West Sussex.

Louth County Council met recently for the purpose of making arrangements for the appointment of a county surveyor in succession to the late Mr. P. J. Lynam. A letter was read from the Local Government Board stating that the candidates would be required to submit to an examination by the Civil Service Commissioners. It was agreed to offer a salary of £275 per annum, and that pending the making of a permanent appointment the work of the county surveyor should be discharged by the assistant surveyors. A vote of sympathy was passed with the relatives of the late Mr. Lynam.

Mr. M. P. Blair, the city engineer of St. Boniface, Manitoba, is a native of Ireland, and was born in 1882. He left the Emerald Isle at the age of seven, and was educated at the Chicago public and high schools and elsewhere. His first professional experience was obtained with the Chicago, Milwaukee and St. Paul Railway, and after holding various other positions he was finally made assistant city engineer and then chief engineer of St. Boniface, and has held the latter office for the last four or five years. He is an associate member of the Canadian and American Societies of Civil Engineers, and a member of the American Waterworks Association, the National Geographical Society, and the Canadian Cement Association.

Mr. Harold Collins, deputy city engineer, of Norwich, was in charge of the engineer's department in the absence on holiday of his father, the city engineer, when the terrible floods overtook the city this week, and with the town clerk (Mr. A. H. Miller) and the works superintendent, was engaged throughout the crisis, almost without intermission, in every possible effort for the protection of life and property. One of the first steps taken when the waters appeared to be spreading was for the removal of the corporation staff, and to hold horses and carts ready for any emergency. The special correspondent of the *Daily News and Leader* freely acknowledged the services rendered by the municipal staff by stating that "those who were left in authority rose to the occasion splendidly and with great effect."

Mr. E. P. Richards, city engineer of Madras, has been appointed to the important position of chief engineer to the Calcutta Improvement Trust. There were over 400 candidates for the post, and selections were made in India and England. The salary during the first six years will be £1,600, after which it will be increased annually by £80 until £2,000 is reached, when fresh terms will be negotiated. In addition, an allowance of £80 a year will be made towards motor car upkeep, plus very generous provident fund and leave rules. The appointment has been confirmed by Lord Carmichael, Governor of Bengal. Mr. Richards has been city engineer of Madras for one year only, but in that time has produced a complete reorganisation scheme which has been approved by the corporation, and will shortly receive the sanction of the Government of Madras. He has in hand a new town hall, large isolation hospitals, new bridges, large improvement schemes, and road widenings and extensive housing schemes. Aided in a very able manner by his assistant engineer, Mr. J. E. Hensman, B.E., Assoc.M.Inst.C.E., and Mr. Srinivisa Chari, B.E., B.A., he has revolutionised the making of the Madras roads, of which there are 400 miles, and many miles of good macadam have been laid and considerable tar-spraying work undertaken by him, there being some 300 motor cars and 600 motor cycles in the city. He will commence his duties in Calcutta about the middle of next month. Some £6,000,000 has been earmarked for expenditure by the Trust, and the work projected is expected to last not less than fifteen years. Mr. Richards when in England was engaged for nearly seven years on the Derwent Valley waterworks, with Mr. Edward Sandeman, M.Inst.C.E., and has also served under Mr. A. Fidler, M.Inst.C.E., borough engineer of Northampton, Mr. S. S. Platt, M.Inst.C.E., borough engineer of Rochdale, and other well-known engineers, besides having acted as superintendent to Messrs. George Bell & Sons, Limited. He is a Fellow of the Geological Society, a member of the Institution of Civil Engineers, the Institution of Municipal and County Engineers, the Institution of Municipal Engineers, and of the Royal Sanitary Institute, and an associate member of the Institution of Water Engineers.

INTERCEPTING TRAPS IN HOUSE DRAINS.

DEPARTMENTAL COMMITTEE'S REPORT.

The report of the Departmental Committee appointed by the President of the Local Government Board to inquire and report as to the use of intercepting traps in house drains was issued on Wednesday. The committee, which consisted of Mr. L. W. D. Mair, Mr. A. A. G. Malet, M.Inst.C.E., and Mr. H. J. Pearson, A.R.I.B.A., with Mr. E. H. Terry as secretary, visited several towns in prosecution of their inquiry.

The committee find that the necessity of the intercepting trap on bacteriological or epidemiological grounds has not been established. It appears, in fact, that the characteristic of sewer air which is of practical importance is its smell, and that, therefore, the question as to the necessity or otherwise is narrowed down to the issue whether, in any given case, sewer air would be more perceptible to the sense of smell with or without the trap. Nevertheless, the question is one of serious public health importance. Where, however, the trap is considered to be necessary or desirable, the measures for providing against the effects of the blocking of the trap should not be neglected—namely, the closure of the open channels in the inspection chamber, giving access to the trap, and the construction with iron pipes of the main portion of the house drain, unless this is remote from the house. It is also desirable that the possibility of splashing should be taken into account in the construction of drains in order that it may be reduced to a minimum.

Sanatoria Exhibition.—An exhibition of appliances, fittings, materials and products relating to sanatoria, tuberculosis dispensaries, and the treatment of tuberculosis generally, was opened on Monday last at the offices of the Society of Medical Officers of Health, Upper Montague-street, London. The exhibition is based entirely on the recommendations of the Departmental Committee on Tuberculosis. One of the features of the collection is a revolving shelter, designed by a Norwich firm. The doors and windows of this structure are removable, and it may be turned round to enable the patient to get all the light possible and as a protection from adverse winds. Other shelters shown are adaptable for the treatment of a consumptive in his own garden at home. All these are built with a view to giving the maximum amount of air, even if protection from bad weather is necessary. Probably, however, the most interesting exhibit is a model of the Zurich system of house-to-house dust and refuse collection. Where the system is in vogue, and this embraces many towns in Switzerland, France, Germany Austria, and other European countries, the householder has to provide himself with a specially contrived dustbin, which is capable of having its contents put into a sanitary cart without the possibility of the refuse being sorted by the dustman in charge of the cart.

ALLEGED DAMAGE FROM TARRED ROADS.

COUNSEL'S OPINION TO THE AMERSHAM RURAL COUNCIL.

Counsel's opinion has been submitted to the Amersham Rural District Council from Mr. W. A. Casson with respect to a claim of Messrs. Beckley & Holliman, watercress growers, The Moor, Chesham, this firm having claimed in respect to alleged damage to their watercress beds through the draining of water from tarred roads. In the course of his statement Mr. Casson wrote:—

"The point in this case is quite a new one so far as the courts are concerned, for there has never been any litigation on the subject in the High Court. The practice of tar-spraying roads is quite a recent one, but it is now a well-established one, and the question arises whether a local authority can be held liable for any damage resulting from the particular kind of material used. It is quite clear that a local authority cannot be held liable for any results that follow the drainage of the surface water from a road by reason of its entering any watercourse if such surface water carries with it any material—*i.e.*, of a poisonous nature—which may have been dropped on the road by a private person. But the case is different where the local authority themselves place tar or any other deleterious substance on the road, as if they do so they must take all reasonable and proper precautions to prevent its causing injury to any stream of water. The owners of a stream may be bound to take the surface water from the roads, but the easement to which they are subject cannot be increased so as to compel them to take dirty water instead of clean water. It has been held in 'Cawkwell *v.* Russell' (1856) that where a man has a right to send clean water on another's land he may be prevented from sending any water at all as soon as he begins to send dirty water. Thus it is evident that the local authority can acquire no right to send tar-polluted water where they have previously sent ordinary surface water into a stream. In the case before me the Amersham Rural District Council clearly injured the watercress beds of Messrs. Beckley & Holliman, and I doubt if they would have a good defence on the merits to an action for damages resulting from this injury, and I am therefore of opinion that the council should compromise the claim on the best terms possible. I am not informed whether a writ has been issued against the council within the time limit fixed by the Public Authorities Protection Act, 1893, but in view of the case 'Hague *v.* Doncaster Rural District Council' (100 L.T. 121; 7 L.G.R. 129), in which it was held in somewhat similar circumstances that there was a continuous injury or damage, and that the time limit did not therefore apply, an action is still maintainable. I think that the council will be well within their legal rights in compromising the claim, and that any payment made in pursuance of an agreement to compromise would be a legal payment, and would not be liable to be surcharged."

It was agreed that the council should settle Messrs. Beckley & Holliman's claim.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. Thomas, M.Inst.C.E., County Surveyor, Buckinghamshire.

EXAMINATION.

The October, 1912, examination will be held in Birmingham on the 10th, 11th and 12th of that month.

FORTHCOMING DISTRICT MEETINGS.

Eastern District meeting at Grays, September 21st or 28th.

East Midland District meeting at Ilkeston, September 28th.

Eastern District meeting at Gerrard's Cross, April 26th, 1913.

A meeting which had been arranged for September 13th and 14th at Wrexham has been postponed.

Thomas Cole,
Secretary.

11 Victoria-street, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

ANNUAL MEETING.

The annual meeting will be held in London in October.

B. Wyand,
Secretary.

39 Victoria-street, S.W.

MUNICIPAL TRAMWAYS ASSOCIATION.

ANNUAL CONFERENCE, WEST HAM: PRELIMINARY NOTICE.

The annual conference of the Municipal Tramways Association (Incorporated) will be held in West Ham on September 25th, 26th and 27th next. De Keyser's Hotel, Victoria Embankment, E.C., has been selected as headquarters for delegates, and the following programme has been arranged:—

September 25th.

10.15 a.m.—Reception by the Mayor and West Ham Council.

10.30 a.m.—Presidential address by Mr. H. E. Blain, tramways manager, West Ham.
Paper: "Tramways Administration by Municipalities: A Retrospect and a Forecast," by Mr. Councillor S. C. T. Neumann, deputy-chairman Bradford Tramways Committee.

1 p.m.—Luncheon.

2 p.m.—Proceed to Tramways Depot, Greengate-street, Plaistow, by special cars.

2.15 p.m.—Discussion on the interim report of the Corrugation Committee.

3.30 p.m.—Inspection of depot and of the Exhibition of Tramway Appliances, &c.

7.30 p.m.—Corporation reception at the town hall.

September 26th.

10 a.m.—Paper: "Tramway Fares and their Basis," by Mr. W. J. McCombe, tramways manager, Hull.

12.15 p.m.—Luncheon.

1.15 p.m.—Proceed by special cars to tramway depot.

1.30 p.m.—Meeting of managers' section.

1.30 to 3 p.m.—Inspection of depot and Exhibition of Tramway Appliances.

3 to 5 p.m.—Cricket party at West Ham Park.

7 for 7.30 p.m.—Association dinner at the Liverpool-street Hotel, E.C.

September 27th.

9.45 a.m.—Annual business meeting at De Keyser's Hotel.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* **The Surveyor** *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

ASSISTANT WATERWORKS ENGINEER.—August 31st.—Corporation of Madras. £26 13s. 4d. per mensem, and allowance for motor bicycle.—Messrs. James Mansergh & Sons, agents, 5 Victoria-street, Westminster, London, S.W. Envelopes to be superscribed "Waterworks Assistant."

INSPECTOR OF NUISANCES.—August 31st.—Corporation of Wells. £60 per annum.—Mr. E. P. Foster, town clerk.

SANITARY INSPECTOR.—August 31st.—Corporation of Stockport. 35s. per week.—Chairman, Health Committee. Letters to be endorsed "Sanitary Inspector."

SURVEYOR AND INSPECTOR.—August 31st.—Barton-on-Humber Urban District Council. £90 to £100.—Mr. G. H. Nowell, clerk. Envelopes to be endorsed "Inspector and Surveyor."

SURVEYOR'S ASSISTANT.—August 31st.—Leatherhead Urban District Council. 12s. per week.—Mr. Sidney R. Drake, surveyor. Applications to be endorsed "Assistant."

JUNIOR ASSISTANT.—August 31st.—Corporation of Bolton. £70 per annum.—Mr. Samuel Parker, town clerk.

ASSISTANT ENGINEER.—August 31st.—Darjeeling Municipality, India. 150 rupees monthly.—The Chairman.

SURVEYOR.—September 2nd.—Holme Cultram Urban District Council.—Mr. J. H. Gibson, clerk, Wigton. Applications to be endorsed "Surveyor."

ARCHITECTURAL ASSISTANT.—September 2nd.—Hereford County Council. £150 a year.—Mr. G. H. Jack, county surveyor.

ASSISTANT BOROUGH SURVEYOR.—September 4th.—Douglas Town Council. £100 per annum.—Mr. Alexander Robertson, town clerk.

DRAUGHTSMAN.—September 5th.—For the Gas Committee of the Salford Corporation. £150 per annum. Chairman of the Gas Committee.

CLERK OF WORKS.—September 5th.—Corporation of Abergavenny. £3 3s. per week.—Mr. W. H. Hopwood, town clerk.

BUILDING INSPECTOR.—September 7th.—Corporation of Burnley. £2 5s. per week.—Mr. P. Thomas, town clerk.

ROAD SURVEYOR.—September 7th.—Argyll County Council. £90 per annum.—Mr. D. Maclean, Estate Office, Strontian, Argyll.

SURVEYOR AND INSPECTOR OF NUISANCES.—September 9th.—Haverhill Urban District Council. £131 per annum.—Mr. Thomas Bates, clerk. Applications to be endorsed "Application for Surveyor."

CLERK OF WORKS.—September 9th.—Corporation of Coventry. £4 4s. per week.—Mr. G. Sutton, town clerk.

SURVEYOR.—September 9th.—Rothwell Urban District Council.—£105 per annum.—Mr. A. Tyldesley, clerk. Applications to be endorsed "Surveyor, &c."

JUNIOR ASSISTANT.—September 10th.—Borough of Batley. £80 per annum.—Mr. Oscar J. Kirby, borough engineer. Applications to be endorsed "Assistant."

CLERK OF WORKS.—September 10th.—Tavistock Rural District Council.—Mr. A. Kenneth Johnstone, clerk.

CHIEF ENGINEER AND COUNTY SURVEYOR.—October 7th.—London County Council. £2,000.—Sir Laurence Gomme, clerk.

MUNICIPAL COMPETITIONS OPEN.

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GOOLE.—September 1st.—Competitive designs and estimates for municipal offices, for the urban district council. Two premiums (£30 and £15).—Mr. R. Tyson, clerk.

CHORLEY.—September 9th.—Designs for a school, for the corporation.—Mr. J. Mills, town clerk.

RANGOON.—September 28th—February 1st.—The [illegible] from January 1st to February 1st, 1913. The latest [illegible]

LLANELLY.—September 30th.—Competitive designs and estimates for school buildings for over 1,000 children, also domestic subjects centre, for the Education Committee.—Mr. G. E. Halliday, F.S.A., F.R.I.B.A., Castle-street, Cardiff, will act as assessor and award premium.—Mr. I. W. Watkins, clerk, Education Offices, Coleshill-terrace, Llanelly.

WANDSWORTH.—October 14th.—Competitive designs [illegible] Mr. P. Dodd, borough engineer, 215 Balham High-road, S.W.

GLASGOW.—October 29th.—Preliminary sketch designs are invited by the corporation for the extension of the municipal buildings. Honorariums of 100 guineas to five selected designs.—Mr. John J. Burnet, A.R.S.A., 239 St. Vincent-street, Glasgow, is assessor.—Applications to the clerk, Mr. J. Lindsay, town clerk.

HUDDERSFIELD.—[illegible] Designs for [illegible] the competition. Premiums of 100, 50 and 25 guineas.—Mr. J. Henry Field, town clerk.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

Buildings.

HYDE.—August 31st.—For building public hall and police courts, for the corporation.—Mr. J. Diggle, borough surveyor.

MINEHEAD.—September 1st.—For building a convenience and cloak-room, for the urban district council.—Mr. L. C. Webber-Incledon, clerk.

MIDLOTHIAN.—September 2nd.—For works at new police station, for the county council.—Mr. A. G. G. Asher, county clerk, County Rooms, Edinburgh.

ABERDEEN.—September 2nd.—For the extension of the fish market, for the corporation.—Mr. W. Dyack, burgh surveyor.

MALDENS AND COOMBE.—September 2nd.—For the extension of the mortuary, for the urban district council.—Mr. R. H. Jeffes, clerk.

COTTINGHAM.—September 2nd.—For the erection of a parish hall, for the urban district council.—Mr. J. S. Moss-Blundell, clerk.

BARNET.—September 3rd.—For building twenty-two cottages, for the urban district council.—Mr. H. W. Poole, clerk.

MERTHYR.—September 3rd.—For the erection of girls' school and domestic subjects block, for the Education Committee.—Mr. E. Stephens, clerk.

JARROW.—September 3rd.—For the erection of a public convenience, for the corporation.—Mr. J. S. Weir, borough engineer.

ARLECDON AND FRIZINGTON.—September 3rd.—For the erection of cart sheds and store-room, for the urban district council.—Mr. J. R. Thompson, clerk.

CARMARTHEN.—September 3rd.—For extensions to a school, for the Education Committee.—Mr. W. Vincent Morgan, county architect, County Education Offices, Carmarthen.

BELFAST.—September 4th.—For the erection of offices, for the Water Commissioners.—Mr. R. Hamilton, secretary, Water Office, Belfast.

KENT.—September 4th—21st.—For the erection of a school, for the Education Committee.—Mr. W. H. Robinson, architect, Caxton House, Westminster.

LEEK.—September 5th.—For the erection of a public convenience, for the urban district council.—Mr. W. E. Beacham, surveyor.

PORTLAND.—September 5th.—For the erection of pumping station and cottage, and fixing borehole pumps, for the urban district council.—Mr. R. S. Henshaw, waterworks engineer.

TOTNES.—September 5th.—For the construction of a culvert, for the rural district council.—Mr. H. Vickery, highway surveyor, South Brent.

WEST RIDING.—September 5th.—For the construction of a bridge, for the Highways Committee.—Mr. F. G. Carpenter, county surveyor.

LYMINGTON.—September 6th.—For the erection of new municipal offices, for the corporation.—Mr. J. Davis Rawlins, town clerk.

WEST RIDING.—September 6th.—For the erection of two new schools, for the Education Committee.—Mr. Francis Alvey Darwin, clerk, County Hall, Wakefield.

MUIR OF ORD.—September 6th.—For the erection [illegible] for the Urray School Board.—Mr. T. Munro, architect, 62 Academy-street, Inverness.

DERBYSHIRE.—September 7th.—For the erection of a school, for the Education Committee.—Mr. G. H. Widdows, architect, County Education Office, St. Mary's-gate, Derby.

ERPINGHAM.—September 7th.—For the erection of three pairs of cottages, for the rural district council.—Mr. J. T. Willis, deputy-clerk, Cromer-road, Sheringham.

LEIGH-ON-SEA.—September 9th.—For the erection [illegible] works, for the urban district council.—Mr. J. W. Laversedge, engineer and surveyor.

LEITH.—September 9th.—For the erection of a school, for the School Board.—Mr. G. Craig, architect, 85 Duke-street, Leith.

LUTON.—September 9th.—For the erection of public baths, for the corporation. Mr. J. W. Tomlinson, town engineer.

LANCASHIRE.—September 11th.—For the erection of a temporary school, for the Education Committee. —Mr. H. Littler, 16 Ribblesdale-place, Preston.

HACKNEY.—September 12th.—For extension to electricity works, for the borough council. Mr. W. A. Williams, town clerk.

PHILLACK.—September 12th.—For laying down 9 miles of water mains and fittings, the construction of two covered concrete reservoirs, and supplying and fixing machinery, for the urban district council.—Mr. W. G. Kempthorne, clerk.

TOWCESTER.—September 14th.—For the erection of seventeen houses, for the rural district council.—Mr. W. K. Higham, clerk.

GRIMSBY.—September 17th.—For the erection of a council school, for the Education Committee.—Mr. Douglas Chandler, clerk.

BLACKBURN.—September 23rd.—For the erection of public halls, for the corporation.—Mr. L. Beard, town clerk.

Iron and Steel.

LEICESTER.—August 31st.—For the supply and erection of steel roof trusses, lattice girders and columns for the extension of the main car depot, for the corporation.—Mr. E. George Mawbey, borough engineer.

EDINBURGH.—August 31st.—For the supply of 1,670 yds. of 6-in. cast-iron pipes and special castings, for the Water Trustees.—Mr. William Boyd, clerk, 12 St. Giles-street, Edinburgh.

NORWICH.—September 2nd.—For the erection of iron palisading, for the corporation.—Mr. A. E. Collins, city engineer.

Roads.

DORKING.—August 31st.—For surfacing with slag tar-macadam, for the urban district council.—Mr. W. A. Clegg, borough surveyor.

BLAYDON-ON-TYNE.—August 31st.—For making up a road, for the urban district council.—Mr. H. Dalton, clerk.

CASABLANCA.—August 31st.—For the construction of public roads, for the Moroccan Adjudications Commission.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

LITTLEHAMPTON.—August 31st.—For the supply of Guernsey or other granite, for the urban district council.—Mr. H. Howard, surveyor.

SAFFRON WALDEN.—August 31st.—For the supply of granite macadam, for the corporation.—Mr. A. H. Forbes, borough surveyor.

SUTHERLAND.—August 31st.—For reconstruction and improvement of county roads, for the county council.—Mr. A. Argo, county clerk, Golspie.

LOUGHTON.—August 31st.—For the supply of granite, gravel and hire of steam roller, for the urban district council.—Mr. H. White, surveyor.

SANDWICH.—September 2nd.—For the supply of granite, granite chippings and channelling, for the corporation.—Town Clerk.

BOLTON-UPON-DEARNE.—September 2nd.—For street-making work, for the urban district council.—Mr. J. L. Hawksworth, clerk.

SUNBURY-ON-THAMES.—September 2nd.—For steam rolling and scarifying, for the urban district council.—Mr. H. F. Coales, surveyor.

CAERPHILLY.—September 2nd.—For the supply of 1,000 tons of 2-in. granite, for the urban district council.—Mr. O. H. Harpur, clerk.

BROMLEY.—September 2nd.—For the hire of a steam roller, for the rural district council.—Mr. Edward Haslehurst, clerk.

SALFORD.—September 2nd.—For paving, flagging, sewering and Limmer rock asphalt works, for the corporation.—Borough Engineer.

BROMLEY.—September 2nd.—For the supply of road materials, carting and team labour, for the rural district council.—Mr. Edward Haslehurst, clerk.

MIDDLETON.—September 3rd.—For making up a road, for the corporation.—Mr. W. Welburn, borough surveyor.

SOUTHAMPTON.—September 3rd.—For private street works, for the corporation.—Borough Engineer.

DINAS POWIS.—September 3rd.—For private street works, for the rural district council.—Mr. J. Holden, surveyor, 20 Park-place, Cardiff.

LEITH.—September 3rd.—For laying tar-macadam and Portland cement paving, for the corporation.—Mr. T. B. Laing, town clerk.

HOVE.—September 4th.—For paving and other works, for the corporation.—Mr. H. Indacott, town clerk.

HAMPSHIRE.—September 4th.—For the formation of a footpath and surface drainage, for the county council.—Mr. W. J. Taylor, county surveyor.—The Castle, Winchester.

GLAMORGAN.—September 4th.—For work of widening and improving, for the county council.—County Surveyor, County Hall, Cardiff.

EASINGTON.—September 4th.—For the paving of certain back streets, for the rural district council.—Mr. J. M. Longden, clerk.

SKIPTON.—September 4th.—For the construction of a roadway, for the urban district council.—Mr. Prichard Wilson, clerk.

WESTMORLAND.—September 5th—7th.—For work of road diversion, for the county council.—Mr. J. Bintley, county surveyor, 7 Lowther-street, Kendal.

TOTNES.—September 5th.—For work of road widening, for the rural district council.—Mr. H. Vickery, highway surveyor, South Brent.

SOUTHEND-ON-SEA.—September 6th.—For road and formation works in connection with the construction of a boulevard 1¾ miles in length and 100 ft. wide, for the corporation.—Mr. H. J. Worwood, town clerk.

WORSBOROUGH.—September 7th.—For the widening and reconstruction of a road, for the urban district council.—Mr. J. Whitaker, surveyor.

HANWELL.—September 7th.—For wood paving a portion of Boston-road, for the urban district council. —Mr. Percy Scott, clerk.

BEDLINGTON.—September 9th.—For making up a certain street, for the urban district council.—Mr C. D. Forster, 24 Grainger-street West, Newcastle-on-Tyne.

ITCHEN.—September 9th.—For work in ten roads, for the urban district council.—Mr. T. A. Collingwood, surveyor.

HENDON.—September 9th.—For making up certain roads, for the urban district council.—Mr. S. S. Grimley, engineer, Council Offices.

RABAT (Tangier).—September 10th.—For the construction of two roads, for the Special Committee of Public Works.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

BEDFORD.—September 10th.—For the supply of broken granite, ironstone slag and ironstone tar-macadam, for the corporation.—Mr. C. Stimson, town clerk.

CARSHALTON.—September 11th.—For the supply of 300 yds. of 2-in. and 1,100 yds. of 1½-in. granite, either Cleehill, Quenast, Penmaenmawr or Guernsey, and the hire of steam roller, for the urban district council.—Mr. C. P. Lovelock, clerk.

HESTON.—September 12th.—For relaying wood paving at Hounslow, for the urban district council.—Mr. J. G. Carey, engineer and surveyor, Council House, Hounslow.

PEMBROKESHIRE.—September 12th.—For the construction of a road, for the county council.—Mr. R. A. Wheatley, clerk, Shire Hall, Haverfordwest.

ALVASTON.—September 14th.—For the supply of slag rejections and granite, for the urban district council.—Mr. W. J. Holbrook, clerk, Full-street, Derby.

ALVASTON.—September 14th.—For the supply of slag rejections and granite, for the urban district council.—Mr. W. J. Holbrook, clerk, Full-street, Derby.

ACTON.—September 17th.—For making up two roads and resurfacing several carriageways with tar-macadam, for the urban district council. Mr. W. Hodson, clerk.

EUXTON.—September 23rd.—For making-up work with tar-macadam and ordinary macadam, for the rural district council.—Mr. H. Swetenham, surveyor, 49 Northgate-street, Chester.

Sanitary.

CHELTENHAM.—August 31st.—For the construction of nine combined circular sewage tanks in three sets, and eight percolating filters 101 ft. in diameter, with roads, drains, and conduits, for the corporation. —Mr. J. S. Pickering, borough engineer.

BENTLEY-WITH-ARKSEY.—August 31st.—For carrying out a scheme of main sewerage and sewage disposal works, for the urban district council.—Mr. Geo. Pye, clerk, 17 Priory-place, Doncaster.

ST. AUSTELL.—August 31st.—For the construction of septic tank and percolating filter, for the rural district council.—Mr. John Stephens, clerk.

CHESTERTON.—August 31st—September 14th.—For the construction of a sewer, with manholes, for the rural district council.—The Surveyor, Brunswick House, Cambridge.

ST. COLUMB MAJOR.—August 31st.—For constructing sewers and underdrains, and laying out irrigation ground, for the rural district council.—Mr. Chas. E. Whitford, clerk.

WIRRAL.—August 31st.—For the construction of sewer and manholes, for the rural district council.—Mr. W. Webb Shennan, surveyor.

RHONDDA.—September 2nd.—For scavenging the district, for the urban district council.—The Surveyor.

ASPATRIA.—September 2nd.—For the construction of works of sewerage, for the urban district council.—Mr. F. Richardson, clerk.

BRADFORD.—September 3rd.—For the erection of twenty-eight sludge filter presses at Esholt, for the corporation.—Mr. Frederick Stevens, town clerk.

FAREHAM.—September 3rd.—For scavenging work, for the rural district council.—Mr. A. Laker, clerk.

CLAREMORRIS.—September 4th.—For cleansing a sewer, for the rural district council.—Mr. A. Forde, acting clerk, Claremorris, Ireland.

WALMER.—September 4th.—For the construction of concrete tube and stoneware sewers and surface-water drains, for the urban district council.—Mr. F. W. Hardman, clerk.

LANCHESTER.—September 4th.—For the construction of sewage disposal works, for the rural district council.—Mr. G. W. Westgarth, surveyor.

MILTON.—September 9th.—For extension of sewers, for the rural district council.—Mr. E. Cecil Harris, clerk, 76 High-street, Sittingbourne.

BRADFORD.—September 9th.—For the construction of circular outfall sewer, with observatories and object pillars, for the corporation.—Mr. F. Stevens, town clerk.

TREDEGAR.—September 9th.—For the construction of subsidiary sewers, comprising about 23¼ miles of 6-in., 9-in., 12-in., and 18-in. pipe sewers, with 800 manholes, for the urban district council.—Mr. H. J. C. Shepard, clerk.

HEMEL HEMSTEAD.—September 9th.—For scavenging work, for the rural district council.—Mr. L. Smeatham, clerk.

DARTON.—September 9th.—For scavenging work, for the urban district council.—Mr. J. Gibson, clerk, 3 Regent-street South, Barnsley.

MOTTRAM-IN-LONGDENDALE (Cheshire).—September 9th.—For cleansing ashpits, for the urban district council.—Mr. F. Thompson, clerk, Stalybridge.

BLAYDON-ON-TYNE.—September 10th.—For work of scavenging, for the urban district council.—Mr. H. Dalton, clerk.

WOODALL SPA.—September 11th.—For the construction of a sewer, for the urban district council.—Mr. J. S. Chatterton, clerk.

BEDFORD.—September 14th.—For the construction of delivery tanks, inlet channels, detritus tanks, precipitation and storm-water tanks, the laying of about 1,600yds. of cast-iron pipes, and water mains, for the corporation.—Mr. Chas. Stimson, town clerk.

DARTFORD.—September 16th.—For emptying cesspools and closets, and removing house refuse, for the rural district council.—The Clerk.

EUCKORN.—September 18th.—For removing night-soil.—Mr. G. F. Ashton, clerk.

ANDOVER.—September 21st.—For the construction of screen chamber, engine house, suction tank, 9-in. rising main, circular bacteria beds, and erection of cottage, for the corporation.—Mr. T. E. Longman, town clerk.

LEWES.—September 24th.—For the construction of main intercepting sewers and sewage disposal works, comprising screen chambers, buildings, settlement and storm tanks, tidal storage tanks, sludge drying beds, and low-level pumping station, for the corporation.—Mr. Montague S. Blaker, town clerk.

CAIRO.—September 30th.—For sanitary installations, for the Office of Public Works.—Administrative Service, Public Works Ministry, Cairo.

BRADFORD.—October 9th.—For the construction of circular outfall sewer in tunnel, and two shafts, for the corporation.—Mr. Frederick Stevens, town clerk.

Stores.

ENNISKILLEN.—September 2nd.—For the supply of kerb, flags, channel stones, Portland cement, bass brooms, picks, shovels and stoneware pipes, for the urban district council.—Mr. A. W. G. Ritchie, town clerk.

GOSPORT AND ALVERSTOKE.—September 12th. —For the supply of artificial paving stone, broken stone, brooms, castings, cement and lime, disinfectants, forage, fuel, gravel and sand, harness repairs, kerb, channel, setts and stoneware drain pipes, for the urban district council.—Mr. E. Talbot Palmer, clerk.

BRADFORD.—September 12th.—For the supply of requisites, for the gas department.—Mr. F. Stevens, town clerk.

Miscellaneous.

HASTINGS.—September 14th.—For the supply of horses and carts, for the rural district council.—Mr. A. R. Inskipp, clerk, 11 Wellington-square, Hastings.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ALNWICK. For carrying out water supply works, for the urban district council:—
H. M. Murray & Co., Glasgow, £4,698.

ANNFIELD PLAIN.—For private street works, for the urban district council.—Mr. T. J. Trowsdale, surveyor:

R. Southren, Dipton, S.O.	£172
J. G. Bell, Annfield Plain	164
Lee & Dunn, Annfield Plain	152
Johnson & Strong, Stanley, S.O.*	147

BOSTON.—For building the new town bridge, for the town council:—
Goddard, Massey & Warner, Limited, Nottingham, £5,612.
Temporary footbridge.—W. S. Thompson, Boston.

BYFLEET AND PYRFORD.—For laying 3¼ miles of stoneware pipes, concrete tubes, concrete manholes, catchpits and stoneware gullies, and incidental works, for the rural district council.—The Surveyor:—

A. T. Bullen, Guildford	£5,605
May & Son, Ashtead	5,508
Osman & Co., Southampton	4,717
Wood & Sons, Swanley, Kent	4,158
Ripley, Strong & Co., Farnborough, Hants	3,927
Hardy & Co., Woking	3,650

CLEETHORPES.—Accepted for making up of Bark-street, for the urban district council.—C. H. Wauthman, surveyor:—
Wilkinson & Houghton, Limited, Cleethorpes, £304.

MATLOCK.—For works of sewerage and sewage disposal, for the urban district council.—Messrs. J. Diggle & Son, engineers:—
Sewerage.—P. Dix & Co., Westminster.
Sewage disposal.—J. W. Wildgoose, Matlock.

MERTHYR.—For scavenging work, for the corporation:—
Dowlais district.—C. Davies & Son, £4,550.
Penydarren district.—W. Thomas, £1,197.
Town district, including Park Ward and Georgetown.—R. Harris, £4,660.
Pentrebach, Abercanaid, and Troedyrhiw district.—R. Harris, £990.
Merthyr Vale and Aberfan district.—R. Harris, £690.
Treharris and Edwardsville district.—D. Hughes, £1,110.

RAMSBOTTON.—For works of sewerage and sewage disposal, for the urban district council.—Messrs. J. Diggle & Son, engineers:—
W. Cunliffe & Sons, Limited, Birmingham.

RIPLEY.—For the supply of pipes connecting the council's reservoirs with the Derwent Valley main, for the urban district council:—
Butterley Company.

ROMFORD.—Accepted for the construction of surface-water drains and sewers, for the rural district council.—Mr. W. J. Grant, surveyor:—
S.W. Drain, Brentwood road, Hornchurch.—B. Hale, Romford, £297.
S.W. Drain, Beeconsfield terrace, Chadwell Heath.—B. Hale, Romford, £27.
Sewer, Willow road, Chadwell Heath.—B. Hale, Romford, £55.

SUNBURY.—The following tenders have been accepted by the urban district council:—
Guernsey Granite.—Rowe & Mitchell.
Flints.—Cramer & Co.
Tar-macadam.—Oaks & Co.
Oil.—Trigg.

TYNEMOUTH.—For carrying out scavenging work, for the town council:—
H. Gray, £2,016.

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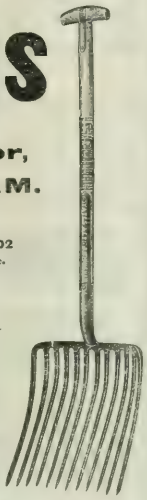

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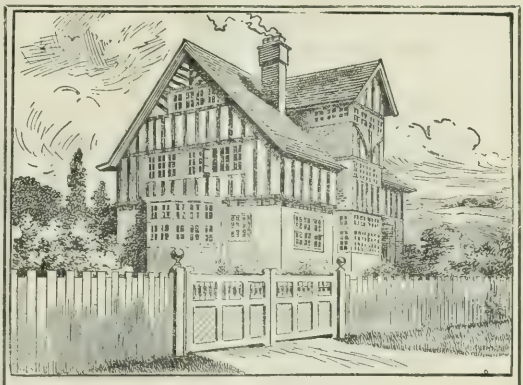

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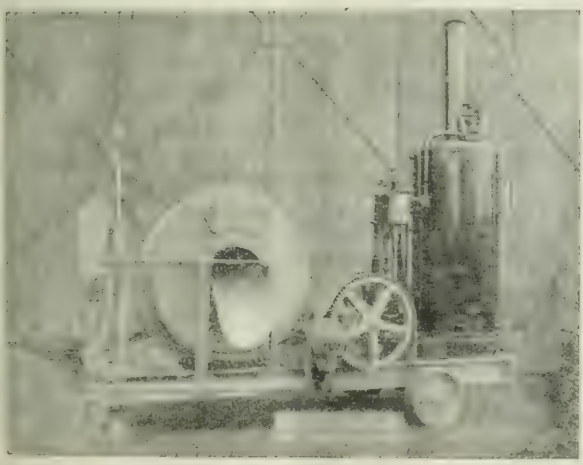

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MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

AUGUST

31.—Institute of Sanitary Engineers: Inspection of Linsdale Urban District Council's Sewage Works.

SEPTEMBER.

14.—Institute of Sanitary Engineers: Visit to Kensington Destructor Works.

18-21.—Annual Congress of the Sanitary Association of Scotland, at Montrose.

21 (or 28).—Institution of Municipal and County Engineers: Eastern District Meeting at Grays.

25-27.—Municipal Tramways Association: Annual Conference at West Ham.

28.—Institution of Municipal and County Engineers: East Midland District Meeting at Ilkeston.

APPOINTMENTS OPEN.

HAVERHILL URBAN DISTRICT COUNCIL.
APPOINTMENT OF SURVEYOR,
INSPECTOR OF NUISANCES AND EXPLOSIVES INSPECTOR.

The above Council will, at their meeting to be held on the 16th September, 1912, proceed to the appointment of a Surveyor, Inspector of Nuisances and Explosives Inspector for their district.

The combined salary will be £131 1s. per annum divided as follows:

Salary as Surveyor	£40 0 0
Salary as Inspector of Nuisances	90 0 0
Salary as Explosives Inspector	1 1 0
	£131 1 0

The appointment as Inspector of Nuisances will be subject to the approval of the Local Government Board.

Candidates must have a thorough knowledge of the duties of the offices and be competent to keep the books and accounts applicable thereto.

The person appointed will be required to devote the whole of his time to his duties, and to give security in the sum of £200.

The appointment will be subject to one calendar month's notice on either side.

Applications, in candidate's handwriting, stating age, present and previous occupation, and accompanied by copies of not more than three testimonials of recent date, endorsed "Application for Surveyor," must be addressed and sent to me not later than 10 a.m. on the 9th day of September, 1912.

(By order)
THOMAS BATES.
Clerk to the Council.

Haverhill, Suffolk.
August 21, 1912.

SURVEYOR within short distance of London has vacancy for Pupil; large sewerage scheme projected.—Box 1,180, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

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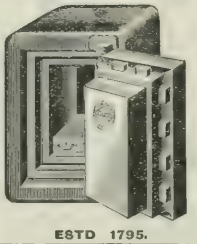
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At the recent Examinations of the Inst.C.E., Surveyors' Institution, Municipal and County Engineers, Civil Service (Technical), London University, Sanitary Institute, &c.,

MR. G. P. KNOWLES' PUPILS

have maintained his usual high percentage of successes. Recent results include:—

BAYLISS PRIZE at A.M.Inst.C.E., February, 1912.
PENFOLD GOLD MEDAL at F.S.I., March, 1912.
FIRST PLACE, Valuation Office, Ireland, May, 1912.
ONE APPOINTMENT, Admiralty Civil Engineers, December, 1911. (Civil Service (Technical) Competitive.

Evening Classes commence early in September.
Correspondence Courses can be commenced at any time.

EVERY PUPIL HAS INDIVIDUAL PERSONAL ATTENTION.

For all information send to.

G. P. KNOWLES, B.Sc., A.M.Inst.C.E., F.S.I., M.R.San.I., &c.,
39 VICTORIA STREET, WESTMINSTER, S.W.

TELEPHONE 1342 VICTORIA.

The Surveyor

And Municipal and County Engineer.

Vol. XLII. SEPTEMBER 6, 1912. No. 1,077.

Minutes of Proceedings.

The Intercepting Trap.

Last week we briefly recorded the issue of the report upon this subject by the Departmental Committee appointed by the President of the Local Government Board, and we now print in full on another page the conclusions, arrived at by the Committee, and various extracts from the report which appear to us to be of particular interest. Our readers should, however, study the report thoroughly, as it will be found to be extremely interesting and valuable. On May 14, 1909, in these columns we dealt with a letter from a correspondent, in the course of which it was stated that "the intercepting trap has given a sense of security to the householder." In reply to this we stated that we considered this feeling of security to be responsible for half the nuisance existing in the ordinary house drain, and that, "although we would not countenance this removal in every case, we do think that, as a nation, we are considerably over-trapped." We now find that the Departmental Committee, after elaborate investigations, has come to the conclusion that the necessity of the intercepting trap, on bacteriological or epidemiological grounds, has not been established; that the smell of sewer air is less perceptible, not more perceptible, when the intercepting trap is omitted; and that it is only in exceptional cases, where the smell from the sewage, due to special circumstances, might be offensive even when discharged at a height, that the intercepting trap may be required. A further statement in this connection is of importance to municipal engineers. The Committee consider that "the question whether, in order to prevent nuisance from smell in such exceptional cases, the intercepting trap is or is not required in any locality, or part of a locality, is one which will need to be considered and determined by the local authority and their advisers, in the light of local conditions."

The original reason for the use of the intercepting trap arose from the belief, then almost universal among sanitarians, that sewer air was one of the most, if not the most direct and commonplace way of all, by which certain infectious diseases were disseminated. The committee naturally directed their investigations to a large extent to this aspect of the question and discuss the results of experiments and observations made in recent years in connection with the bacteriology of sewer air by several scientists. These have been dealt with in these pages at various times (The Surveyor, April 17, 1908; June 25, July 30 and August 6, 1909). A number of special experiments were also carried out for the Committee and a large amount of evidence was collected from a number of witnesses, including medical officers of health, municipal and civil engineers, architects and others. Among the statements made in the report some are highly important and must have far-reaching effects upon present-day methods of house drainage. It is stated in the conclusions that "the bacteriological evidence undoubtedly indicates that the bacterial danger of sewer air is incomparably less than the bacterial danger of drain air, and that therefore the entry of sewer air into a house is of correspondingly smaller importance, bacterially, than the entry of drain air." Again, "the free ventilation of sewers appears to be unnecessary for the prevention of pressure of sewer air on traps;" and "the objectionable features of the fresh air inlet may be overcome apparently without detriment, by omitting this contrivance altogether. The only ventilation which appears to be required on a house-drain, apart from anti-syphonage pipes, is that which should be provided by an opening at the top of each soil pipe." From these statements it certainly seems that the danger which the intercepting trap was intended to prevent is greater in the house drain than in the sewer, and as the provision of the intercepting trap, together with its unsatisfactory accessory the fresh air inlet, only increases the danger, there are very good reasons why these should both be abolished.

It is quite possible that the various experiments described in the report, and upon the basis of which to a great extent the conclusions were arrived at, do not carry conviction to some minds. For such people the case of East Grinstead should be convincing. In the report it is described as a "very striking instance." The town is largely residential with a population of 7,000. There are practically no intercepting traps at all, and no ventilation of the sewers is provided except such as can take place through the soil pipes and ventilating shafts of the house drains. Yet the average annual death rates during the four successive quinquennial periods between 1891 and 1910 were 13·2, 11·9, 9·7 and 9·9 per 1,000 respectively. The rates for enteric fever, diphtheria, and the principal epidemic diseases, including diarrhœa, were also low, and the medical officer of health stated that he has "never had a complaint of smell or nuisance from a house ventilating shaft yet." This is the result of practical experience over a period of years, and we think the report amply justifies the claims of those who wish to abolish the intercepting trap, and represents a great step forward in the progress of sanitary science.

* * *

Ultra-Violet Rays.

A brief review of recent progress in the sterilisation of water by means of the ultra-violet rays is given elsewhere in these pages, and the application of the method to the purification of water supplied in bottles for drinking purposes at Chicago is also described in another article. It appears that in Chicago water taken from the city mains requires double coagulation, settlement and double filtration,

before it is fit to be sterilised, and the fact suggests that there may be a real need for pure bottled water in Chicago. The installation is small, but it is interesting as being the first commercial undertaking for the purification of water in America by this particular process, and, seeing that the method is making headway elsewhere, it will probably be followed by larger and more important installations in that country. In France several municipal supplies are at work. The R.U.V. sterilisers in operation represent a total capacity of 10,000,000 gallons per day. The cheapness and efficiency of the process of actual sterilisation by this means is apparent, but the need for such elaborate preliminary treatment of the water as that adopted at Chicago is apt to convey the impression that, though actual sterilisation is a cheap process, the preliminary treatment required renders it expensive in application. It is, however, to be doubted after all whether this is so. In the first place no body of consumers will drink turbid water. As is very well known, most of the waters in America receive quite as much preliminary treatment before they enter the town mains as is described above. In this country, where the supplies are often derived from deep wells, the water is of so clear a quality that it could be treated without any filtration. For instance, at Cambridge Dr. Sims Woodhead used a violet-ray lamp to treat the raw water drawn from a chalk well where the supply was considered to need sterilisation. In other cases where water is coloured or turbid it is clarified by various processes before use, so that it is quite wrong to imagine that this preliminary process of clarification is necessarily an extra expense where use is made of the ultra-violet rays. What has really happened is this. The experimenters have tried to make the sterilising agent perform the work of the filter, and have failed. This is an old error, and has been made in the case of other sterilising agents and disinfectants. It is the same type of error as that made in attempting to disinfect crude sewage instead of the final effluent.

Whether it is at all probable that the use of bottled water, as in the case of Chicago, is likely to increase, is open to question, but the method would very likely have its uses in the case of aërated waters. Such waters should certainly be above suspicion, and might very properly be sterilised. Sterilised water in bottles would, moreover, be in considerable demand at any place where the public supply was under suspicion, and in America, where typhoid epidemics are of frequent occurrence, there may well be a larger demand for pure bottled water than we in this country should expect. Further, having once suffered from the results of polluted water, the individual affected would probably prefer to err on the side of safety and demand the bottled sterilised water, whether the public supply were safe or not. Thus this somewhat elaborate preparation of the most ordinary necessary of life, combined with extraordinary safeguards in bottling and subsequent storage, may be more necessary than might at first appear.

Age Limits for Appointments.

We have on more than one occasion received complaints in regard to the practice of inviting applications for public appointments from such candidates only as are within specified limits of age. The allegation is that such a course debars many men with a ripened experience from applying for appointments which, being of a public character, should be opened to the widest competition which is reasonable. While we fully sympathise with those older men who are adversely affected by the practice in question, we are unable entirely to agree that it is a wholly bad one. On the contrary, a reasonable age limit appears to us to be highly desirable for two reasons. In the first place, it saves many older men the trouble and expense of applying for posts for which younger men are required and in many cases are more suitable; and, in the second place, it is necessary in the interests of those who are making their first steps in a peculiarly difficult profession. There is no need for the capable assistant who has succeeded in obtaining a permanent (though not a chief) appointment to migrate to the workhouse (as one correspondent has suggested), inasmuch as, even without any guarantee of security of tenure, it is not customary to discharge assistants merely on account of age and in order to replace them with younger men. The suggestion has also reached us that surveyors require young assistants in order to enable them to magnify the importance of their own offices. It is evident, however, that it would be ridiculous and suicidal for a chief to surround himself with an inexperienced and incompetent staff for such a purpose, inasmuch as such a course of action must result in his incurring all the discredit which attaches to inefficient and wasteful administration. In our view the real grievance in regard to age limits is that in many cases they are out of all proportion to the salaries offered and the responsibilities attaching to the positions advertised. The appointment of experienced and senior candidates to posts carrying inadequate salaries is not in the best interests of the profession generally and tends to a general lowering of rates of remuneration. The whole subject, however, is of great interest, and we shall be glad to have the opinions of our readers on it.

The Development of Swansea.

The call of the sea is responsible for an amazing development of municipal enterprise in these islands, which is none the less to be encouraged because it is frankly of a competitive character. Included among the seaside places that have come within the influence of this new spirit is Swansea, which is just now the theme among its many well-wishers of an enraptured prevision that paints its future in the most glowing colours. One ambitious scheme for a Greater Swansea has originated with the *South Wales Daily News*, and this has been the subject of a considerable amount of public comment, some favourable and some hostile. The idea of the scheme is the development of Swansea as one of the chief watering places in the Kingdom, and its laudable purpose finds a hearty supporter in Mr. C. T. Ruthen, who is of opinion that, although the project will involve a huge expenditure of money, "it is, nevertheless, a magnificent idea," which would, however, take many years to fructuate. It is recalled in this connection that some credit is deservedly due to the borough surveyor of Swansea, Mr. George Bell, as a pioneer in these schemes of expansion and improvement, for a year or more ago he presented to the town council a report upon the development of the town which included proposals regarding the foreshore and the reclamation of land. Mr. Bell's main idea—which is also that of those who have followed in his footsteps—was the reclamation from its present sordid surroundings of one of the finest bays in the country. His suggestion was the "neutralisation as far as possible of the unfortunate effects due to the presence of the railway skirting the shore," by a scheme of reclamation that would regain from the railway the front position, and the screening of the line "by a belt of trees at the back of a fine drive." Mr. Bell also visualised the prospect of a new and adequate suite of civic buildings within the limits of the improved area. When so many minds are in agreement upon the possibilities of Swansea's future as a seaside resort, it may be taken for granted that something will be done in time to materialise some such scheme as Mr. Bell foreshadowed in his report to the town council.

Garden Cities and Garden Suburbs.

The letter from Mr. Ewart G. Culpin, the secretary of the Garden Cities and Town Planning Association, which appeared in our issue of August 23rd, points out concisely and clearly the essential distinction between a "garden suburb"

and a "garden city." In a single sentence it may be said that the former is a palliative of existing evils, whereas the latter seeks to profit by the experience of the past, and to prevent the creation of those evils in the new "city." Valuable as is the garden suburb as a means of providing for the city worker a home in healthy surroundings and in acting as an example which may operate to enlighten the confirmed city dweller, it will be recognised that its object is entirely different in character from that of the garden city proper. The latter is the fruit of the imagination of Mr. Ebenezer Howard, who conceived the idea of planning a town to be built on virgin soil in such a way that the central position should be devoted to residential and industrial purposes, and be surrounded by an outer agricultural ring. It is essential for the carrying out of such a scheme that the area of the city should be adequate and that all the affairs of the town should be under the control of some central authority. The science of town planning so far as it affects the municipal engineer has really very little to do with the creation of such a "garden city." It is only in the very rarest instances that an opportunity occurs for laying out an entire city *de novo*. In such cases many of the characteristic features of a "garden city" are retained, but in the usual task which falls to the lot of the municipal engineer—*viz.*, that of making a town plan for the extension or development of an existing town—the underlying principles are entirely different. Mr. Culpin's letter makes a timely appearance and will serve to prevent a confusion of thought which has hitherto existed in the lay mind to a very considerable extent.

The Protection of Roads from Drifting Sand.

A paragraph which appeared in a recent issue (August 23rd, p. 277) relates to a case of serious difficulty arising in dealing with sand drifting on to a road. In the case referred to the depth of the sand upon the road was on an average about 18 in., while in the hedgerows it was 5 or 6 ft. deep. In dealing with a difficulty of this kind it is important that there should be a good understanding between the surveyor and the occupiers of the adjacent land; and it may be suggested that in such cases it is better to take joint action in order to avoid the necessity for the incurring of a continued expense in sand removal than it is to adopt means, however sporting, to drive the other party into a corner. It may not be generally realised that a barrier which may allow large quantities of sand to drift over it may be only a few feet lower than a barrier which would cause the sand to be arrested on its windward side, the sand ridge so formed permanently protecting the road from drifting sand, provided reasonable means be taken to fix the sand-hill by encouraging the growth of suitable grasses. The hedge may, if far enough from the carriageway, be trained so as to encourage the growth of a protecting ridge, or temporary barriers may be used, and when covered by sand, dragged out and placed on the top of the ridge; or cheap materials may be employed, the permanent burial of which does not cause an unreasonable expense. The principle is followed in Egypt with sand, and in Russia with snow, and such expedients are doubtless pursued in many small areas since the idea necessarily occurs to the persons concerned sooner or later. When once the principle is understood the method of applying it can either be worked out on the spot or with the advice of a competent civil engineer.

Overtime.

In another column we publish a letter in which a correspondent discusses the rather difficult question of the working of overtime by assistants in the offices of municipal engineers. The point which he raises is entirely different in principle from that which is involved in those occasional spells of additional work which occur in almost every office at times of special pressure. Provided adequate salaries are being paid, we are of opinion that most assistants will willingly do what is required of them at such times without expecting additional remuneration. It is quite another thing, however, when overtime is required as a regular thing on several evenings a week. As our correspondent points out, such a state of affairs must be due either to bad organisation or under-staffing, and in either case the system operates most unfairly on the junior members of the profession. The work of an assistant to a municipal engineer is not finished when he leaves the office. If he desires to rise in his profession, there are diplomas to be obtained necessitating careful preparation for examinations of no little difficulty. If he is compelled to work at the office regularly until a late hour he is not only being unfairly treated as regards the extra time devoted to his official duties, but he is at the same time being handicapped in his chances of professional advancement. We feel sure that it is only necessary to bring home the nature of the injury which is thus being inflicted on many assistants to those who are responsible in order that it may be mitigated. If necessary, the matter is one in regard to which the Institution of Municipal and County Engineers might take some action such as is suggested by our correspondent, and so show a practical interest in the younger generation of members.

"Dwellings" or Homes.

The evils of the block system of housing were well summed up in a paper which was read before the York Congress of the Royal Sanitary Institute by Dr. J. Wright Mason, the medical officer of health of Kingston-upon-Hull, and some extracts from which were given in our issue of August 23rd. As compared with the cottage, the cost per room is nearly 100 per cent greater, the death-rate is higher —particularly from tuberculosis—and the rate of infant mortality is very much greater. The hygienic evils are due no doubt to the fact that block dwellings do not as a general rule attract the best class of tenant. Moreover, as Dr. Mason pointed out, wherever a common occupancy is resorted to the conveniences and yards become more or less neglected, owing to the responsibility for their cleanliness being a collective instead of an individual one. All things considered, there can be no doubt as to the superiority of the cottage as a home for the working-class family, and so far as England is concerned the block dwelling has not flourished outside London, where the cost of land is frequently so high as to prohibit the erection of cottages from an economic standpoint. In Scotland, however, the block dwelling is very extensively found; but the improvement in means of transit which has taken place in recent years, coupled with the advocacy of the garden city idea, are together operating to induce the erection of cottages rather than blocks on the areas now available.

Madras Water Supply: Progress of the Work.

Following upon our review of Mr. Madeley's report (August 16th), it remains to be noted that the distribution scheme for Madras water supply having been accepted by the corporation and having received the sanction of Government, the work is to be pushed forward with all due speed. Evidences of activity in this direction will have been observed in our advertisement pages, in the invitation for applications for the post of assistant engineer and in the advertisement inviting tenders for some 6,500 tons of cast-iron pipes and "specials," as well as other materials and work. Further tenders may be called for as occasion arises, and it may be as well to note that the contract for the pumping machinery has already been let, and that the steelwork for the elevated tank will not be the subject of open tenders.

Intercepting Traps in House Drains.

DEPARTMENTAL COMMITTEE'S REPORT.

The report of the Departmental Committee appointed by the President of the Local Government Board in October, 1908, to conduct an inquiry with regard to the use of intercepting traps in house drains was, as we have already briefly announced, issued on Wednesday of last week. The investigation nominally originated with a proposal by the Willesden Urban District Council to adopt a series of building by-laws in which the requirement as to the provision of an intercepting trap was to be omitted. The Local Government Board refused their assent to this proposal, but promised that it should be made the subject of a general inquiry, and in due course Mr. Brook Kitchin, Dr. Darra Mair, and Mr. A. A. G. Malet were deputed, as representing the architectural, medical, and engineering departments respectively of the board, to carry it out.

Soon after the commencement of this joint inquiry it became evident that, in consequence of conditions found in intercepting traps in Willesden, an extensive examination of such traps in other districts would be necessary. Accordingly, the assistance of a large number of local authorities of districts near London, where much building under modern conditions has taken place, was invoked. Twelve months elapsed before these local examinations were completed, and at this stage it was deemed necessary, in consequence of the growth of the investigation, to convert the joint inquiry into an inquiry by Departmental Committee. In this committee Mr. Pearson took the place of Mr. Brook Kitchin.

It was contemplated that the committee should visit a number of towns and districts in England and Wales, where conditions illustrative of the advantages and disadvantages of the intercepting trap might be found, but, after consideration, it was decided that it would be more satisfactory and less costly to examine representative witnesses in London, and subsequently to make local investigations and experiments. The committee issued a circular letter therefore to the local authorities of the Metropolis and of the large towns, inviting statements from their expert officers in regard to the main points at issue. They also communicated with various gentlemen of recognised experience in drainage questions, with certain others who had been engaged in special research and investigation in regard to sewer air and drain air, and with the Royal Institute of British Architects, the Architectural Association, the Royal Sanitary Institute, and the Institution of Civil Engineers. The responses to these communications were very numerous, and they comprised many valuable contributions.

Since hearing evidence the committee have also studied a large number of valuable and interesting experiments, the results of which have amply justified the large amount of time which was necessarily expended on them, and which, indeed, has been one of the chief reasons why the report has not been presented earlier. The experiments were conducted and carried out by Mr. W. J. Steele, then the deputy engineer to the Bristol Corporation (now engineer to the Corporation of Newcastle-on-Tyne), in connection with the effect on traps of sewer air and drain air under pressure; by Mr. J. Patten Barber, engineer to the Borough Council of Islington, in connection with the passage of sewage through various intercepting traps; and by Dr. F. W. Andrewes, pathologist to St. Bartholomew's Hospital, in connection with the convection of sewage microbes from sewers to drains, under practical conditions. The last-mentioned experiments were carried out at East Grinstead, with the assistance of Dr. Wallis, medical officer of health, and Mr. W. E. Woollam, surveyor, and at Willesden, with the assistance of Dr. Butler, medical officer of health, and Mr. Woods, chief sanitary inspector.

SUMMARY AND CONCLUSIONS.

We have shown (the committee state in their summary and conclusions) that the disadvantages involved by the use of the intercepting trap are substantial and of serious practical importance, and that as the most important of the effects of these disadvantages are concealed from view, they may remain in existence quite unknown to the householder. On the other hand, the construction of house drainage may be simplified by the omission of the intercepting trap. The disadvantages of the trap may, to some extent, be obviated. Thus, the objectionable features of the fresh air inlet may be overcome, apparently without detriment, by omitting this contrivance altogether. The only "ventilation" which appears to be required on a house drain, apart from anti-syphonage pipes, is that which should be provided by an opening at the top of each soil pipe.

LIABILITY TO BLOCKAGE.

The tendency of the intercepting trap to retain a considerable proportion (averaging, according to our experiments, from 42 to 79 per cent) of the solid matters of the sewage passing through it at any given time, and thus to favour blocking of the trap as well as putrefaction of the sewage before it reaches the sewer, may be diminished to a great extent by using a trap of smaller diameter than is customary at present. The liability of the trap to become blocked appears, however, to be insuperable, and it is this liability which constitutes its most serious disadvantage. The accumulation of sewage in the drain produced by the block and from which many undesirable consequences may follow is not readily evident with ordinary use of the drain, and therefore may long remain undiscovered. This uninspected blocking of the trap and accumulation of sewage appears to be very common, evidence of it having been found in more than 23 per cent of 5,600 traps, which were specially examined.

Although the liability to blocking is inherent in any intercepting trap, its evil effects can be minimised by constructing the house drain of at least the lower part of it of iron pipes, and by closing with a removable cover the usual open channels in the inspection chamber which is provided as a means of access to the trap. The object of these measures is to ensure that the effects of a block at the intercepting trap may become evident as soon as possible, and may admit of easy remedy without nuisance arising, and also to reduce to a minimum the chance of leakage from that part of the house drain which must be filled with sewage before a block at the intercepting trap can be discovered with ordinary use of the drain.

BARRIER TO SEWER AIR.

On the other hand, it seems to be established that the trap does serve as an effectual barrier to the entry of sewer air into the house drain, which is the fundamental advantage claimed for it. It is not liable to be forced and rendered useless, as has been supposed to be the case, by pressure of air from the sewer. This, it would appear, is chiefly because sewers are not air-tight under practical conditions, and therefore air in a sewer finds easier outlets than the water seal of the trap. The pressure which is liable to force the intercepting trap is limited to that which arises in the sewer connection after its opening into the sewer has been submerged, that is to say, after the aërial continuity of sewer and sewer connection has been destroyed. Likewise, the volume of air which can be forced through the trap is limited to that contained in the sewer connection.

Furthermore, when an intercepting trap has been forced in this way, the water seal is not destroyed. When the pressure is relieved the trap will remain sealed, though, it may be, to a less depth than formerly, and therefore air is not liable to pass continuously through a trap once it has been forced.

In the absence of the intercepting trap, the trap-seals in unventilated house-drain are, similarly, not liable to be forced by pressure from the sewer, and they are not liable to be forced even after the sewer connection has been submerged, provided the house drain is furnished with a proper ventilating shaft.

[illegible] owing to exceptional circumstances, such as the absence or the blocking of the ventilating shaft of the house drain, pressure is exerted against the trap on the drain only one trap is liable to be forced [illegible] that which has the weakest water seal. Air from a drain is not liable thereby to pass into a dwelling through a trap, unless it so happens that the weakest trap of all the traps on the drain belongs to

one of the sanitary fittings inside the house. In this connection it needs to be borne in mind again that the water seal of an efficient trap which has been forced is not destroyed. At the same time provision should be made, as indicated in our report, against the tendency of ventilating shafts to become blocked by rust.

The main sources from which air from the sewer may gain entry into a house, in the absence of an intercepting trap, are defects in the drain and the open top of the soil pipe or ventilating shaft, such entry being in either case merely passive, or actively induced by aspiration, in consequence of differences of temperature. The entry of sewer air into the dwelling through defects in the drain may be practically excluded if the house drain is constructed of iron pipes. An iron drain can be made absolutely air-tight without serious difficulty, and usually remains airtight, contrary to what is feasible in the case of stoneware drains. It is probable, therefore, that the entry of sewer or drain air into a house can be limited in practice to what may come from the ventilating shafts outside.

Assuming that, in a given case, air from a drain or from a ventilating shaft can enter a house, the essential question is whether there is any difference, so far as the inhabitants are concerned, between the entry of sewer air plus drain air and the entry of drain air alone. For if, in the absence of an intercepting trap, sewer air, together with drain air, can escape from a given drain or a ventilating shaft into a dwelling, it is equally possible, assuming the presence of an intercepting trap, that drain air alone will escape into the dwelling.

We have collected and carefully considered the chemical evidence, the bacteriological evidence, the results of recent and exact experiments on animals, as well as the general and epidemiological evidence, in their bearing upon the existence of definite risk to health as a consequence of the access of sewer air into the house drain in the absence of the intercepting trap. It is difficult to summarise this evidence, and it must therefore be studied in the body of our report. Briefly, however, it may be said that the chemical evidence shows that the most frequent characteristic of sewer air is the presence of smell. This smell is due to the presence of certain volatile substances given off from sewage in such minute quantities as to be harmless in themselves, apart from smell, or, possibly, to effluvia from moulds which may be attached to the walls of sewers. It is established that the smell of sewer air is only very exceptionally due to sulphuretted hydrogen, contrary to what has been supposed, and that this dangerous gas is usually not present, even in minute traces, in the air of sewers.

BACTERIAL DANGERS.

The bacteriological evidence shows that micro-organisms of sewage origin are very rarely present in sewer air. On the other hand, they may be present in drain air in large numbers. This difference is the result of the splashing of sewage which occurs in drains, and which does not usually occur in sewers. The effect of any given splashing in a drain is of extremely short duration, the bacteria subsiding with great rapidity, but air currents, produced by ventilation, may meanwhile have conveyed these bacteria for considerable distances along the drain or into ventilating shafts of the drain. On the other hand, owing to the rarity of bacteria of sewage origin in sewer air, which has been repeatedly established, opportunity very rarely occurs for their convection, by air currents, from sewer to house drain, in the absence of the intercepting trap; indeed, direct experiments show that the possibility of such convection is so small that its practical importance in relation to danger to health is infinitesimal. The bacteriological evidence undoubtedly indicates that the bacterial danger of sewer air is incomparably less than the bacterial danger of drain air, and that, therefore, the entry of sewer air into a house is of correspondingly smaller importance bacterially than the entry of drain air.

The foregoing evidence is confirmed by experiments on animals which show that while animals may be adversely affected by exposure to the concentrated effects of putrefying excrementitious substances, they are not affected, either in their growth and nutrition or in their susceptibility to disease, by exposure to sewer air.

It is also confirmed by the general and epidemiological evidence, which is to the effect that human beings deliberately exposed to the effects of sewer air do not appear to be affected in health; that the association of the incidence of certain specific diseases, such as enteric fever and diphtheria, with drain defects which allow of the entry of sewer air as well as of drain air into houses, is almost identically the same as the association of similar defects with the absence of disease; and that the experience of districts without intercepting traps does not show that their absence has been harmful.

The necessity of the intercepting trap, on bacteriological or epidemiological grounds, has not therefore been established. It appears, in fact, that the characteristic of sewer air which is of practical importance is its smell, and that, therefore, the question as to the necessity or otherwise of the intercepting trap is narrowed down to the issue whether, in any given case, sewer air will be more perceptible or less perceptible to the sense of smell with or without the trap.

Nevertheless, the question is one of serious public health importance. Human beings vary greatly in their perception of smells, and offensive and unpleasant odours affect the comfort and physical well-being, and probably the health, of the individual. It is obviously most important that public health authorities should make every effort to secure that both sewers and house drains are so designed and constructed that the opportunities of their contributing smell to the atmosphere shall be reduced in every possible way.

EXCEPTIONAL CIRCUMSTANCES.

In ordinary cases the smell of sewer air is less perceptible, not more perceptible, when the intercepting trap is omitted, and chiefly, it would appear, because in the absence of the trap opportunity is afforded for sewer air to escape entirely at a height above the ground. But there are exceptional cases where the intercepting trap may be required, in order to prevent perceptible smell from the escape of sewer air from the tops of ventilating shafts of house drains. Sewage may be so offensive that the escape of sewer air, even at a height, is a perceptible nuisance, so much so that it may be necessary to close as many sewer ventilators as possible, whether at the ground level or at a height; house drains may be connected with cesspools, flat or storage sewers, or with sewers which are old and foul with deposit; houses may be built in terraces, one above the other, so that the ventilating shafts of the house drains of one terrace are at or about the level of the ground of another terrace, and so forth.

As circumstances in this respect will vary in different localities, the question whether, in order to prevent nuisance from smell in such exceptional cases, the intercepting trap is or is not required in any locality, or part of a locality, is one which will need to be considered and determined by the local authority and their advisers in the light of local conditions. Where, however, the trap is considered to be necessary or desirable, the measures for providing against the effects of blocking of the trap should not be neglected—namely, the closure of the open channels in the inspection chamber giving access to the trap, and the construction with iron pipes of the main portion of the house drain, unless this is remote from the house.

VENTILATION OF SEWERS.

The importance of the effect which the presence of the intercepting trap has on the ventilation of sewers, on which much stress has been laid, has probably been exaggerated. The free ventilation of sewers appears to be unnecessary either for the prevention of pressure of sewer air on traps or for the safety of sewermen, except in the case of sewers which are large enough to admit them. Even in such sewers, however, it is dangerous to rely on ventilation alone, and special precautions should always be taken. Moreover, it is exceedingly difficult to ensure that sewers are freely ventilated, even when the most elaborate measures for this purpose are adopted. On the other hand, the prevention of nuisance from smell renders it necessary that any openings which may be deemed to be requisite for the ventilation of sewers should not be at the ground level.

The relationship between the splashing of sewage and the temporary presence of sewage microbes in drain air, and the wafting of such microbes to considerable distances by currents of air, which has been established in the course of our inquiry, appears to be a matter of practical importance, whether the intercepting trap is present or not. The bacteriological evidence suggests that if exposure to drain air is related, as many suppose it is, to attacks of

sore throat or other septic affections, the explanation may be found in the liability of drain air, unlike sewer air, to carry in suspension large numbers of microbes of sewage origin. It is desirable, therefore, that the possibility of splashing should be taken into account in the construction of drains, in order that it may be reduced to a minimum. It is likewise important, whether the intercepting trap is present or absent, that the tops of soil pipes and of the ventilating shafts of house drains should be as remote as possible from windows, not only with a view to avoid smell, but also to minimise the chance of sewage microbes, which may be present in drain air, being wafted from them into the dwelling.

EXTRACTS FROM THE REPORT.

The following are some of the more important passages in the committee's report:

DISADVANTAGES OF THE INTERCEPTING TRAP.

The alleged disadvantages of the intercepting trap fall into four groups. One is that it forms an obstacle to the passage of air from the sewer through the house drains and the ventilating shafts thereof to the external air, and that, consequently, the ventilation of sewers is rendered both difficult and costly. As this alleged disadvantage is claimed by those who favour the trap to be its chief advantage, we do not propose to discuss it at this stage, though we refer to it later on. Another disadvantage urged by many is that the trap involves separate ventilation of the house drains, and that this necessitates the provision of a fresh air inlet to the drain, which, owing to the capricious nature of air currents, often acts as an outlet for foul air, and becomes a nuisance. A third objection is that the intercepting trap complicates and enhances the cost of the construction of house drains, not only by reason of the addition of the trap itself, but also from the necessity of providing the air inlet to the drain, proper means of access to the trap, and in other ways. Lastly, the trap is objected to on the ground that it forms a serious impediment to the passage of sewage from the house drain to the sewer, and that this frequently results in more or less complete blockage of the drain. . . .

ADVANTAGES.

An incidental advantage claimed for the intercepting trap is that it prevents the passage of rats from the sewer into the house drain. Apart from the undesirability on general grounds of the presence of rats in and about houses, such an advantage might be of very great importance in connection with plague. It appears to be doubtful, however, whether the intercepting trap is a barrier to the rat, for rats have been observed to pass through it, both from the drain into the sewer and from the sewer into the drain. Mr. Patten Barber informed us that he had seen rats chased into the inspection chamber of a drain, where it was supposed that the intercepting trap would have checked their further progress, but it was found that they had escaped through the trap into the sewer. Conversely, Mr. Woods, the chief sanitary inspector of Willesden, informed us that, during the reconstruction of the inspection chamber of a house drain, he saw three or four rats, in succession, come through the water in the intercepting trap from the sewer and disappear into the house drain. . . .

The experience of East Grinstead and other places suggests that, in ordinary circumstances, the absence of intercepting traps tends to make sewer air not more, but less, perceptible to the senses. In East Grinstead there are no sewer openings at the street level, and there are practically no intercepting traps, and the medical officer of health states that he has "never had a complaint of smell or nuisance from a house ventilating shaft yet," although previous to the closure of street manhole covers there had been serious nuisance from the escape of sewer air. On the other hand, the experience of places like St. Helens and Burton-on-Trent suggests that, in exceptional circumstances, it may be necessary to provide intercepting traps expressly to prevent sewer air from becoming evident to the senses, for the same reason that it is necessary to close as many as possible of the ventilating openings in the sewers. . . .

BACTERIOLOGY OF SEWER AIR.

This accumulated bacteriological evidence, which exhibits very few discrepancies, establishes the essential fact that the number of micro-organisms in sewer air is extremely small. This is established not only in the case of good sewers and those which are well ventilated, but also in the case of bad sewers, even those containing more or less stagnant sewage with much deposit, and those in which ventilation is small or absent. Indeed, it is in the latter kind of sewer that the number of sewer air microbes would appear to be at a minimum.

It seems also clearly to be established, not only that the bulk of the bacteria of sewer air are derived from the atmosphere, but also that bacteria of sewage origin—that is, those that may be pathogenic—are very rarely present in sewer air, and that when their presence can be detected at all their number is very small. In this respect the older investigations, such as those of Dr. Haldane and Prof. Carnelley, and of Mr. Parry Laws, have not been seriously shaken by the most recent investigations. Moreover, as will appear presently, it is probable that the occasional presence of sewage organisms in sewer air is dependent on splashing. . . .

BACTERIAL DIFFERENCE BETWEEN SEWER AIR AND DRAIN AIR.

It is evident from the foregoing investigations that there is a material difference bacteriologically between sewer air and drain air, for, while bacteria of sewage origin are rarely found in sewer air, and when found their number is very small, in drain air, on the other hand, not only are sewage microbes frequently found, but also, when present, their number may be very large. While this general statement indicates broadly what is commonly characteristic of drain air in contrast with sewer air, it is subject to certain qualifications. For instance, Prof. Winslow's experiments show that, although many sewage microbes may be collected on plates exposed to drain air for more or less considerable periods, the number of such microbes, when quantitatively estimated in relation to measured volumes of the drain air, is very small.

Again, it is scarcely open to doubt that the bacterial difference between sewer air and drain air is accounted for by the splashing which occurs in the passage of sewage in a house drain, especially when falling from a height or passing through a trap. Indeed, since the presence in large number of sewage microbes in drain air has been shown to be so directly associated with splashing of sewage in a drain, more especially by the investigations of Dr. Andrewes, the presumption is strong that, if there were no such splashing, sewage microbes would be as seldom present in drain air as in sewer air. It is obvious that sewage, flowing along a drain, is not likely to give up its microbes any more readily than sewage flowing along a sewer has been shown to be.*

It is also established by Dr. Andrewes' experiments that the presence of sewage bacteria in drain air, as the result of splashing, lasts only a very short time, and that they subside with great rapidity. The appearance of sewage bacteria after splashing is doubtless effected, not by the ejection or active disengagement from the sewage of the bacteria themselves, but by the detachment from the splashing or disturbed sewage of more or less minute drops of sewage. If the passage of sewage or water through an intercepting trap be watched, as, for instance, in an open experimental installation like that used in the Islington experiments, it will be observed that droplets are frequently thrown off from the liquid, sometimes to an astonishing distance. Besides these comparatively large visible droplets, there must be many so minute as to be invisible, and it is from such minute droplets that Dr. Andrewes concluded that the plates used in his drain air experiments were mainly infected. It is possible that the enclosure of microbes in droplets helps to explain their extremely rapid subsidence, which was such a striking feature of his experiments.

But, notwithstanding that the presence of sewage bacteria in drain air is subject to the foregoing reservations, the broad fact remains, and must be accepted as an essential practical point, that sewage bacteria are frequently present in drain air, although such bacteria are usually absent from sewer air.

PRACTICAL IMPORTANCE OF THIS DIFFERENCE.

The practical importance of this essential bacterial

* Major Horrocks concluded from some of his experiments that sewage bacteria might be detached from the internal surface of drain pipes after they had become dried, but it is doubtful whether such drying as was effected artificially in his experiments can be anything but a rare occurrence under practical conditions in this country, while it is certain that in sewers there is always great humidity of the air and that their walls are always moist. In soil pipes, however, particularly those exposed to the sun, there may be such drying.

difference between sewer air and drain air is very great.

One of the dangers feared from the omission of the intercepting trap is that pathogenic microbes given off from sewage may be wafted from the air of the sewer into the house drain, and thence into the dwelling itself. It is obvious, however, that if, as appears usually to be the case, micro-organisms of sewage origin are not present in sewer air, there can be no wafting of pathogenic microbes from sewer to drain as has been apprehended. It is likewise obvious that if sewer air contains, as apparently it does contain sometimes, such microbes of sewage origin, but so few in number that their presence can be demonstrated only with difficulty, the chance that they can be wafted into a house drain is very small, while the chance that any of them can pass further and enter the dwelling itself must be smaller. Consequently, even if in any particular instance sewage microbes can gain admission into a house from the air of the drain belonging to it, the possibility that such microbes can include any derived from sewer air if the intercepting trap is absent must be very remote.

On the other hand, the bearing of the frequent presence of sewage bacteria in drain air needs to be clearly recognised. It is contended, for instance, that an intercepting trap, though in no way operative as protection to a dwelling-house from the entry of microbes derived from the air of the drains belonging to it, will at least ensure the house, however remote the chance of such an occurrence may be, from the entry of microbes (*viâ* the sewer) which may be derived from the sewage coming from the drains of other houses. But clearly the bacteriology of drain air shows that theoretically it is possible for a dwelling-house to be invaded by microbes, derived from the drains of other houses, irrespective altogether of intercepting traps.

Thus the air inlet of a drain, as we have shown already, may act as an air outlet, and smell from it may affect persons other than those resident in the house to which it belongs. Again, the air outlet or ventilating shaft of a house drain may be so situated as to affect, so far as may be judged by smell, residents of houses other than those of the house to which it actually belongs. Therefore it is conceivable that, in cases where the smell of drain air is wafted to persons other than the residents of the house by the drain, sewage microbes of drain air origin may be wafted to them also. It may be true that, though such a contingency is conceivable, it is only a remote possibility. On the bacteriological evidence, however, it can scarcely be denied that it is a less remote possibility than the wafting of microbes from sewer air to drains, and thence in whatever way to the interior of the dwelling, since in the latter case microbes of sewage origin are seldom present in sewer air, while in the former case microbes of sewage origin are frequently present in drain air.

In other words, while an intercepting trap may guard a house against a bacterial danger through the sewer which appears indeed to be almost non-existent, it does not exclude the possibility of drain air microbes finding their way from one house to another through other channels, involving bacterial danger theoretically not inconsiderable. Indeed, it might not unreasonably be argued that in the ventilating shafts of house drains lies the principal bacterial danger, and that the free ventilation of house drains, which is usually associated with the provision of an intercepting trap, is itself calculated to foster the dispersal of drain air microbes in the neighbourhood of houses. It might even be contended, on strictly bacteriological grounds, that any ventilation of house drains or the provision of any external openings in them is wrong, and constitutes a possible danger, since in the absence of air currents, brought about by ventilation, such microbes, however numerously suspended they may be in drain air as the result of splashing must merely subside and remain in the drain itself.

We are not suggesting that this is a serious danger, although it is possible that it may have some importance in relation to sore throat, and perhaps other illnesses. It is necessary, however, to make quite clear what is the logical outcome of the bacteriological evidence that microbes of sewage origin are frequently present in drain air, and seldom present in sewer air. That the danger in question is probably not serious seems to be indicated by the fact that in the air of London microbes of sewage origin can very rarely be detected, even after the exposure for many hours in likely places of plates coated with media specially designed to demonstrate their existence. It follows, however, that if danger of this kind through drain air is not of importance, the danger that sewage bacteria of sewer air may find access into the interior of a dwelling *viâ* the drain owing to the absence of an intercepting trap must be still more unimportant.

PASSAGE OF SEWAGE MICROBES FROM SEWERS INTO DRAINS.

Nevertheless, as one observer (Major Horrocks) found by experiment in Gibraltar that test microbes introduced into a sewer from a house drain may be recovered from another and neighbouring drain in direct aërial connection with the same sewer, we thought it desirable that further direct investigation should be made. When, therefore, Dr. Andrewes offered to make experiments suggested by us in the course of his further observations for the Local Government Board on the bacteriology of drain air and sewer air, we asked him to include investigation on this point, especially as to the numerical extent to which such sewer air microbes might pass into drains. . . .

These experiments, even assuming that the first experiment at Willesden was not vitiated by accidental contamination, confirm, therefore, as conclusively as may be expected, the deduction to be made from previous observations establishing the rarity of the presence of sewage microbes in sewer air—*viz.*, that under practical conditions the chance of sewage microbes passing from sewer air to drain air is very small, and that their chance of passing further from the drain into the dwelling and thence into a human being must be still smaller. It needs to be remembered, moreover, as Dr. Andrewes has pointed out in his report* to the board on these experiments, that the test microbe was present in the sewage to the number of hundreds per c.c. in one case, of thousands per c.c., in another case, and of at least a million per c.c. in another case, and that "no one has suggested that pathogenic bacteria are ever present in sewage in numbers approaching this."

In contrast with the results of these experiments, a further series made by Dr. Andrewes at St. Bartholomew's Hospital may be mentioned. On four successive days he discharged culture of b. prodigiosus from the water-closet on one or other of the four floors of one of the hospital blocks, four 2-in. plates having been previously suspended, one above the other, inside the top of the soil pipe with which they are connected, and also a similar tier of plates in an adjoining pipe (constructed like a soil pipe) into which the sink wastes on each floor discharge. Both these pipes open at the top, discharge below into a single inspection chamber provided with an intercepting trap, but not with an air inlet, so that the two pipes referred to are the only available channels for air currents from or to the inspection chamber. On all four occasions Dr. Andrewes recovered the test microbe from both pipes, thus confirming the results obtained by Major Horrocks in a somewhat similar experiment. On two occasions the number of the test microbes recovered was very small, in one pipe or the other, but usually it was considerable. Thus in the case of the soil pipe the numbers of test microbes were on the four days 47, 153, 64 and 2 respectively, and in the case of the sink waste pipe 34, 7, 127 and 118.

The results of these experiments emphasise the point to which we have already referred—namely, that the bacteriological evidence indicates that, if any bacterial danger exists at all in house drainage, it is to be found in the drain air that may escape from the outlets of ventilating shafts of house drains. But even this danger requires to be regarded in its true perspective, as we have pointed out.

SEWER AIR AND DISEASE.

In the earlier days of epidemiological investigation it was common to attribute outbreaks of many spreading diseases to the influence of emanations from decaying animal matter, or of effluvia from drains and sewers. Indeed, as we have mentioned in the opening of our report, these influences were regarded at one time as being the most direct and commonplace of all agencies by which such diseases were disseminated among human beings. But as first one and then another agency of disease came to be identified, it became less and less frequent to attribute disease to mere foul emanations, including those from sewers and drains. It has been suggested to us that this

* Third Report on the Bacteria of Sewer Air and Drain Air, with special reference to the Conveyance of Sewage Bacteria by Air Currents, by F. W. Andrewes, M.D. Annual Report of the Medical Officer of the Local Government Board, Vol. xl., p. 387. 1910-11.

change has been the result, not so much of fallacious interpretation of facts by earlier observers, but of the careful and costly measures which have been taken during the last thirty to forty years to protect the public from the influence of emanations from sewers and drains. At all events, although sewer air is not generally regarded in such a dangerous light as it formerly was, there is no doubt a considerable body of medical opinion which retains the view that certain diseases, notably typhoid fever, diphtheria, quinsy and sore throat, and certain "septic" diseases, are fostered, or are even actually produced, by exposure to sewer air or drain air.

On the other hand, many believe that if past prevalences of disease attributed directly to sewer air could be reinvestigated in the light of present knowledge, some other explanation of the facts ascertained would be patent, and that emanations from drains and sewers, though they may be extremely objectionable to the senses and harmful in the same way that any offensive air may be, are not the cause and do not foster the spread of any disease. Thus Dr. Haldane expressed the opinion in his evidence that the theory of sewer air infection was based on "worthless evidence," and that, as a general rule, "illness was put down to sewer air if the cause was unknown," particularly so "at the time when the influence of water and of milk and of personal infection was really not understood." He was even "very suspicious of the theory" that sewer air, apart from its smell, can be a predisposing cause of disease.

It is clearly impossible to prove, by direct evidence, either the one proposition or the other—either that emanations from sewers were actually the cause of epidemic illness in the past, and would be so again if opportunity offered, or that these conclusions were wrong and that such emanations do not cause epidemic illness. Nevertheless, it may be said that it is by no means the case, at the present time, that opportunity does not exist for sewer or drain emanations to foster disease if they are capable of doing so, and that our present knowledge as to the influence of personal infection, of infected water, of infected food, of infected dust, and so forth, does afford presumption that some at least of the conclusions of the earlier investigators may have been erroneous. . . .

ASSOCIATION OF DISEASE WITH DRAIN DEFECTS.

In the investigations to which we have already referred, in which there had appeared to be direct causal relation between disease in human beings and exposure to sewer air or drain air, it is probable that this supposition has often been based on the frequent association of disease with drain defects. It is a common routine practice to examine the drainage systems of houses on the occurrence therein of the more important infectious diseases, and the frequency with which this has revealed the existence of drainage defects, permitting of the possible entrance into the house, sometimes of drain air alone, sometimes of drain air mixed with sewer air, has been regarded as affording presumption that the two facts were directly connected. For example, it has been stated that in one town out of 196 invaded houses as many as 89, or 45 per cent, had defective drains; and that in another town out of 548 houses invaded with typhoid fever, 151, or over 29 per cent, exhibited drain defects, and so on. It is obvious, however, that even such frequent association of disease and drain defects does not afford any presumption of causal relationship between the two, unless it can at least be shown that the existence of drain defects is very much more common in houses invaded by disease than it is in houses not invaded by disease. . . .

EAST GRINSTEAD.

A very striking instance of this kind is provided by East Grinstead, a small town of some 7,000 inhabitants, in Sussex. Although this town is largely residential, there are practically no intercepting traps at all, and no ventilation of the sewers is provided, except such as can take place through the soil pipes and ventilating shafts of house drains. Dr. Wallis, who has been medical officer of health of this town for many years, informed us that he has been unable to trace any ill-effect on the health of East Grinstead to the system of drainage in use there, and he submitted statistical data in support of this view. These show that the annual general death-rate in East Grinstead during the last twenty years has always been low, ranging from 14·2 to 8·9 per 1,000. During the four successive quinquennial periods between 1891 and 1910 the average annual death-rates were 13·2, 11·9, 9·7 and 9·9 per 1,000 respectively, as compared with 18·7, 17·7, 16·0 and 14·6 per 1,000 respectively in England and Wales. During the same period thirty-one cases of enteric fever were notified in East Grinstead, an average annual attack-rate of only 25 per 100,000 of the population. Diphtheria, likewise, has had a small incidence there, while the average death-rate from the principal epidemic diseases, including diarrhœa, was also low—*viz.*, 0·9 per 1,000.

It is important to note that from time to time drain defects similar to those found in other places have been found in East Grinstead, and that the measures taken in regard to defects in house drains are similar to those taken in other towns. Nothing exceptional in this connection has been done.

GERMANY.

Mr. Durham brought to our notice the experience of certain towns in Germany in this connection. In Germany it is unusual to provide an intercepting trap on the house drain, and in many towns the trap is actually prohibited. Mr. Durham informed us that the omission of the trap originated with an Englishman, the late Mr. Lindley, the designer of several sewerage systems on the Continent. Mr. Lindley was opposed to the principle of the intercepting trap, holding that the house drainage system should be regarded as an integral part of the sewer system, and this, we understand, is the accepted view in Germany.

Mr. Durham has himself had large experience in Continental drainage work, and he informed us that he has never heard of any complaint being formulated in Germany as a result of the absence of the intercepting trap, although, owing to the severe winters there, the house drainage pipes, which are above ground, are placed inside the house. Indeed, he stated that the only important German town which, in his experience, insisted on the provision of an intercepting trap—*viz.*, Cologne—had since 1896 prohibited its use, and that in that town many existing traps had since been removed.

Mr. Durham gave us much interesting information as to German methods in the drainage of houses, the most important of which was in regard to the German method of construction of sink and bath waste pipes. These do not discharge into the open air, as is usual in this country, but into a common waste pipe similar to, but of smaller diameter than, a soil pipe, and ventilated like a soil pipe. These pipes, like the soil pipes, are placed inside the house, and are constructed of iron. In Germany underground pipes are usually constructed of cast-iron with lead joints, and if stoneware pipes are used the joints are made with asphalt and not with cement.

The vital statistics of certain German towns which have been sewered in recent years were submitted by Mr. Durham as showing that the omission of the intercepting trap has not done harm. Without laying undue stress on these statistics, it is suggested that, if the admission of sewer air into house drains is likely to be a factor in the dissemination of disease, it might be expected that the lowering of the general death-rate and that from typhoid fever, which usually follows systematic drainage of a town, would be absent or less marked in those towns which have not required the intercepting trap. There is no evidence of this, however, in the available statistics. The improvement of health after systematic drainage seems to have been quite as striking in these towns as in many English towns under like circumstances, both in Cologne, which formerly required the trap and in the other German towns which did not. The following figures are taken from the annual summary of the Registrar-General of England and Wales:—

In Berlin the general death-rate has fallen from 26·5 per 1,000 in the quinquennium 1881-1885 to 15·5 per 1,000 in 1906-10, or by 41½ per cent; in Hamburg from 25·2 to 14·8 per 1,000 in the same periods; in Dresden from 25·0 to 14·7; in Breslau from 31·3 to 21·2; in Munich from 30·4 to 17·4; and in Frankfort from 19·7 to 13·8. In Cologne* the death-rate fell from 26·6 in 1881-85 to 17·5 per 1,000 in 1906-10, or 34 per cent.

The statistics as regards mortality from enteric fever are similar. For the same quinquennia, 1881-85 and 1906-10, mortality from this disease in Berlin amounted to 23 and 4 per 100,000 respectively; in Hamburg, 28 and 4; in Dresden, 18 and 4; in Breslau, 29 and 5; in Munich, 17 and 2; and in Frankfort, 12 and 2. In Cologne the mortality amounted to 25 and 3 respectively.

* In 1888 Cologne was enlarged by the incorporation of many outlying places. The death-rate from all causes in the quinquennium 1891-95 was 24·4 per 1,000, and that from enteric fever 12 per 100,000.

AMERICA.

In the course of our inquiry we have also received interesting information from America. The tendency there appears to be to abandon the intercepting trap, and, although we have no statistical information, we understand that where it has been given up or its provision is not enforced no harm has resulted.

VENTILATION OF SEWERS.

So far we have dealt with the question of the intercepting trap without reference to the ventilation of sewers. We have done so intentionally, because, as we pointed out at the outset, the objection adduced by opponents of the trap that it prevents the ventilation of the sewer by the house drain is regarded by those who favour the trap as the main reason for retaining it. But now that we have investigated the advantages and disadvantages of the trap apart from their bearing on sewer ventilation we may briefly consider the latter point of view.

The opposing contentions are, on the one hand, that the intercepting trap makes the ventilation of sewers difficult and costly, and that without the trap the ventilation of sewers may be effected through the soil pipes of house drains safely and without nuisance; on the other hand, that it is the business of the responsible public authority to make independent provision for the ventilation of public sewers, and that it is improper to make use of house drains for this purpose, not only because they are private property, but also because, even if such a proceeding is unlikely to cause illness, it may be offensive from the escape of sewer air near windows and chimneys.

As to the latter objection, we have already pointed out that the experience of East Grinstead and other places shows that the result of using private house drains for ventilating sewers is, usually, not to increase, but to lessen the nuisance that may arise from the escape of sewer air. There can be no doubt, too, for it has been repeatedly proved, that, so far as nuisance is concerned, the escape of sewer air at a height is much to be preferred to its escape at the ground level.

IMPORTANCE OF SEWER VENTILATION EXAGGERATED.

On the other hand, it is probable that in the controversy that has taken place upon the intercepting trap too much importance has been attached to the question of sewer ventilation, for there is a considerable amount of evidence which indicates that the necessity for ventilation of sewers has been exaggerated.

The ventilation of sewers—and by this term we mean the free and systematic ventilation of sewers—is usually regarded as necessary for two main reasons—*viz.*: (1) To prevent the forcing of drain traps inside and about houses by pressure of air from the sewer, and (2) to enable sewer men to do their work in safety.

As regards the prevention of pressure on house traps, we have already detailed experiments which show that, even in Bristol, in spite of the absence of any designed sewer ventilation, pressure on the intercepting trap did not arise when the sewer was surcharged until the opening of the sewer connection in the sewer was submerged, and that, therefore, if the intercepting trap is absent, pressure on the house traps, such as that of a water-closet, is likewise not liable to occur until the sewer connection is submerged.

As to the pressure on the intercepting trap, which in the Bristol experiments arose after the submersion of the sewer connection, we have also pointed out that not only can this pressure not be avoided by any system of sewer ventilation short of the ventilation of every sewer connection, but also that similar pressure on house traps is manifestly unlikely to occur when the intercepting trap is absent, if the pipe to which house traps are connected is ventilated in the customary manner.

It appears therefore that, for the purpose of preventing pressure of sewer air on house traps, the necessity for the independent ventilation of sewers is not established, and that, as we have already explained, this is mainly because it is impracticable to make systems of sewers airtight.

Furthermore, the experience of Bristol does not suggest that a system of sewers which is not ventilated is attended with more risk to sewer men than a system which is freely ventilated. Sewer men in Bristol have been singularly free from accident, although it appears that before men are admitted into a sewer the usual precaution taken is to open several adjoining manholes about an hour beforehand, a precaution which is commonly taken in towns whose sewers are freely ventilated.

There is evidence to show, however, that, under any circumstances, great care should always be exercised in the case of large sewers, in which men can walk, to ascertain that the interior is safe before men are admitted, and that the existence of means of free ventilation should never be regarded as a sufficient safeguard in itself. The history of accidents which have occurred shows that dangerous conditions may arise very unexpectedly in large sewers. For instance, in a case at East Ham, investigated by Dr. Haldane, where five men were suddenly overcome and drowned in a large outfall sewer, it appears that the spot at which the accident happened was regarded as quite safe, and that men had been in the habit of entering the sewer there daily for several years without taking any special precautions. Yet on the fatal occasion a man entering in the usual way was observed to fall at once into the sewage, and four men who followed in succession to the rescue of their comrades were similarly overcome. Dr. Haldane's investigations showed that this disaster was caused by sulphuretted hydrogen, but the conditions which gave rise to the accumulation of this dangerous gas could not be exactly determined, although it was surmised to have been due to the combined effects of a high temperature and a shortage of public water supply, which led to unusually rapid putrefaction of sewage, both in the sewers and in the intercepting traps of house drains.

There have been somewhat similar accidents elsewhere in ventilated sewers, and Dr. Haldane is of opinion that in some cases the disturbance of sewage, caused by men wading in it, has led to the unexpected evolution of sulphuretted hydrogen.

A new danger has arisen of late, we understand, from the occasional discharge of petrol into sewers. This proceeding requires to be sternly repressed, not only because it may imperil the lives of sewer men, but also because of the risk of explosion. Ventilation of sewers cannot be an effectual safeguard against this danger.

In the case of sewers which are too small for men to enter, which, as a rule, include those of a smaller diameter or height than about 3 ft. 6 in., it would seem that the need for their ventilation, on account of risk to sewer men, hardly exists at all, and that the important requirement is that the manhole chambers on such sewers are safe when men have to descend into them. To ensure this it is usual to open two or more adjoining manholes, so as to induce currents of air for the time being.

If, therefore, the objection to the intercepting trap rested solely or mainly on its interference with sewer ventilation, we should be inclined to question the importance of such an objection.

DIFFICULTY OF VENTILATING SEWERS.

In this connection it may be mentioned that, in places where more or less elaborate means of sewer ventilation have been adopted, their efficacy in actually producing ventilation appears to be often in doubt. In Manchester,* for instance, where several methods of sewer ventilation were experimentally tested for prolonged periods, the best proved to be one in which mechanical means were employed, air being extracted from the sewers by fans and admitted at various regulated inlets. It was found, however, that the air in the sewers was not affected more than about 180 yds. from the exhaust, and that the volume of air entering at the inlets was much less than the volume extracted by the fans, although the sewers under examination were made as airtight as possible, by providing every sewer connection with an intercepting trap and by closing all known openings except the regulated air inlets.

Again, the factors which govern the movements of air in sewers are so complicated and uncertain that it appears to be quite impossible to foretell whether any given opening in a sewer will act as an inlet or as an outlet for air. Even when a tall shaft is erected close to an offensive street manhole, with a view of causing the manhole to act only as an air inlet, it sometimes happens that the manhole continues to act as an offensive outlet.

In Leicester the sewers are very freely ventilated, for not only are intercepting traps uncommon, but many independent sewer ventilating shafts are also in existence. It appears that the object of providing the latter was largely with the view that they would act as outlets for sewer air so that the ventilating shafts of house drains would act as inlets for fresh air. Mr. Mawbey, the borough surveyor of Leicester, has

* Reports to the Manchester Corporation upon the examination of the air of sewers upon which systems of artificial ventilation were tested, T. de Courcy Meade, 1901, and A. S. Delepine, 1906.

carried out numerous systematic observations on the air currents in the sewer ventilating shafts, and he has found that, although generally the velocity of the outgoing air was greater than that of the ingoing air, they acted frequently both as air inlets and as air outlets, even within brief periods of time. Thus in 1,042 observations on thirty sewer ventilating shafts (6 in. by 4 in.), each observation lasting fifteen minutes, the anemometers recorded 619 down currents and 1,002 up currents. Many shafts, therefore, acted both as air inlets and air outlets during each observation, while some never acted as outlets. Similarly, with twenty shafts of larger size, in a total of 575 observations, the instruments recorded 449 down currents and 547 up currents.*

Moreover, it is necessary to point out that, if the ventilation of sewers and the exclusion of sewer air from house drains by intercepting traps were proved to be necessary, it would be requisite to make provision for the separate ventilation of every sewer connection, for, as the Bristol experiments showed, it is only when the aërial continuity of sewer and sewer connection is interrupted that sewer air is likely to pass into the house drain. Such a system of ventilation would be not only costly, but difficult, if not impossible to carry out generally, for it would involve the erection of ventilating shafts on, and their projection above, the fronts of houses, to which there is naturally great objection. If the intercepting trap is omitted, however, the ordinary house drain ventilating shaft at the back of the house serves as outlet, not only for air from the sewer itself, but also for air from the sewer connection, after its opening into the sewer has been submerged.

STERILISATION OF WATER BY ULTRA-VIOLET RAYS.

RECENT PROGRESS.

The adoption of the ultra-violet rays for the sterilisation of water by several municipalities in France, as well as by numerous hospitals, industrial concerns and private establishments, shows that this new method is making considerable headway. It is also to be observed that the "R.U.V." sterilisers, which have been successful, as stated above, in France, are now being introduced into this country by Mr. Philip J. Bertin, so that we may look forward to seeing trials made at home upon a proper commercial scale.

The process is of recent origin. The first patent relating to sterilisation of water by means of the ultra-violet rays was that of De Mare in the year 1906. The research work of Messrs. Henri, Helbronner, and von Recklinghausen at the Sorbonne University of Paris is of recent date. Minor experiments have been made in this country, while in America the first commercial undertaking has not been working very long.

It appears that while ordinary light produced at low temperatures, such as that from gas, incandescent filament lamps, &c., is poor in ultra-violet radiations, the sources of light based on the incandescence of vapours are extremely rich in ultra-violet rays. Thus the mercury vapour lamp enclosed in a quartz container is used. These lamps have a very long life, and are therefore economical.

Experiments have shown that the water has the power of absorbing the ultra-violet rays to a very great extent, and it has therefore been found necessary to construct the apparatus so that as little air space as possible is interposed between the lamp and the water which has to be treated. Of course, it is now generally understood that the rays exert a germicidal effect upon the water. It is, however, necessary to have a small air space between the lamp and the water, otherwise the temperature of the lamp is increased, and as a consequence the light power is decreased and the efficiency of the lamp is lessened. The temperature of the lamp is maintained at a few hundred degrees centigrade. Also it has been found that lamps which are in direct contact with the water are apt to become covered with scale, which, being impermeable to the rays, interferes with their work of sterilisation. Similarly it has been found necessary to work with a perfectly clarified water in order to obtain good results. In the R.U.V. system the water is passed under a single lamp and is agitated so as to turn over and over any dust particles contained likely to obstruct the action of the rays on the micro-organisms which such particles of solid matter. Further, in order to make the whole system as safe as possible all the treated water is automatically excluded from the reservoir of sterilised water by means of an electric connection between the quartz lamp and an automatic valve, so that the untreated water is shut off upon the failure of the electric current.

Perhaps enough has been said to demonstrate that the process has passed beyond the experimental stage. Sterile water for public use is now a practicable possibility, and the merits of the ultra-violet ray system must recommend it for serious consideration. The cheapness and simplicity of the plant and absence of chemicals in the water are advantages which cannot be overlooked, and which should go far to ensure the successful application of the method in England.

A CHICAGO INSTALLATION.

An account is given in the *Engineering Record* of New York of plant for the filtration and sterilisation of Lake Michigan water at Chicago. This water is used in a bottled water service for drinking purposes. As this is probably the first application of the ultra-violet rays to sterilisation of water on a commercial scale in America, it is of special interest. The plant deals with 150 gallons per hour, and has been in operation since March 14th of the present year. The process consists of coagulation, sedimentation, double filtration and sterilisation by means of the violet rays of a Cooper-Hewitt quartz tube mercury vapour lamp.

An ordinary small-sized lamp is enclosed in a 11½-in. diameter case. The ordinary glass globe used to cut out the rays is omitted, and a 5-gallon copper cylinder is substituted. The water enters the bottom at the periphery of the can in a tangential direction, rises to the surface and flows over a cylindrical baffle and under a second concentric baffle, and finally escapes by a 1-in. overflow pipe in the centre. It was found that the mercury-vapour tube gave best results when placed 2½ in. above the surface of the water. The water from the city mains is used and is treated with ½ to ¾ grains of aluminium sulphate per gallon, after which it is allowed to settle for two or three hours. It then passes through two 20-in. diameter pressure filters, and before entering the second filter it receives from ½ to ¾ grain per gallon of the coagulent. This, we are told, is absolutely necessary in order to obtain sterilisation by the violet rays. Even with this amount of preliminary treatment erratic results were at first obtained. These were found to be due to small bubbles of free air (arising from the removal of pressure on the water issuing from the filters) causing the water to be too cloudy for proper working. Thus an additional open tank had to be inserted on the line.

In the consumption of current the installation is said to be too small to warrant giving any figures. Current for a 110-volt 4½-ampere lamp is obtained at the rate of 8 cents per kw. hour. The cost of the process and the price paid for the bottles of water are not stated. Elaborate precautions are taken in cleaning the bottles and in corking them. Further, the vessel in which the water is stored ready for use is cleansed and sterilised by means of a portable violet-ray lamp, which is set down over the jar for five minutes.

Problems in Engineering with Solutions.*—The English journal THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER carries on a section devoted to various questions which might be put in an examination for the position of municipal engineer in an English town or city. The questions are given one week and answers provided by various correspondents given in subsequent issues. The volume noted above is the first one to be made up from these questions and answers. As is well known, the position of municipal engineer in England is one of most varied activity, so that the subject covered by the questions and answers extends through the whole field of engineering. For example, the chapter headings are as follows: Mechanics and Hydrostatics; Strength and Elasticity of Materials; Theory of Structures; Surveying and Levelling; Water Supply and Hydraulics; Sewerage, Sewage Disposal, Road Making and Railways; Building Construction and Materials; Law and Miscellaneous. While the questions and most of their solutions are distinctly British in character, the wide range of subjects and the method of treatment make the book of some value to American engineers. There is a good deal to be said in favor of the question and answer method of instruction.—*Engineering News.*

* Report to the Highways and Sewerage and Sanitary Committee of the Borough of Leicester on "Sewer Ventilation," by E. G. Mawbey, M.Inst.C.E., 1909.

* Being Questions and Answers reprinted from the Assistants' and Students' Section of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER. First Series, 1905-10. Edited by Sydney G. Tuttle, Assoc.M.Inst.C.E. London: St. Bride's Press, Limited. Price 5s. nett.

Institution of Municipal and County Engineers.

ANNUAL GENERAL MEETING IN LONDON.

(*Conclusion.*)

The last of the series of papers submitted for the consideration of the members of the Institution of Municipal and County Engineers during the second day's proceedings at Caxton Hall, Westminster, is reproduced herewith:—

HOW THE NEW DISTRICT COMMITTEES MAY PROMOTE THE PROGRESS OF OUR INSTITUTION.

By A. HORSBURGH CAMPBELL, M.INST.C.E.,
City Engineer, Edinburgh.

[*From Photo by D. M. Lee & Son, Blairgowrie.*

This paper will of necessity be brief: not that the subject with which it deals is in any way to be considered a small one, but that with respect to the object of the paper there can be but one opinion, and that is the desirability of the new district committees each becoming a source of strength, a centre of influence, and a power for good among the members in particular, and, indirectly, those serving in the "rank and file" of the profession within the respective districts and not yet connected with the institution.

That there is a great field still to cultivate, that there are many eligible men who still hold aloof from our ranks, either from indifference, for lack of that *esprit de corps* that should unite us, or because of their attachment to other bodies, is an admitted fact, and it is to be hoped that the new constitution and the introduction of new aggressive work and of personal influence may tend to the gathering in of such as ought to be members of one flock and units of one incorporation. It is only right in passing to give a meed of praise to our retiring president, who during his year of office has induced a greater number of meetings, obtained larger gatherings at those meetings, and generally quickened interest to a degree not attained by any of his distinguished predecessors, and in this way has caught the spirit of the times, and has given a send-off to the new life of the institution; but the immediate purpose of the paper is to endeavour to carry on this revived interest, to excite action where not yet aroused, and to give opportunity to the members of the institution by the submission of this paper for free discussion and ventilation for the diversity of view and expression of the varied opinions which are entertained in regard to the methods and means to be applied in the progress of our institution.

I do not mean by such progress merely increase of members, but primarily for increase of usefulness, of professional and scientific betterment, and for those things which weigh even more heavily and which bulk more prominently than that of mere numerical strength. That there is much scope for this must be patent to all thinking ones, when we consider that as yet we are too much as separate units where we might be a combined organisation, our efforts too much of an individual kind rather than those of an organised body, so that we find:—

(1) The multiplicity of associations and institutions with their manifold branches instead of one powerful whole; we find division and disunion instead of that "unity which is strength." But how are those divisions to be healed and this institution to become a vehicle of power and influence professionally?

Chiefly, I answer (1) By the agency of the district committees, and indirectly (2) by the co-relationship of districts with central headquarters; (3) by means of an official magazine; (4) by the establishment, in connection with our institution, of an intelligence bureau; and (5) by the granting of a Royal Charter. The last named of these, and probably the most important, can only hope to be obtained when the other steps have been successfully scaled.

(1) *By the Agency of District Committees.* It is well here to refer to the new Articles of Association and by-laws constituting those district committees.

Article 35 says: "District committees of the association may be formed, and district secretaries appointed, in accordance with the by-laws for the time being of the association, and there shall be referred to such committees all such local or other business and matters as the by-laws for the time being shall prescribe, or as may be specially referred to them or any of them by the council; but the acts and resolutions of the district committees shall not be binding upon the association unless approved of by the council"; and, again, in By-law 11, it is provided "for the purpose of promoting the increase and extension of professional science, knowledge and practice, and the interchange of views thereon, for educational purposes, and for the promotion of the professional interests, rights, powers, and privileges of the members, and the improvement of their professional status, and for the election of district representatives of the council, the United Kingdom, and such parts of the British Empire as are hereinafter mentioned, shall be divided into the following districts . . .," and so on, to the number of some fifteen districts in all.

Although occupying such little space in the printed matter, four great countries and continents comprising districts twelve to fifteen are considered so unimportant as to be disposed of in one short line—*viz.*, Scotland, Ireland, India and Africa; and in the course of the same section it is provided "that each district committee may arrange for such meetings in its district as it thinks fit, but the business at such meetings can only be for the purpose above mentioned, and such business as is incidentally necessary thereto."

I proceed now to discuss how our progress may be promoted:—

(1) *By the Agency of District Committees.* The formation and constitution of those district committees is set forth in the extracts above given; but it must not be supposed that those committees—if they are at all to realise their utility and to rise to their expected level—will be restricted in their meetings or their services to the mere letter of the constitution bringing them into being.

The printed constitution is but the skeleton of the body, but the dry bones to the living reality. This reality must consist of the putting on of flesh, and the stirring to the depths of that as yet untouched body of opinion and of skill that still holds aloof, and that must be brought into a living unity with us as an institution.

I suggest for the consideration and discussion of the members the following methods, among others which it is hoped will be submitted by members at the meeting, and which is indeed one of the purposes of this paper:

(1) Each district committee, being representative of a group of counties, may within its own sphere subdivide into counties.

(2) Each district should have a strong executive committee for the management and administration of its own affairs.

(3) Each district should, within itself, be a self-governing part of the whole, and should be permitted to realise its own independence.

(4) To maintain the corporate unity of the institution, the district committees should be united by the medium of the general council of the institution and the permanent officers at headquarters.

(5) An officially recognised magazine or *Surveyors' Chronicle* should be established, with the editor-in-chief responsible to the institution as one of the headquarters' staff.

(6) Such an organisation, actively maintained, must eventually lead—in combination with other municipal services—to one result—*i.e.*, the granting of a Royal Charter providing for efficiency of qualification, standardisation of skill, protection in the zealous and capable performance of duty, and mutual support and defence of members.

The foregoing are only suggestive, and not by any means exhaustive of the sphere of influence which our institution may yet command. I observed at a recent meeting our friend Mr. E. J. Elford, of Southend, the secretary of the Eastern District, asked for suggestions as to those new district committees. It was a sign of the times; the darkness before the dawn of that new day of restored energy and activity of life at headquarters, as well as in the remoter part of our realm.

But to elaborate briefly the several suggestions above submitted:—

(1) *Districts and District Committees*—with sub-division into county areas.

It will be felt, I think, that the districts created by the new constitution are still too large in area and too widespread in membership for them to exert the influence they otherwise might. Districts which, for instance, comprise five or six administrative counties of England, and in another instance the whole of Scotland, and, again, the whole of Ireland, cannot be considered sufficiently identical in local experience, and must be still too large and scattered to permit that frequency of contact which is so needful if interest is to be maintained.

Periodically (such as once, or preferably twice, a year) it is well that members resident in the same district should come together; but this infrequency of meeting is not calculated to knit so closely together the members as, say, a monthly—informal—meeting can do. Of course, it will be said, "Oh, what is the good of systematising down to the county unit?" I answer, "Because the county unit is a well-defined, homogeneous area, possessing in its county council, and in its several urban and rural district councils as local governing bodies, certain close community of interests, kindred concerns, and facilities for frequent meetings of the officers to discuss, learn and profit by." (2) The county unit has already been tried and found not wanting in the Kent county surveyor, the Somerset county and the Thames Valley surveyors, although possibly the last-named is not strictly the county of survey. Sufficient experience has now been obtained of those and kindred county sub-divisions of our institution to be assured that those can only be for good, and that their multiplication through the length and the breadth of the land is to be desired. This increase can only be successfully accomplished through the agency and under the guide and direction of (1) the general council, but more particularly and in detail by (2) the district committees.

The general council, as the focus and centre of influence, unifying and assimilating the many distinctly local efforts, aiding by advice, guiding by experience, and encouraging by cash aid where necessary those new forms of activity, and, secondly, the district committee being more local by lending the practical assistance of its officers in the setting up in each county within its own area of a county association or other suitable sub-section, officered not necessarily by the district officers, but by its own local chairman, secretary and committee. The functions and duties of these last named would necessarily be small, but not by any means unimportant. They would be in their initiative executive officers, responsible through the district committee, and thereby to the council of the institution, for the growth, interest and life and zeal of their county members. It is not from Westminster that the outposts will be moved won and saved but by the persuasion of one's self to the immediate neighbourhood. The meeting in those outposts will then find that there are not bad townships or isolated defaulters, but a body of colleagues of a good kind, operating really at all times to aid by advice, to stand together in meeting, and to defend (if need be) by financial contribution and moral support unjustly impeached

(2) *District Executive Committees and Officers.*—It is upon them more than aught else will depend the progress of the institution under their respective areas. They are the intelligence department between the suggested outpost officers, and the headquarters' permanent staff. Upon them will depend whether their districts are to be active centres of influence for pushing along the work, and for reviving and maintaining interest; which can only be done by frequency of meeting, enabling the formation of professional and personal friendships, having in each district, say, two meetings annually, one a summer meeting for district business and for visitation of works, and one a winter meeting for discussion of papers on some scientific or professional topic, to be followed or accompanied, say, by an annual district soirée, or other form of social gathering.

And here I would beg leave to utter a note of dissent from that phrase in the new by-laws which provides that "All members," &c.—that is, of the institution—"shall be invited to attend the various district meetings;" this is quite superfluous, a waste of stationery, stamps, time and money, which I trust the council may speedily correct. As illustration, take the recent annual meeting of the Scottish district at Stirling. There we were honoured by three or four visitors only from England, none from Ireland, none from Wales. Yet, according to By-law 11, every member, associate member and student—about 1,400 in all—is individually invited by a postal communication for the sake of about sixty local members and three from across the border; or, again, take the recent East Ham meeting, with an attendance of about thirty-six to forty all told, no less than about 1,400 to 1,500 invitations are sent out, and this waste of everything repeated on the occasion of each meeting ! ! that one is disposed to ask, "To what purpose is this waste?" when, moreover, the fact of the meeting can be read in the technical Press over and over again. I respectfully submit that if we notify personally the district members only and announce in the Press notice of the meeting, "Members from other districts are cordially welcome by due notification to the district secretary," that this wanton waste of paper, printing, stamps and time will be saved to the institution, and the district secretary much relieved.

But the district committees can do more than arrange two meetings annually; they can come in to fill the void between the private members and the council that sits only at distant intervals at Westminster; they can be the medium of intelligence, the centre of information, the seat of succour to the brother down on his luck through some mischance that may have lain in wait upon him. I would, however, throw out this hint to my colleagues upon the council, and invite the consideration of the members to the proposal for the council itself to be more migratory, and less fixedly Westminster in its place of meeting. There are about twelve districts, excluding India and Africa; why not change the venue of our council meetings so that, say one a year or thereabouts, the council, by holding its business meeting in that district, will come into close touch with the particular affairs of each district, without neglecting its duty to the whole institution? The presence of the council once annually in each district could only react with benefit upon both the council and the officers and members of that district. But, further, the district committees can, by their diligence, call into being that merely strictly local county administration already referred to. If they fail in this needed growth of our institution work, who shall succeed? And I would therefore commend this propaganda to their best consideration.

(3) and (4) *Each District to be Self-governing, and through the Secretaries to be in constant touch with Headquarters.*—This is essential to success; each must work out its own salvation along lines suited to its own locality, subject always to the nominal oversight and veto of the council to be evoked only in case of crisis or of need—that is, not interference from headquarters. That is allowing latitude and freedom for the expansion and development of the institution along the varied channels and by the many ways that lead out of individual effort and official freedom, and the district committees may therefore vie with one another in bringing each forward new forms and ways suited to its own locality. But although self-governing it is to be desired that the council should have the benefit of new ideas and fresh district developments, so that they as the central governing body may communicate such developments to other districts. Therefore another reason for the council to be migratory in its

meetings, and for frequency of correspondence, constancy of communication between general secretary at headquarters and the hon. secretary of each district is to be encouraged.

(5) *An Official Magazine to be Published.*—It is said, "Of making many books there is no end." This doubtless is so, but the initiation of a magazine—to be published quarterly to begin with—is an equipment much to be desired of the strictly official work of our institution. Consider what it may not accomplish for us, as the intelligence domestic bureau for its nearly 1,500 members as the voice and vehicle of official information concerning the work, ways, and progress of the institution in its various districts, as a medium of direct interchange of individual and official thought and opinion on matters professional, and, it may be, officially personal; further, as the collector and distributor of information, as the statistical centre and publisher on matters of solely institution interest; as the publisher of official minutes, notices, reports, &c., connected with the institution.

I do not suggest that such a magazine or chronicle should reproduce *in extenso* those papers and reports, many of which (like the present) may be a weariness of the flesh, but that there is a need for some such magazine, and a sphere for some such chronicle, is patent when it is remembered that, if we are to keep ourselves individually abreast of current professional views and literature, we have weekly to go through the countless columns of almost countless publications, to extract therefrom those tit-bits of information which appeal to our peculiar and personal needs and tastes. What is wanted in our professional literature is such a time saver as a surveyor's review giving ready references to things that matter to us as municipal and county engineers; so that we might go for further information to any particular article in the particular paper containing the article.

Such a chronicle as I suggest, capably edited by one more or less in responsible touch with the council, has possibilities we cannot forecast for the betterment of our institution. It would be, as regards purely institution business, the full record; and as regards science and art as applied to our work, the informer and reference to the articles in other press publications. It would not, therefore, be competitive in any way with the existing technical press, which is so full and informative on such matters; but supplemental to that press on the important inner affairs of our institution, and that which really matters to us as a profession.

(6) *Royal Charter.*—This surely is an aim worthy of us all. It may be but as yet an idle dream, an airy phantasy; still, it is a consummation worthy of our best aim. If it inspire us to proper purpose, to sustained integrity, to continued good work in the straightening up of crooked ways, and making plainer and easier for the multitudes we serve life's rough paths, we shall have at least merited that mark of Royal favour in the granting of a charter that will enfranchise our profession in this League and Union of Honour, and give it that material strength that shall wield power to defend collectively as our duty a member and a brother unworthily aspersed, and to succour him and them who, through no fault of their own, are falling in the race.

May I hope, in conclusion, that the submission of these suggestions will induce a host of others which can point the way of work to our council and officers for the continued progress of our institution and the betterment of our work in our respective spheres of public service?

DISCUSSION OF MR. CAMPBELL'S PAPER.

Mr. J. L. Redfern (Gillingham), in proposing a vote of thanks to Mr. Campbell, said he had read the paper with great interest. He was sure the district committees would not lack subjects for discussion. There was no want of interest in the professional side, but what he should like the district committees to do was to pay particular attention to the material welfare of the rank and file. The questions of superannuation and security of tenure were both prominently to the front, and although superannuation was finding favour with the local authorities, it was difficult to convince people that security of tenure would be beneficial to all parties. But he thought so, and the district committees would have to look into the question very closely. They would have to keep pestering every authority, both Government and local, to grant them what they wanted at as early a date as possible. They knew the extent to which members of public bodies were hindered in the discharge of their duties, he himself had found it necessary to bring an action for libel last year against a local paper. He was successful in being awarded both damages and costs, and was able to get hold of the costs. He did not press for damages, as he did not want to be vindictive. But it was not everyone who came out as successfully as that, or who felt disposed to go to court, and he thought it was the duty of the district committees to investigate such cases, so that when a member was being subjected to a system of pinpricks the committee could be communicated with and some sort of remonstrance lodged. While some good would come of that, certainly no harm would result. When members knew they had the support of their institution they would feel in a stronger position than at present. Another direction in which the committees could assist would be in scrutinising advertisements and drawing the attention of local authorities to the inadequate salaries which were frequently offered in connection with official appointments, and it was his hope that they would do their utmost to improve the status of assistants. Miserable salaries were offered to these men after they had spent years of their lives in study and work, and it was a shame that advertisements of the kind he referred to should appear. In his own office one of his assistants who applied for an increase of £20 was offered yearly increments of £5, but on his (Mr. Redfern) protesting, the assistant got the £20 in one sum. He considered that the stepping-stones to the higher places in the profession should be made easier for the junior members.

Mr. F. R. Phipps (Basingstoke), seconding the vote of thanks, said the paper before the meeting was one of the most vital they had had, and it was the duty of the council and the members generally to consider it earnestly and see what they could do to improve their status. It was difficult to know what effect any representations of the district committees would have on councils who offered inadequate salaries, for the latter were likely to point out that the institution possessed no charter like the Institution of Civil Engineers, and it was therefore essential that they should go forward and get recognised by the powers that be. Possessed of a charter, their recommendations would have greater force. The county associations had been very successful where formed, because members had felt in the past that the institution covered such a wide area that they could not get local representation, and could not afford to travel great distances to the places where the meetings were held. The question of a journal to represent the institution was rather a difficult one. He thought they owed a debt of gratitude to the papers which catered for them at present, and he thought they had almost enough journals of the kind. His opinion was that it would be a difficult matter to "run" such a paper; it would be an advantage, but difficult to carry through.

Mr. E. Willis (Chiswick) supported the vote of thanks. Speaking as to the importance of securing unity before trying to get a charter, he said they must endeavour to draw into their ranks all the young men and most of the older men now outside their organisation, even though they might not be the most highly qualified. That done, they might stand a chance of obtaining a charter of incorporation. The Institution of Mechanical Engineers had not been able to get one; even the Institution of Electrical Engineers had been opposed. The terms on which the Institution of Civil Engineers admitted members did not cover the ground for members of this institution, and on that point he thought they had a chance if they could be unanimous. The district committees were too large to give the amount of help they looked forward to getting. A helpful point would be for a list of meetings and visits to be published, if possible, at the beginning of the session, and then members could make arrangements accordingly. They would have larger attendances if members had this information beforehand.

Mr. W. Harper (Cardiff) said he was sorry to strike a dissenting note. Mr. Campbell had covered a great deal of ground, but he could not see that he had broken any that was fresh. There was a lot of superficial talk, but no practical suggestions as to what the district committees could do. He was afraid, too, that if they followed Mr. Campbell's ideas of entering into all kinds of things at their district meeting that, instead of creating that unity which was essential, there would arise differing factions, with the result that they would have disunity everywhere. There was a word of caution he wished to throw out in all seriousness. He did not like the Socialistic element disclosed in the paper, and in particular was averse to the project of independent control by the various

district committees. He had no sympathy either with the idea of an itinerant council. Mr. Campbell had not, in proposing that the council should meet at twelve different places during the year, suggested a secretary's office on wheels. How could they conduct their business without their secretary and books of reference? As they knew, all the main railway lines led to London. He should like to see the council meet in Cardiff, but how many of the members could they expect to attend a meeting held there? He very much doubted whether they would get the necessary quorum, and he trusted that the proposal which had been put forward would not be entertained for a moment by the district committees.

The vote of thanks was carried.

The President (Mr. R. J. Thomas) said he had the utmost confidence that the district committees would be loyal to the council, and had no doubt that each district would so discuss the subject as to arrive at an amicable arrangement.

Mr. Campbell, in replying, said he had only one observation to offer as to the discordant note from Wales. They generally looked to Wales for light and leading, but that day Wales had treated them to a shower of cold water which had brought no refreshment with it. If his own had been only superficial talk he had hoped that Mr. Harpur would have contributed to the enlightenment of the meeting rather than have derided the efforts made by one of his colleagues on the council.

VISIT TO AYLESBURY.

Mr. Campbell's was the last of the ten papers which were considered during the two days' sitting at Caxton Hall. On the third day of the meeting the members travelled to Aylesbury, the county town of Bucks, where a paper on the municipal works of the urban district—reproduced in our issue of August 23rd last—was read by the engineer and surveyor to the local authority, Mr. W. H. Taylor.

The members were welcomed on arrival by the chairman of the Bucks County Council, Mr. Tonman Mosley, and Mr. Nippin, the chairman of the Aylesbury District Council, the former in the course of his remarks paying a warm tribute to the work of the president (Mr. R. J. Thomas) in his capacity as county surveyor. Alluding to the improvement of the highways which Mr. Thomas had effected, Mr. Mosley said there had been many difficulties to overcome, but he thought evidence of the adoption of up-to-date methods would be found wherever one went in the county. Acknowledgment of the welcome extended to the institution was made by Mr. W. Nisbet Blair (St. Pancras) and Mr. C. F. Wike (Sheffield), and the president added some words in appreciation of Mr. Mosley's remarks. Although not a native of the town, he had had the pleasure of living in Aylesbury for twenty-two years. Aylesbury had been very kind to him, and he had tried in a small way to take his share in its joys and sorrows, and he hoped to continue to do so.

In the discussion which ensued upon Mr. Taylor's paper,

Mr. C. Vawser (New Barnet) congratulated the author upon the low cost of tar-painting—0·748d. per super. yard—in Aylesbury. In regard to street lighting, Mr. Taylor, in referring to the change from flat flame burners to No. 4 Kern and large incandescent burners, had not stated what increase of illuminating power was obtained. Then as to the disposal of sludge-cake, was this rendered difficult during the summer owing to the lack of fertilising power?

Mr. G. W. Lacey (Oswestry), commenting on the low cost of road work—10·75d. per super. yard—put an inquiry as to the rate of wages paid for labour. Haulage at 6s. 6d. was also low. Working out the number of super. yards paved, the use of 135 tons of granite meant a coating of stone only 2 in. thick, and he thought that was a rather light coating. Mr. Taylor had used crude tar for painting roads and it was a point to be noted that the use of ordinary gas tar in many places appeared to meet with success. Many of them had been rather afraid to use crude tar on account of its varying quality, and had fallen back upon distilled tar and proprietary articles. Concluding, Mr. Lacey said he would like to know what had been the experience with grain te chippings as compared with sand for spreading over the tarred surface.

Mr. E. J. Elford (Southend-on-Sea) asked the reason for using flints when granite could be obtained for only 1½d. per yard more.

Mr. J. F. Smillie (Tynemouth) suggested that if effective team labour was obtainable at 6s. 6d. per day it would be much cheaper than keeping horses.

In closing the discussion, the President complimented Mr. Taylor on the way in which he maintained his roads for the county council. There had, he said, been a very distinct improvement in these roads in recent years, and that without any great increase in cost.

Mr. Taylor, in acknowledging a vote of thanks passed to him, explained that the tar-painting at 2s. 6d. per yard included only the paving, and not the 6 in. of rubble underneath. The No. 4 Kern burner gave a candle power of 120, and an average of 80, and the large incandescent burner from 150 to 170. The difficulty which arose in connection with the carting away of the sludge-cake arose only during haytime and harvest, when the farmers were too busy to send for it. The granite coating was of an average thickness of 2 in. to 2½ in. Labourers' wages in Aylesbury were 18s. per week. He preferred to use granite chippings in the direction suggested, but the cost would be much greater. Flints were used in a few side streets, but this form of paving was being gradually superseded by granite. He could not agree with Mr. Smillie on the question of horse-keeping, for he found that the work was done better with their own horses.

In the afternoon the Hon. Walter Rothschild's museum and the beautiful grounds of Tring Park were visited by the members, a number of stoppages taking place *en route* at points where excavations had been made in the road surface in order to illustrate the methods of construction adopted. On the return to Aylesbury tea was provided at "The Chantry" by the president, this kindly and much appreciated hospitality bringing the annual meeting to a close.

CORRESPONDENCE.

"Be calm in arguing; for fierceness makes
Error a fault and truth discourtesy."
GEO. HERBERT, *"The Temple."*

THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

To the Editor of The Surveyor.

Sir,—Referring to the paper which I had the honour to submit at the last annual meeting of our Institution of Municipal and County Engineers on the developments open to the institution for the progress and prosperity of its membership, I beg to send you herewith a letter which I have received from Mr. Thomas S. Picton, borough engineer, Eccles, Lancs, which he has given me permission to send for publication with a view to inviting correspondence on this important subject.

I shall be glad if you will find space for it in your valuable paper.—Yours, &c.,

A. H. Campbell,
City Engineer.

Engineer's Office,
Parliament-square,
Edinburgh.
September 2, 1912.

[COPY OF LETTER REFERRED TO.]

Dear Mr. Campbell,—Had there been time on Friday, the 12th inst., I fully intended having something to say on your paper, which you have clearly put before the members at our annual meeting in Caxton Hall. I may say I am in entire agreement with your theories. For purely propaganda and social work arranging the business of the institution into counties is very practical. Take, for instance, the North-Western District—comprising Lancashire, Cumberland, Westmorland, Cheshire, and the Isle of Man—except for the ordinary stereotyped district meeting, what chance have we got to bring all our members occasionally together in the winter for a social function, or during the summer for a day's outing or visit to some works of importance? None whatever. If a county division could be arranged, it would be much easier to accomplish, and I am sure would be very much appreciated by our Lancashire members.

Your next idea of the council holding its ordinary meetings occasionally in the provinces—has this ever been tried? If not, I cannot quite see the drift of the remarks of Mr. Harpur, of Cardiff, when he said that itinerant councils would be the means of causing a disunion in the institution. I cannot accept his argument. There is not such an accumulation of business in connection with the council's work that would necessitate *all* the books of the institution being brought to that particular council meeting. I think all the minute books, &c., that would be required for an ordinary

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
Age Limits for Appointments	314
Appointments Vacant	339
Assistants' and Students' Section	328
Association of Managers of Sewage Disposal Works	338
Correspondence	326
Country House Sewage Purification	335
Development of Swansea	314
"Dwellings" or Homes	315
Flood Havoc in Norfolk	327
Garden Cities and Garden Suburbs	314
Institution of Municipal and County Engineers:—	
Annual General Meeting in London	323
Correspondence	326
How the New District Committees may Promote the Progress of the Institution	323
Notices	338
Visit to Aylesbury	326
Institution of Municipal Engineers	338
Intercepting Traps in House Drains	313, 316
Lectures and Demonstrations for Sanitary Officers	331
Local Government Board Inquiries	330
Madras Water Supply: Progress of the Work	315
Municipal Competitions Open	339
Municipal Contracts Open	339
Municipal Tramways Association	338
Municipal Work in Progress and Projected	332
New Streets and Buildings	338
Overtime in Municipal Engineers' Offices	315, 327
Personal	334
Protection of Roads from Drifting Sand	315
Recent Publications	337
Royal Sanitary Institute Congress at York—	
Engineering and Architecture Section	335
Notices	339
Sterilisation of Water by Ultra-Violet Rays	313, 322
Structural Steel for Bridges and General Building Construction	331

council meeting could be put into a Parliamentary tin box, and sent off to, say, Edinburgh, Manchester, Exeter, Scarborough, Chester, or Newcastle, as the case may be, and the members of the council would naturally follow if they so desired. Where is the difficulty? The question of any extra expense would be very little, if any; and, looking at the attendance list during the last few years, some country members of the council have put in very bad attendances, even now when all the meetings are held in London (except the two annual meetings in the provinces). I think Mr. Harpur is making a great difficulty out of a very little matter.

About your idea of a magazine or review purely for officials, and on professional subjects and work. I welcome the idea, if it can be carried through in a proper manner, and edited by an accomplished engineer who thoroughly understands the work of a municipal and county engineer, and who would make it a "review," and not for advertisements only, but, as you have expressed it, "a time saver." If this "review" can be produced monthly at, say, 1s. or 6d. per month, it would, I feel sure, be taken up by most engineers, especially if the services of Mr. H. P. Boulnois or any other able engineer could be secured as editor of such "review."

Unless there is a little bit more life and enthusiasm put into the work of the districts, very little real progress will be made in our institution, and the chances of obtaining a Royal Charter few and far between. Our annual meetings are just over, and we hope to see each district get soon to work and inaugurate a policy of advancement on every line which may benefit the institution, so that all may meet together for mutual help and assistance, and also to stimulate our assistants and pupils to become attached to the institution, and consider it their home.

The "forward men" of the council *must* quicken the paces of the more conservative members. Unless we desire to be swallowed up by the "other society," *we must* be more progressive in our policy, and cater for the "younger members of our institution." I hope, Mr. Campbell, you will not be afraid to voice your opinions in the council meetings, and thus apply your gifts on behalf of the rising generation of members, who desire to see our institution the *first* in the United Kingdom.

Yours faithfully,

Town Hall, Eccles. THOMAS S. PICTON.
July 22, 1912.

[Mr Campbell's paper, and a report of the discussion which followed its presentation at the annual meeting, appear elsewhere in this issue. Ed. THE SURVEYOR.]

OVERTIME IN MUNICIPAL ENGINEERS' OFFICES.

To the Editor of THE SURVEYOR.

SIR,—May I invite your assistance and that of your readers to remedy or mitigate what I consider a great injustice to many assistants in municipal engineering offices? I refer to the overtime which in some of the larger offices is systematically enforced throughout the winter months, and to some extent in the summer as well.

I do not think any assistant worth his salt would object to an occasional spell of overtime if the pressure of work demands it, but to be compelled to work for months on end, as is done in some offices I am acquainted with, is neither reasonable nor just, and, so far as I can see, cannot be defended.

Any long spell of overtime is nearly always due to one of two causes—either want of proper organisation on the part of the chief or to the under-staffing of the office.

If it is due to poor organisation, it is rough on the assistant that he should have to suffer for the faults of his chief; and if it is due to under-staffing, for which the chief cannot always be held responsible, it is the duty of the chief to see that his assistants are sweated as little as possible.

That it is sweating there can be no doubt where men are asked to work three or four hours, and on occasion considerably longer, several nights each week, without any payment or return other than a paltry allowance of a shilling for tea, and even this is not always forthcoming. The trades unionist members of our councils are strongly opposed to overtime for their own class, even when paid for as time and a half or double time; and one well-known Labour M.P. within the last few weeks has gone so far as to say that if he had his way he would only pay half-pay for overtime, and that would soon put an end to it. If overtime had to be paid for in the case of officials at the same rate as that paid to artisans, we should get very little overtime worked, for I am sure that any official working his staff overtime under these conditions would find very little favour in his council's eyes, and would be soon told it must stop.

The hardship is particularly severe in the case of the younger assistants, who require all their spare time for working up for the examinations of the Institution of Municipal and County Engineers, the Institution of Civil Engineers, or the various examinations held in connection with our technical schools.

I am sure that in many cases it is only necessary to bring this matter before the heads of departments to effect a great improvement, and I would suggest, Sir, that a tactful letter from the council of the Institution of Municipal and County Engineers expressing the hope that their members would encourage their assistants to sit for their examination and give them an opportunity of obtaining reasonable time for study would bring about a desirable change, even if it is impossible to adopt a system of no overtime.—Yours, &c.,

N. T.

FLOOD HAVOC IN NORFOLK.

COUNTY SURVEYOR'S STATEMENT.

A special meeting of the Norfolk County Council was held on Saturday to consider the situation arising out of the floods. Resolutions were passed sympathising with the sufferers, and authorising immediate steps to repair the damage to the roads and bridges as quickly as possible. An application will be made to the Road Board for assistance to meet the enormous burden cast upon the county, and a deputation was appointed to wait also on the Local Government Board with a view to obtaining sanction for a loan to meet the cost. The county surveyor, Mr. T. H. B. Heslop, presented a report, in which he stated that fifty-two bridges and culverts on the main road had been damaged or destroyed, and he estimated that the cost of repairing and replacing them would be £15,800. He also roughly estimated that the sum of £12,000 would be required to repair the damaged roads. He submitted a scheme for proceeding with the work of repairing at once, and the report was adopted.

Liverpool Waterworks.—The revenue from the Liverpool Corporation water undertaking last year was £374,653, and the expenditure £370,838. The capital expenditure on the waterworks to the end of last year was £6,498,780. The total length of new mains laid during the year in the city and its suburbs was 17,327 yds. Eighty-nine new fire hydrants were fixed during the year, making the total number of fire hydrants in the Liverpool compulsory area 16,044. There still remain in suburban districts 449 of the old fire plugs.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

267. Road Making.—Will some reader kindly give the heads of a specification for the conversion of a macadamised into a wood paved road? ("Inquirer.")

269. Masonry Arch.—Draw the line of least resistance in a stone segmental arch of 10 ft. span with a rise of 2 ft. 6 in., the voussoirs having an equal thickness of 12 in. and each being equally loaded. (A.M.I.C.E.)

271. Bending Moments.—If a straight prismatic baulk of timber floats in a horizontal position with a weight of 4 cwt. hung to each end, what will be the bending moment at the centre of its length?

REPLIES TO QUESTIONS.

270. Traverse Surveying.—Shortly describe and explain the method of plotting a traverse survey by the method of co-ordinates. ("Surveyor.")

Traverse sheet ..... survey. (Closed) traverse No..... Date.

Point.	Observed angle.	Corrected angle.	Whole ° bearing.	Reduced bearing.	Cardinal points.	Distance.	Difference of latitude. North.	Correction.	Difference of latitude. South.	Correction.	Departure. East.	Correction.	Departure. West.	Correction.	Co-ordinates. N.	Co-ordinates. E.	Point.
	° ′ ″	° ′ ″	° ′ ″	° ′ ″		Feet.											
A			90 0 0												350	350	
B	237 55 0	237 58 0	147 58 0	33 2 0	SE	267			226·3	−·2	141·5	+·4					B
C	283 55 0	283 58 0	251 56 0	71 56 0	SW	250			77·5				237·7	−·7	123·9	491·9	C
D	217 20 0	217 23 0	289 19 0	70 41 0	NW	198	63·5						186·9	−·5	46·4	254·9	D
E	255 45 0	255 48 0	5 7 0	5 7 0	NE	239	238·0	+·1			21·3	+·1			111·9	68·5	E
A	264 50 0	264 53 0	90 0 0	90 0 0	E	230·5					259·5	+·6			350	89·9	A
	1259 45 0	1260 0 0					302·5		303·8		422·3		424·6		350	350	B

Step 1. (Columns 2 and 3.)—The observed angles were the external angles of a closed polygon; therefore they should equal twice the number of right angles as the polygon has sides + 4 right angles. (Euclid.)

$\therefore 1 \times 90 + 360 = 900'' + 360 = 1260$.

Our observed angles are too small, hence a correction must be added.

∴ add 3′ to each observed angle.

Step 2. (Column 4. Whole ° bearing.)—Explanation: Every line in a traverse will have an error; therefore it would not do to plot them from angles and measurements by means of protractor and scale. If we assume some standard direction, it may be true N., magnetic N., or we may choose it so that we may get our survey on the paper, and from this direction we calculate the angle each line makes with it.

This angle is called the bearing.

Measured clockwise right round the circle, they are termed whole circle bearings.

Let us assume AX as our standard direction and that line AB makes an angle of $\alpha°$ with it.

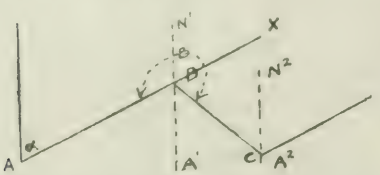


FIG. 1.

Req. ∠ to be added to ∠ bearing of line BC

Let the required angle ABC be β

Produce AB to X

Then $N\hat{B}X$ = a since $A'N'$ is ∥ to AN

$N\hat{B}C = 360 - N\hat{B}X + X\hat{B}A + A\hat{B}C$

Whole ° bearing $+ 360° = \alpha + 180° + \beta$

Whole ° bearing $= \alpha + \beta + 180° - 360°$

$= \alpha + \beta - 180°$

If the angle β was acute, by similar reasoning whole ° bearing $= \alpha + \beta + 180°$

Hence rule to find bearing of any line.

Add bearing of previous line to the included angle (measured clockwise) between the two lines.

If result is more than 180° subtract 180°

.. less .. 180° add 180

.. more .. 360° subtract 360

and if then it is more than 180° subtract 180°

.. .. .. less .. 180° add 180°

Therefore in our example we have assumed bearing of AB = α = 90

∴ α =	90	0′	0″	=	° bearing of AB
β =	237	58	0		
	327	58	0	=	more than 180°
	180	0	0		
α' =	147	58	0	=	° bearing of BC
β' =	283	58	0		
	431	56	0	=	more than 360°
	360	0	0		
	71	56	0	=	less than 180°
	180	0	0		
α'' =	251	56	0	=	° bearing of CD
β'' =	217	23	0		
	469	19	0	=	more than 360°
	360	0	0		
	109	19	0	=	less than 180°
	180	0	3		
α''' =	289	19	0	=	° bearing of DE
β''' =	255	48	0		
	545	7	0	=	more than 360°
	360	0	0		
	185	7	0	=	more than 180°
	180	0	0		
α =	5	7	0	=	° bearing of EA
β''' =	264	53	0		
	270	0	0	=	more than 180°
	180	0	0		
	90	0	0	=	° bearing of AB

This traverse being closed, of course this proves the bearings.

Step 3. (Columns 5 and 6. Reduced bearing.)—The ° bearings are clockwise and must be reduced to their respective quadrants. Take bearing of BC = 147° 58′ 0″. This obviously is in the S.W. quadrant and reduced bearing is the *smallest* angle it makes with our standard direction. (Remember

our ● bearing makes an angle of 147° 58′ 0″ with standard direction.)

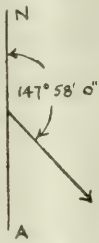


Fig. 2.

Reduced bearing = 180 − 147° 58′ 0″ = 32° 2′ 0″ S.W.
Similarly reduced bearing of CD = 71° 56′ 0″ S.W.

Step 4. (Column 7.)—Fill in distances from field book.

Step 5. (Difference of latitude and departure.)—

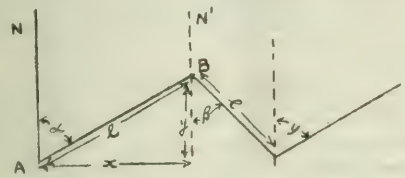


Fig. 3.

Let α be the reduced bearing of AB, whose length is l feet.

Then $x = l \sin \alpha$ = departure = E. or W.
$y = l \cos \alpha$ = latitude = N. or S.

It is best to tabulate these calculations as follows:—

Departure (BC)		Latitude (BC)	
log distance = log 267 =	2·42651	log distance = log 267 =	2·42651
log sin 32° 2′ 0	9·72482	log cosine 32° 2′ 0 =	9·92826
log departure	2·15133	log latitude	2·35477
Antilog = departure =	141·5	Antilog = lat. =	226·3
(CD)		(CD)	
log distance = log 250		log distance = log 250	
log sin 71° 56′ 0 =		log cos 71° 56′ 0 =	
&c.		&c.	

Now we have departure of C = 141·5
" " latitude " C = 226·3

This is SE. therefore under proper headings these figures may be placed

226·3 S
141·5 E

Similarly for all other points.

Since the traverse is a closed polygon
Northings must equal Southings
Eastings " " Westings.

If they do not, a correction must be added or subtracted to make them equal.

This correction should be in proportion to length of line. (The error is probably caused by bad measurement of line.)

Step 6.—To get the traverse on our paper we must arrange the point B in such a manner that all other points fall on. We will therefore take B as

350 N. and 350 E.

Point C is 226·1 S. and 141·9 E.

Therefore it is "less North" than B, therefore the N co-ordinate is 350 − 226·1 = 123·9 N. It is 141·9 E. therefore it is more E than B, therefore the East co-ordinate is 350 + 141·9 = 491·9 E.

Point D is "less North" than C. ∴ subtract 77·5 from 123·9 = 46·4 N co-ord of D.

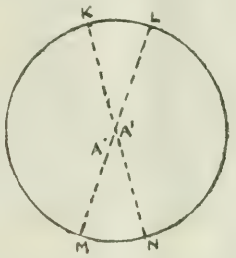
Being W it is less E than C. ∴ subtract 237·0 from 491·9 = 254·9 E, &c.

A piece of drawing paper should be squared to some suitable scale and the points pricked off in the usual way. Join these points up and check them with measured distances. (T. K. *Petworth.*)

Notes.

Your correspondents I. W. S. (Clapham Junction) and W. D. (Dudley) in their answers to Question 266 last week, described in detail just how to approximate the horizontal angle between two stations. The former gentleman assumed the general construction of a theodolite, but did not take into consideration the eccentricity of the centre of the horizontal scale.

It must be borne in mind that to fix the centre of the lower scale is quite an impossibility, therefore to measure an angle over one portion of the scale is simply an approximation.



Let A be the centre of the graduated circle A^1 the axis around which the vernier revolves. For a given angle KA^1L, which is covered by the vernier, will be less when vernier is at KL than it is at MN.

This error is obviated by reading both verniers of instrument and taking mean.

Still there is the possible and very probable error of bad graduation of scale.

To eliminate this the instrument is brought to zero and directed on to station α (say) by the method described the instrument is turned through a certain angle θ_1 and brought of to β (say).

Read both verniers and take mean = ϕ (say). Now bring the instrument back on α with the angle θ_1 as zero and measure angle again. Read both verniers and take mean = ϕ^1 (say). If this method of reading be done three or four times each part of the scale will have been passed over and the mean of all the angles such as ϕ ϕ_1 &c., will be *very approximately* the angle required.

There is also the error caused by personal bias when an observer in bisecting a signal tends either to carry cross-hairs too far or not far enough. To eliminate this always move cross-hairs with tangent screw from right to left in first round and from left to right in second.

This applies also to twisting tripod when moving the instrument.

Other possible errors are bad centre of station and signals not being vertical. These latter errors cannot be eliminated, therefore great precaution is necessary such as taking lowest part of rod visible from instrument. (T. K., *Petworth.*)

THE MONTHLY PREMIUM.

The premium for August is awarded to:—

Mr. H. F. Wilkinson,
Town Hall,
Tottenham.

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangement well suited for easy reference.—*The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By Sydney E. Garrett, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Bettws-y-Coed U.D.C. (August 27th. Mr. T. C. Ekin).—£9,700 for water supply purposes, including the construction of a reservoir at Elsie Lake, and £3,720 for electric lighting purposes.—Mr. Artemus Jones appeared for the council, and evidence was given by Mr. Evan Evans, the county surveyor, Mr. H. E. Mitchell, electrical engineer, and several ratepayers. The only opposition was from Mr. W. B. Corns, a member of the council.

Cheltenham T.C. (September 3rd. Mr. R. G. Hetherington).—£3,900 for laying wood blocks in the Promenade.—In support of the application it was urged that the present annual cost of maintaining the thoroughfare was £362, and that on the basis of a fifteen years' loan at 3¾ the expenditure of £3,900 on wood blocks would effect a saving, as the annual cost for interest and instalment would amount to £341 only. A provisional contract had been entered into with the Acme Wood Paving Company at £3,526, the company having undertaken to maintain the road in good order for fifteen years.

Feltham U.D.C. (August 20th. Mr. F. H. Tulloch).—£1,250 for the purchase of land in the Bedfont-lane, which, according to the official notice, was required "for a cemetery and other purposes."—The surveyor, Mr. G. Stevens, stated that the depth of the subsoil of the plot to be purchased varied; it was 6 ft. at least in the part which would be used for the cemetery if required. Asked if the council had any idea as to whether it would be necessary to drain inside the site, the surveyor said that it would not be necessary, as the drains outside would suffice.

Hastings T.C. (September 3rd. Mr. F. H. Tulloch).—£2,181 for works of paving in Norman-road, St. Leonards, and Harold-road and Saxon-road, Hastings.—The case for the council was explained by the town clerk (Mr. Ben F. Meadows) and the borough engineer (Mr. P. H. Palmer). It was pointed out that the estimate for Norman-road was £806, and that for Harold-road and Saxon-road £1,375. The town clerk produced a memorial from tradesmen and large ratepayers in Norman-road asking for wood paving to be placed there. There was no opposition.

Headington R.D.C. (August 23rd. Mr. W. O. E. Meade-King).—£2,362 for works of private street improvement.—The surveyor, Mr. A. Walker, stated that the streets affected were at present in a very bad condition. They were fully sewered, and were practically built over. Witness supplied details as to the making of the new roads. The inspector said he had received a letter from a frontager, who asked for the period of repayment to be extended to thirty years. That, of course, the board would not agree to.

Leek U.D.C. (August 30th. Mr. F. H. Tulloch).—£1,050 for acquisition of land as extension to the existing cemetery.—Evidence was given by Mr. Wm. Allen, law clerk, and W. E. Beacham, surveyor, after which the inspector visited the site and inspected trial holes which had been put down. The area was 1a. 3r. 24p., and the addition makes a total area for cemetery purposes of nearly 12 acres, which has served the town since 1856.

Manchester T.C. (August 29th. Mr. F. H. Tulloch).—£5,000 for the provision of baths and wash-houses in St. John's Ward, £2,150 for laying out the New Moston recreation ground, and £2,950 for the purpose of street improvement in Barlow Moor-road and Wilmslow-road, Didsbury.—Mr. Charles Behrens, ex-Lord Mayor of Manchester, in the course of a statement, said there was no district where baths of the kind proposed were more necessary than in St. John's Ward. He understood that in a population of 7,000 people the number of baths to be found in the houses was not more than twenty. Mr. W. Holden, chairman of the Baths Committee, gave evidence in support of the scheme, and proposed that the loan should extend over a period of thirty years. Councillor Chantler said the total investment in the baths of the city was something like £400,000, and the actual charge upon the city rate, which in some districts was 9s. in the £, was under 2d. in the £. The corporation did not carry on the baths with a view to making money out of them. The primary object was the betterment of the citizens from a health and a sanitary point of view. Evidence was also heard with respect to the other applications.

Southport T.C. (August 27th. Mr. F. H. Tulloch).—£6,000 for the substitution of sanitary gullies in place of the existing shallow gullies and catchpits; £3,400 for the purchase of land between Hesketh-road and Park-road for purposes of a recreation ground and street improvements; and £1,800 for the widening of Rose Hill.—The town clerk, Mr. J. E. Jarratt, stated with respect to the loan for sanitary gullies that in a place like Southport it was a great advantage to have such gullies. The inspector: I was wondering if the cartway would be likely to break them. The borough surveyor: Our traffic in Southport is very light, except on the main roads. The inspector (after consulting a section): You have a number of this particular kind already in Southport, and where the traffic is heavy you propose to keep them up with concrete? The borough surveyor: In the new streets they are put in. Lord-street has got them, and the traffic is as heavy in that street as in any, and the tram traffic is heavy. The inspector: You have never had one broken? The borough surveyor: No. The inspector: And you have not used concrete? The borough surveyor: None of them has concrete round them, and none has been broken. The inspector: I think that is all I need. With respect to the purchase of land for a recreation ground, it was stated that the price to be paid worked out at £295 per acre, and as to Rose Hill, it was explained that the widening would be to the extent of 10 ft. and 11 ft.

APPLICATIONS FOR LOANS.

Aghalee R.D.C.—£4,148 for the provision of labourers' houses.

Ashington U.D.C.—£3,080 for laying out Hirst Park.

Brynmawr U.D.C.—£1,100 for the provision of municipal offices.

Hemel Hempstead Joint Hospital Board.—£8,000 for a new isolation hospital.

Kingswood U.D.C.—£750 for a sewerage scheme.

Llandovery R.D.C.—£500 towards the cost of a new bridge.

Plympton R.D.C.—£570 for a water supply scheme.

South Shields T.C.—£500 for a gymnasium and handicraft centre at the high school.

Trowbridge U.D.C.—£16,000 for sewage disposal scheme.

LOANS SANCTIONED.

Chelmsford T.C.—£4,784 for works of street improvement.

Cleckheaton U.D.C.—£847 for alterations and extensions at the public baths.

Finedon U.D.C.—£1,000 for the purchase of the sewage farm.

Gelligaer U.D.C.—£1,700 for the purchase of a site for a cemetery.

Hayes U.D.C.—£1,484 for sewerage and improvement works.

Leek R.D.C.—£6,000 for a sewerage scheme (provisional sanction).

Littleborough U.D.C.—£400 for road improvements.

Queenstown U.D.C. £7,000 for the provision of labourers' dwellings.

Wantage R.D.C.—£400 for water supply purposes.

FORTHCOMING INQUIRIES.

SEPTEMBER	£
7.—**Harrogate.** For additions to public baths (Mr. R. H. Bicknell)	2,000
10. **Clacton.** For electricity purposes (Mr. H. R. Hooper)	2,650
10.—**Colne.** For street improvement purposes (Mr. F. H. Tulloch)	22,370
10.—**Newark-on-Trent.** For the provision of pleasure grounds (Mr. W. O. E. Meade-King)	2,365
10.—**Newport (Mon.).** For water supply, depot, and convenience purposes (Mr. A. G. Drury)	10,094
10 **Nottingham.** For works of improvement and the provision of a motor fire engine (Mr. W. O. E. Meade-King) ...	12,600
10. **Radcliffe.** For works of sewerage (Major J. Stewart)	900

	£
10.—**Stalybridge.** For additions to baths and provision of a new bath (Mr. T. C. Ekin)	8,092
11.—**Atherstone.** For housing purposes (Mr. Edward Leonard	3 000
11.—**Dunmow.** For the purchase of a water undertaking (Mr. H. R. Hooper) ...	3 000
11.—**Eccles.** For electricity, fire engine, and bowling green purposes (Mr. T. C. Ekin)	6.920
11.—**Lathom.** For the provision of a pumping plant (Major J. Stewart)	500
11.—**Litherland.** For private street works (Mr. F. H. Tulloch)	1,425
11.—**Long Eaton.** For water supply purposes (Mr. W. O. E. Meade-King)...	1.750
11.—**Newport.** For the provision of a disinfecting station (Mr. Morgan J. Rees) ...	1.239
12.—**Balderton.** For lighting purposes (Mr. T. C. Ekin)	650
12.—**Bourne.** For sewage disposal purposes (Mr. W. O. E. Meade-King)...	925
12.—**Lye.** For the provision of public offices (Major J. Stewart)	1,000
12.—**Stafford.** For the erection of artisans' dwellings (Mr. Edward Leonard)	3.280
12.—**Stretford.** For the provision of a convenience and street improvement works (Mr. F. H. Tulloch)	15.100
12.—**Wednesbury.** For the provision of an engine and dynamo (Mr. H. R. Hooper)...	3 700
12.—**Winterton.** For water supply purposes (Mr. R. H. Bicknell)	1.816
13.—**Coventry.** For cemetery, public convenience and road purposes (Mr. H. R. Hooper.	2,292
13.—**Daventry.** For the provision of water-softening plant (Mr. T. C. Ekin)	1.250
13.—**Leicester.** For street, fire station and sewerage purposes (Mr. W. O. E. Meade-King) ...	2.995
13.—**Smethwick.** For street improvement works (Major J. Stewart) ...	9,950
14.—**Frinton-on-Sea.** For the provision of a cemetery (Mr. F. H. Tulloch) ...	
17.—**Leyton.** For works of sewerage (Major J. Stewart) ...	1.600
18.—**Penge.** For works of street improvement (Major J. Stewart) ...	3.537
19.—**Sutton Coldfield.** For the provision of a town planning scheme (Mr. Thomas Adams)	
19.—**Swansea.** For the purchase of land for housing purposes (Mr. Edward Leonard)	20.050

Romance of a Large Bookstore.—To have built up the largest business of its kind in the world employing over sixty people, with branches throughout London, and known throughout the world, all this accomplished in the small space of about seven years, by two individuals (who are still mere youths), is an achievement which any man would be proud of. This is the record of Messrs. W. & G. Foyle, of 135 Charing Cross-road, who on Monday opened what will doubtless be the largest and most unique bookshop in the United Kingdom. Commencing about seven years ago with no capital whatever, these two young men (almost boys then) opened a small back-up shop at a London suburb. Soon the latter saw them moving into larger premises at Cecil-court, Charing Cross-road W.C. Not long afterwards Messrs. Foyle again hammered out, and took a lease of a large shop in the Charing Cross-road. Their trade increased by leaps and bounds, branches were opened, warehouses acquired for their greatly increasing stock, and additional offices obtained for the extra staff. Their daily post averaged 1,000 letters, and special mail vans called three times daily for their thousands of parcels. Finding their accommodation again becoming too small, they on Monday opened new premises, in which will be over 20 miles of shelving, and well over 1,000,000 volumes on every conceivable subject on view. So minute is the firm's system of classification that any book can be found within a few minutes. They have also a system by which any books asked for and not in stock can be obtained within a few days.

LECTURES AND DEMONSTRATIONS FOR SANITARY OFFICERS.

The Royal Sanitary Institute announce that their fifty-fourth course of lectures and demonstrations for sanitary officers will commence on Monday, the 16th inst., concluding in November. Part I. of the course comprises four lectures on Elementary Physics and Chemistry in relation to water, soil, air and ventilation, and meteorology, and twenty-one lectures on Public Health Statutes (Orders, Memoranda, and Model By-laws of the Local Government Board and the By-laws in force in the Administrative County of London), The Practical Duties of a Sanitary Inspector—*e.g.*, drawing up notices as to sanitary defects, drain-testing, disinfection, methods of inspection, note-taking, reporting, and elementary statistics, Municipal Hygiene or Hygiene of Communities, including prevention and abatement of nuisances, sanitary defects in and about buildings and their remedies, water supplies, sanitary appliances, drainage, refuse removal and disposal, offensive trades, disinfection, and Building Construction in its Sanitary Relations, Local Physical Conditions, and Measurement and Drawing Plans to Scale. Inspections and demonstrations are arranged in connection with the lectures, and include visits to disinfecting stations, dairy premises, municipal depots, artisans' dwellings, offensive trades, waterworks, common lodging-houses, sanitary works in progress, refuse and sewage disposal works, and other public and private work illustrative of sanitary practice and administration. In some of the visits the students are shown the routine of an inspector's office work and duties.

Seven lectures on Meat and Food Inspection are included in Part II. of the course, full particulars of which can be obtained from the secretary of the institute, Mr. E. White Wallis

STRUCTURAL STEEL FOR BRIDGES AND GENERAL BUILDING CONSTRUCTION.

BRITISH STANDARD SPECIFICATION.

A new edition of the British Standard Specification for Structural Steel for Bridges and General Building Construction (Report No. 15. Revised August, 1912) has recently been issued. The new issue is of importance in view of the fact that the London County Council (General Powers) Act, 1909, requires that all rolled steel used in the construction of skeleton frame work for buildings shall comply with the requirements of this specification.

Since its first issue in June, 1906, the committee from time to time had brought before them points which had arisen in connection with its use, and the present issue embodies the necessary amendments in regard to these. Some of the more important modifications to the specification are as follows:—

(1) The classification of the material dealt with into two categories, A steel and B steel.
(2) The increase of the allowable phosphorus content in B steel from ·07 to ·08 per cent.
(3) The increase of the upper limit of tensile strength for plates, sections and bars (other than rivet bars), from 32 to 33 tons per square inch.
(4) The reduction of the lower limit of tensile strength for rivet bars from 26 to 25 tons per square inch.
(5) The insertion of clauses dealing with—(*a*) Tests by an independent expert, (*b*) rejection after delivery, and (*c*) arbitration in cases where this is not otherwise provided for.

The price of the specification is 5s. 2d., post free, and it may be obtained from any bookseller, or direct from the offices of the committee, 28 Victoria-street, Westminster, S.W., and is published for the committee by Messrs. Crosby Lockwood & Son.

Newcastle Corporation Tramways.—The report of the general manager of the Newcastle City tramways shows that the gross receipts for the year ended March, 1912, were £223,565, as compared with £215,850 for the previous year. The traffic revenue per car-mile worked out at 11·68d., and the total operating costs at £6·375d., compared with 11·15d. and 6·164d. respectively in the previous year. The sum paid towards the relief of the rates for the year was £13,442, and £8,427 is carried to the reserve and renewals account, which now stands at £104,670.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Goole, Glasgow £29,000, Keighley £14,000; housing and town planning—Boston: parks and open spaces—Yarmouth: roads and materials—Glasgow £86,000, West Suffolk £24,000; sewerage and sewage disposal—Belper £10,250, Lisburn £8,000, Tyldesley £13,500; water, gas and electricity—Kirkcaldy £46,800; miscellaneous—Keighley.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

ADMINISTRATION.

Kent C.C.—The county surveyor, Mr. H. P. Maybury, has received authority to consider the interests of the roadmen by (1) establishing a system of small discretionary increases of wages in individual cases of exceptional merit, and (2) by making small allowances to men who, when working some way from home, prefer to cycle back at night rather than to have a lodging near their work.

Liskeard R.D.C.—The roadmen's wages have been increased to 17s. per week.

Mytholmroyd (Yorks) U.D.C.—All the workmen who have been receiving under 22s. per week are to have their wages advanced to 21s. 6d.

BUILDINGS.

Blandford T.C.—The tender of Messrs. Stickland & Son, at £204, has been accepted for the repair and renovation of the municipal buildings.

Chelmsford T.C.—The fire station is to be enlarged at a cost of £193.

Congleton T.C.—A house is to be provided for the town hall keeper at a cost of £282. The borough surveyor, Mr. J. H. Walters, has received instructions to prepare a plan for the extension of the boiler-house at the Forge pumping station.

Cainsborough U.D.C.—The public baths in Lea-road are to be enlarged at a cost of £1,450.

Coole T.C.—Over 70 competitive plans have been received for the proposed new municipal offices, and they have been submitted to the judgment of an assessor.

Glasgow T.C.—A proposal is made by the Washhouses Committee for the provision of swimming, slipper, and Turkish baths at Langside, at an estimated cost of £29,000.

Hatfield R.D.C.—The surveyor, Mr. H. T. Sidwell, has been requested to submit a modified plan for necessary repairs to the municipal stables at Mill Green.

Keighley T.C.—The Institute is to be enlarged at an estimated cost of £14,000, part of which will be paid by the West Riding County Council.

Ludlow T.C.—The question of the acquisition of the assembly rooms for £1,900 is under consideration.

Northwich U.D.C.—The council have accepted the tender of Mr. Thomas Astles, of Northwich, for the erection of new baths, at a cost of £7,850. The work is to be completed in fourteen months.

Rhyl U.D.C.—The decision of the Local Government Board has been received with reference to the application made for sanction to a loan of £7,500 for the purchase of the Rhyl Pier undertaking. The board has deferred sanctioning the loan till the council submit a definite scheme of repair and reconstruction, with an estimate of the cost, and an undertaking that such scheme will be carried out in the event of the Local Government Board giving its sanction.

HOUSING AND TOWN PLANNING.

Boston R.D.C.—Plans have been approved for a number of cottages to be built under the Housing Act. It has also been decided to proceed at once with the erection of two cottages at Benington, and to apply to the Local Government Board for a loan of £340.

Nantyglo and Blaina (Mon.) U.D.C.—The council have approved a recommendation of the Housing Committee that land should be obtained in Bush's field and on the unbuilt portion of Part-street for the erection of seventy-five houses, and that a site should be procured for the erection for the same number of houses in the North Ward.

St. Austell R.D.C.—The question of providing workmen's dwellings under sec. 1 of the Housing and Town Planning Act has been referred to the Plans Committee.

PARKS AND OPEN SPACES.

Evesham T.C.—Arrangements are being made for the extension of the recreation ground by the leasing of land adjoining.

Halifax T.C.—The question has been raised of providing a second bowling green at Shroggs Park. In five weeks, it was mentioned in committee, the existing green had brought in £9 from the fee of 1d. charged.

Llandudno U.D.C.—A sub-committee has been appointed to report upon the suitability of certain land which Lord Mostyn is prepared to lease to the local authority as a golf course.

Withernsea (Yorks) U.D.C.—The council have accepted a gift consisting of 8,000 sq. yds. of land on the sea front between the Pier Towers southwards to Queen's-terrace. The conditions of the gift are that the council within five years make a road from Seaside-road to Pier-road, and in three years make a road across the field to Norfolk House. It is estimated by the surveyor, Mr. J. H. B. Kirton, that the cost will be about £800. The council propose to lay out the grounds in gardens, and, if desirable, build a pavilion and shelter.

Yarmouth T.C.—After refusing the application of the council for a loan of £10,000 for the purchase of 85 acres of land for golf links extension, on the ground that the price appeared to be excessive, and recommending the reopening of negotiations with the vendors, the Local Government Board have intimated their assent to the reduced price of £9,000, which has now been agreed for the land.

ROADS AND MATERIALS.

Aberdeen C.C.—The road surveyor to the Huntly District Committee, Mr. John Allan, has reported upon the destructive effect of the heavy motor traffic on the main roads. Particularly was this the case with the Aberdeen turnpike between Bainshole and Cairnie. Parts of that road had deteriorated so quickly and to such an extent that it was almost impossible at the present rate of maintenance to get them into a proper state of repair. The road was 16½ miles long, and the rate of remetalling would have to be greatly increased if the road was to be kept in a proper state of repair. The roads opposite Broomhill, at Newtongarry Inn, at Ramstone Brae, Shielknowe Quarry, and along the farm of Westerton would all have to be dealt with, as well as various parts in the end of the Cairnie road. He estimated the cost of this work, including maintenance, at £400. Mr. Allan added that early in the year a Morrison's patent scarifier was fitted to the new engine, and it had proved very successful. He hoped to use it extensively this year.

Bolton T.C.—The borough engineer, Mr. E. L. Morgan, has been instructed to proceed with the work of making up Ashbee-street and Garnett-street.

Cheltenham T.C.—A grant of £300 has been received from the Road Board for tar-macadam surfacing on part of London-road.

Calashiels T.C.—The tender of Messrs. Neil, McLeod & Son, Edinburgh, at £2,289, has been accepted for the improvement of Corn Mill-square.

Glasgow T.C.—It has been agreed to construct a new road and bridge from Great Western-road at Botanic Gardens to the end of Queen Margaret-drive through Queen Margaret College grounds, at an estimated cost of £86,000.

Havant U.D.C.—Properties valued at £580 have been purchased for widening the junction of North-street and West-street.

Kent C.C.—The council have approved the undermentioned expenditure on improvements to main roads: Bromley—the laying of artificial stone paving on the main road footpaths, of an area of 1,760 yds. super., at an estimated cost of £463; Southborough—the construction of 125 ft. of footpath on the London-

road, at an estimated cost of £55; Cheriton—formation of a new footpath on the south side of High-street, £90; Hawkhurst—a concrete wall, with iron fence, in front of a pond on the Sandhurst-road, £50; Stone-street—a retaining wall for 60 yds. in front of a roadside pond, £50.

Southmolton R.D.C.—The council have approved the estimate of the surveyor, Mr. W. S. Gardiner, at £266, for improving Leigh-road, Chulmleigh. The estimate includes £56 for tar-macadam.

Taunton R.D.C.—It is announced that the Road Board have promised to contribute to the scheme for the improvement of Priorswood-road at Rowbarton, leading from Cheddon-road to the Bridgwater main road.

West Suffolk C.C.—The improvement scheme on the road, 18 miles in length, leading from Newmarket right through the centre of the county, and which practically joins the counties of Cambridgeshire and East Suffolk, will consist of making up with granite, strengthening the weak sides, and tarring throughout. The cost, £24,000, is to be met by a loan of £19,000, free of interest, from the Road Board, and a contribution of £5,000 from that body.

Wincanton R.D.C. It is expected that a grant will be received from the Road Board for carrying out an improvement at Yenstone, near Templemore. The estimated cost of the work is £2,000, and it is thought the Road Board will contribute half of that sum.

SEWERAGE AND SEWAGE DISPOSAL.

Belper R.D.C.—The work in connection with the scheme of drainage for Crick township, as prepared by the surveyor, Mr. R. C. Cordon, at an estimated cost of £10,250, is shortly to be put in hand.

Berkhampsted R.D.C.—The surveyor, Mr. H. N. Hedges, has had consultations with the medical officer of health with respect to a sewage disposal scheme for the village of Long Marston. He has also been directed to report as to alternative sites for the treatment of the effluent from the Wilstone filters by broad irrigation.

Bulkington (Warwickshire) U.D.C. The Local Government Board have written to the council on the subject of the sanitary defects of the district. The communication stated: "House drains are practically non-existent, and where they do exist are usually the cause of nuisance. The water supply of the district is very unsatisfactory, the well from which the water is derived being liable to pollution from middens in close proximity. It is of extreme importance that measures should at once be taken to safeguard the sources of supply. The board consider that the general sanitary administration of the district would be facilitated by the adoption of up-to-date by-laws as to (*a*) new buildings, (*b*) cleansing of footways and pavements, (*c*) prevention of nuisances, and (*d*) slaughter-houses." The council have decided to consider the Local Government Board's recommendations at a special meeting.

Chapel-en-le-Frith R.D.C.—The tender of Mr. M. A. Boswell, Wolverhampton, at £8,990, has been provisionally accepted for works of sewerage.

Dunmow R.D.C. A site for sewage disposal works has been purchased for £450.

Isle of Wight R.D.C. A sum of £483 is to be spent on sewerage and outfall works.

Lisburn (Co. Antrim) R.D.C.—The Balmoral sewerage scheme as amended is estimated at £8,000, which shows a saving in the cost of construction of the outfall sewer of £3,900. Messrs. Swiney & Croasdaile are the engineers.

Settle R.D.C.—A scheme of sewerage and sewage disposal for Airton has been adopted, the estimated cost being £1,100.

Tipton U.D.C.—The tender of Messrs. Thompson & Farley, Kidderminster, at £5,696, has been accepted for carrying out the sewage disposal scheme.

Tyldesley U.D.C.—A scheme has been approved for the construction of a main outfall sewer, at an estimated cost of £13,500.

WATER, GAS, AND ELECTRICITY.

Belfast T.C. In connection with the scheme inaugurated some time ago for the better lighting of the streets a further step forward has been taken by the extension of the electrical system to leading thoroughfares.

Chapel-en-le-Frith R.D.C.—The tender of Messrs. Eadie & Co., at £3,972, has been accepted for the construction of a new reservoir at Dove Holes.

Chelmsford R.D.C.—The engineer, Mr. J. Dewhirst, has been instructed to submit an amended scheme for a water supply for Broomfield.

Dundee T.C.—The completion of the scheme for the raising of the level of Lintrathen Loch, from which Dundee gets its water supply, was reported at a meeting of the Water Committee recently. Mr. George Baxter, the water engineer, estimated the cost of the new works at £15,000, and these had been completed at a cost of £12,481. The construction of a new road had cost £1,248, and miscellaneous expenses £900.

Guisborough R.D.C.—A water supply improvement scheme is to be carried out at Newton-Mount-Kennedy.

Hinckley U.D.C.—New water mains are to be laid, at a cost of £212, and the tender of the Holwell Iron Company, at £6 9s. per ton, has been accepted for the work.

Kirkcaldy T.C.—A scheme is under consideration for the extension of the gasworks, at an estimated cost of £46,800.

Street U.D.C.—The surveyor, Mr. H. Cousins, has been instructed to carry out test borings down to the rock surface under the peat and clay.

Ticehurst (Sussex) R.D.C.—A committee has been appointed to consider an offer by the local water company for the purchase of the undertaking by the council.

Tipton U.D.C.—Extensions at the gasworks are to be carried out as follows: Vertical retorts, West's Gas Improvement Company, Manchester, £9,700; scrubber, Messrs. R. & J. Dempster, Manchester, £440; engine and exhausters, Messrs. Dempster, £235.

MISCELLANEOUS.

Beccles T.C.—The council have accepted the gift of a steam fire engine from Mr. W. Garrod, sen.

Brierley Hill U.D.C. Land to the value of £6,500 is to be purchased for a cemetery, subject to the sanction of the Local Government Board.

Keighley T.C.—The Tramways Committee have been authorised to prepare a scheme for a system of trackless trolley vehicles between the tramways terminus at Ingrow and the junction of Haworth-road and Hebden-road, and to obtain tenders for the necessary equipment. It was stated that the committee had decided on this route because it was a rather steep gradient, and they knew exactly what the revenue was. They had no fear regarding the possibility of loss.—From the statement of accounts in respect of the tramways and the motor-buses for the year ended March 31st, it appears that there has been a profit on the tramways of a little over £1,100, and a loss on the motor-buses of £2 437.

Manchester T.C.—The council on Wednesday last were almost unanimous in placing a £10,000 contract for tramway points and crossings with an American firm whose quotation was £800 below the tender of a Sheffield company. It was stated that the American goods would be equal in quality to the English, and that delivery would be made quicker.

DEPUTY CITY SURVEYOR FOR MANCHESTER.

The Manchester City Council on Wednesday last approved the recommendation of the Town Hall Committee to appoint a deputy city surveyor, at a salary of £500 a year.

The Virtues of a Water Supply.—In a letter of thanks to the Wigton Rural District Council, which was read at a meeting on Tuesday, an agriculturist of the district ascribed to the new water supply extraordinary virtues. The water, he declared, caused a saving in both tea and soap, and the same thing occurred in the matter of whisky, for the water was so pure that there was no necessity to d intect it with spirits. Public bodies, he added, received too few thanks for the many benefits they from time to time conferred on struggling humanity. The clerk said it was the first letter of thanks he had ever read to the council.

PERSONAL.

Mr. D. Hinchcliffe, surveyor and inspector to the Shepton Mallet Urban District Council, has had his salary increased by £40 a year.

Mr. S. G. Bloy, surveyor to the Mutford and Lothingland Rural District Council, has had the misfortune to strain his leg and thigh somewhat seriously while on duty.

Mr. William Tuke Robson, chief assistant engineer in the Hull Corporation tramways department, was on Wednesday appointed manager of the South Shields tramways, at a salary of £300 a year. There were fifty-three applicants.

Mr. A. W. Priest, in the employment of the Rushden Urban District Council, and formerly for twelve years in the service of the Corporation of Wolverhampton, has been appointed general foreman to the Teddington Urban District Council, at a salary of £104, rising to £120.

Mr. Wilfred H. Veal, pupil of Mr. John S. Walton, the borough engineer of Falmouth, was, at the Royal Cornwall Polytechnic Exhibition, held at Falmouth during the week commencing August 26th, awarded a first-class bronze medal for his plans of a villa and survey of a building site, the judges stating that his plans had been executed with great care, and that the precision of the plans disclosed general ability. In March last Mr. Veal passed the examination of the Surveyors' Institution, qualifying for a Professional Associate.

Mr. J. T. Child, the city engineer of Calgary, hails from England, where he served his articles with Messrs. Hopkins, Gilkes & Co., general iron manufacturers and constructional engineers, of Middlesbrough, and was afterwards for two years on the Ordnance Survey. He went to Canada in 1883, and had varied engineering experiences, which led up to his being consulted, in 1908, upon the question of bringing water to Calgary by gravitation, to relieve the ever-increasing cost of pumping. In that year he designed and partly constructed the Calgary gravity water supply system, and was, in 1909, appointed to his present office. He is a member of the Canadian Society of Civil Engineers.

"FERROMAC" ROAD CONSTRUCTION.

Roadite, Limited, 9 Great George-street, Westminster, London, S.W., patentees of the "Ferromac" system of road construction, held a demonstration of their process recently at Fisherton-de-la-Mere, near Wylye, Wiltshire, on the road they are laying for Mr. J. George Powell, the county surveyor. Among the surveyors present were Messrs. R. Giddings, surveyor to the Bradford-on-Avon Rural District Council; — Hancock, surveyor to the Warminster Rural District Council; F. Jones, borough surveyor, Frome; F. G. Billingham, borough surveyor, Devizes; S. W. Saunders, surveyor to the Devizes Rural District Council; J. T. Huxham, of Amesbury; A. F. Long, of Warminster; and H. Skelton, of Bemerton, Salisbury. All seemed much interested in the process.

Torquay Pavilion.—Mr. Henry A. Garrett, Assoc.M. Inst.C.E., the borough engineer and surveyor, writing with reference to the description given in our issue of the 23rd ult. of the new pavilion at Torquay, asks us to state that the roof of the building is externally covered with copper, this alone having cost nearly £2,000, and that the internal oakwork is in an Austrian wood.

Oxfordshire Roads. The total cost of Oxfordshire's urban main roads has been £6,189, a decrease of £426 compared with the previous year, which is partly due to the transfer of Caversham to Reading. The rural main roads show a total cost of £28,741, an increase of £444. After allowing for the money received for repairing roads over railway bridges, restoration of damage to roads, and fees for motor cars and locomotives, amounting to £1,165, the nett expenditure on the rural roads has been £27,575, or £61 12s. a mile, as compared with the total in the previous year of £27,015.

WARRINGTON BOROUGH ENGINEER'S DEATH.

Mr. Thomas Longdin, borough engineer and surveyor of Warrington, died suddenly in his office on Wednesday morning. He was at business at the usual hour, apparently in good health, but while engaged in conversation with the deputy town clerk (Mr. A. T. Hallaway) suddenly fell forward in his chair and expired a few minutes afterwards.

Mr. Longdin, who had been in the service of the corporation for thirty-four years, was sixty-five years of age.

FOR OTHER ADVERTISEMENTS

See End of Paper.

DRAUGHTSMAN required for the Public Works Department of Sierra Leone for two tours, each of 12 months' residential service with possible extension. Age between 25 and 35, preferably unmarried. Strict medical examination and vaccination if necessary.

Salary £300 a year, rising to £350 by annual increments of £10. Free single quarters provided at established stations. Free first-class passage out and home again on satisfactory termination of engagement. Half salary on voyage out, full salary from date of arrival in the Colony.

Two months' leave on full pay after 12 months' tour, increased to four months' if returning to the Colony, with full pay during voyage or voyages and free passages. Candidates should have had considerable experience in architectural and engineering draughting, and should have held a responsible position in the drawing office of an Architect and Surveyor, or Civil Engineer in good general practice. They should be neat and expeditious draughtsmen, capable of taking levels and making surveys for buildings, bridges and other works. They should also have had experience in the control of a drawing office staff, and be capable of getting out designs and details of buildings—including steel frame work—bridges and other works, with some experience in architectural design. They should be well up in building construction, and the preparation of specifications, bills of quantities, and estimates, and preference will be given to those applicants who have served articles with an Architect and Surveyor, or Civil Engineer with a practice in constructional work, and, other things being equal, to candidates who have passed the examination of the Surveyors' Institute (Building Subdivision), or the Institute of Municipal and County Engineers.

Application by letter (no special form required), stating age, whether married or single, giving full particulars of experience, accompanied by copies of testimonials (not originals), with names and addresses of referees of whom inquiries can be made as to capabilities and character, should be sent as soon as possible to the Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

Quote M 5537 on left-hand top corner of application.

HANWELL URBAN DISTRICT COUNCIL. The above Council are prepared to receive Tenders for the Supply of—

1. Broken Guernsey Granite.
2. Kentish Pit Flints.
3. Distilled Tar.

Forms of Tender and further particulars may be obtained on application at the Council Offices, Hanwell.

Tenders to be delivered to the undersigned not later than the 23rd September, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

Any person, firm, or company canvassing any Member of the Council will be disqualified for receiving orders or contracts from the Council.

(By order)

PERCY SCOTT,
Clerk to the Council.

Council Offices,
Hanwell, W.
September, 1912.

WANTED, immediately, a Temporary Assistant in a Surveyor's Office in North-West District. Must have had good Municipal experience; salary £2 2s. per week.—Reply, enclosing copies of testimonials, &c., and earliest date could enter upon duties to Box 1,183, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

Royal Sanitary Institute Congress at York.

ENGINEERING AND ARCHITECTURE SECTION.

Among the papers which came up for consideration at the first sitting of the Engineering and Architecture Section of the York Congress of the Royal Sanitary Institute was the following:—

COUNTRY HOUSE SEWAGE PURIFICATION.

By JOHN E. TUKE.

When we come to consider the question of a suitable installation for a small hamlet or isolated country house, whether large or small, we have special factors which have to be taken into account. Some of these special considerations are worthy of discussion.

The question of site is the one which has naturally to be considered first, and it is evident that the range of choice must be very considerably limited. While it should be borne in mind that the installation should be situated as far as possible from the house or houses on the one hand, or from a public highway on the other, this will have to be governed by the question of levels, and the possibilities of final outfall for the purified effluent, and it may be taken as an axiom that, unless lifting by some means is feasible, it is not possible to obtain satisfactory results with an available fall of less than 5 ft. from the invert of the incoming drain or sewer to the final outfall, unless in some exceptional instances the nature of the subsoil is capable of providing free soakage, as, for example, on gravel or chalk.

This limitation of site makes it essential that special steps be taken to ensure against offence from the sewage works to either eyes or nose.

AERIAL NUISANCE.

The claim is often made that a properly designed sewage disposal plant should not smell, but it has been pointed out by an eminent member of this institution that, for some reason at present not fully understood, a sewage installation may be free from smell for 360 days in the year, and yet be a source of offence on the remaining five days. It has often been noticed that such occasional aërial nuisance is specially evident before rain, and the explanation, in my opinion, is that a sudden fall in the barometric pressure draws out the naturally foul air from the interstices of the filter-beds, and the probable humidity of the atmosphere inclines to aggravate the tendency to smell. Thus it is obvious that special provision must often be made in connection with these small schemes for screening, and for reducing the possibilities of air pollution.

In practice I have found that the ordinary ferro-concrete or wooden covers to the tanks in most cases, with shallow trays, formed of small mesh expanded metal filled with a layer of peat-moss litter over the filter-beds, is sufficient to overcome this difficulty. It might be pointed out, however, that these trays should be above the discharge pipe from the tanks, so as to check the free passage of foul air from the tank when a sudden increase in the rate of flow of the incoming sewage takes place.

The second point upon which I would suggest discussion is the question of increased tendency to smell, caused by the relative septic condition of the tank effluent. The idea that septic action was to solve the sludge problem of the sewage engineer has long been exploded, and the finding of the Royal Commission on Sewage Disposal that septic action, *per se*, is not necessary for the satisfactory aërobic treatment of the tank effluent has still further modified the theory, so that the municipal sewage engineer has frankly re-christened his septic tanks "sedimentation tanks," and has to lay himself out to deal practically with the full initial volume of solid matter by manual or mechanical means.

The absence of regular attendants, and the impracticability of installing sludge lifting and pressing plant for a small installation renders it necessary to try to devise some alternative method.

I believe that the hydrolytic tank of Dr. Travis in England, the Emscher or Dortmund tanks in Germany, and the modification of these as designed, I think, by Mr. Aird Murray, of Canada, at the Lethbridge works, point the way in which this modification should be sought, for in such a tank the liquid sewage, which constitutes, I suppose, roughly 95 per cent of the total volume, can be treated in an aseptic condition, while septic action may be utilised for its sole useful function of breaking down and digesting the solid portions, so as to render them more capable of being attacked in the filter-bed or removed from the tank.

I have found in a large number of cases that a tank formed somewhat on these lines, which perhaps may be called a semi-septic tank, is capable of discharging to the filter-beds an emulsified effluent containing a considerable proportion of the solid matter in suspension, and collecting a thick scum of irreducible fibrous particles at the top, with a very slight deposit of sludge at the bottom of the tank. The capacity of such a tank in relation to the average daily flow is one which requires some consideration, as, in my opinion, it should be as small as possible, consistent with an adequate scum-forming capacity, so as to require as infrequent attention as possible, and the depth should be great in relation to its area. It will be seen from what I have already said that personally I am in favour, in the small installations which have not the advantage of regular attention, of passing to the filter-bed as large a proportion of solid matter as is possible, in contradistinction to the practice of the municipal engineer who prefers to keep back his solids and deal with them in bulk, and to take a very weak effluent on to his percolating filters.

I believe it will be found much easier occasionally to change the material of the upper portion of the filter-bed than to increase the quantity of solid matter which has to be removed from the liquefaction tank.

DISTRIBUTION.

This brings me to another point on which I should like to suggest some thoughts—*viz.*, the effective distribution of the stronger tank effluent on to the filter-bed surface. There is no doubt in my mind that efficient distribution and aëration are the most important factors in securing a non-putrescible effluent. Forms of distribution which may be perfectly satisfactory on large beds with weak sewage and in isolated positions are quite impossible on the small beds and with the greatest need for avoidance of air pollution, and with the different character of the effluent from the type of tank I have recommended.

No form of perforated pipe distribution should be allowed on account of the constant liability to choke, neither can small rotary contributors dependent for their movement upon the reactionary pressure of the outflow be relied on, and fixed sprays, even if sufficient head is available, are liable to cause some smell, although they possess the advantage of increased aëration if they can be used in isolated places.

An upward water-logged filter cannot by any possibility be more than a mechanical strainer, and this might be more easily arranged by means of fine wire screens. The provision of a filter-bed which depends for its distribution on the overflowing of a series of ducts or channels, which, although originally fixed level, never remain so, results in the sewage short circuiting through the bed in two or three places and is more or less useless.

I have found that the most satisfactory method of distribution is by means of a series of serrated edged channels or troughs, which may be fed intermittently by means of either an oscillating tipper, or from a dosing syphon, or, better still, may be made to revolve or travel over the surface of the bed by mechanical or hydraulic pressure. There is another small point which should be considered in relation to small sewage installations, which is of little moment in connection with a public sewerage scheme, and that is the provision of suitable grease traps. Grease or fat is the slowest substance to be affected by aërobic bacterial action, and tends to clog the interstices of a filter-bed and prevent the liquefaction process in a septic or semi-septic tank. Hence the flushing-rim grease trap, which, excellent as it may be when it is desired easily to discharge all such matter from a kitchen sink into a public sewer, is not suitable with a private sewage installation, and a large capacity trap, preferably of 20 or 25 gallons, so as to avoid the necessity of too frequent attention, should be used; this should be fitted with properly constructed dirt basket or scoop, and cleaned out at least once a fortnight. This will make considerable difference to the efficient working of the sewage purifi-

cation plant, and lessen the chance of smell from the installation.

USE OF DISINFECTANTS.

Another point which should be noticed is that great care should be taken with the use of disinfectants. These are freely used nowadays in houses connected to public sewers, and yet the volume is not sufficient to interfere with the municipal sewage works, but the writer has frequently found the bacterial action of a small installation entirely suspended and the tanks and filter-beds rendered practically sterile by this means. If infection from the effluent be feared, then disinfect after purification and not before, or else it is probable that the purification will not take place at all.

COST.

A word or two may be said in comparison of the relative cost of installing and maintaining a municipal as against a private installation. I think it may be fairly assumed that the capital expenditure charges are about 30s. to 40s. per head of the population dealt with in the former case, as against £4 to £5 per head from a private installation. The relative figures as to maintenance may roughly be put at from 7d. to 1s., as against 1s. 6d. to 2s., per annum. If the initial cost of a private installation seems high, it must be remembered that in many country districts the only alternative is the old cesspool system, with its constant expense and danger to health, and fortunately the builders of country houses are gradually being educated up to realising that an expenditure for this purpose is a wise one, but it is somewhat curious to note how much further advanced is the thought on this really important question in the South and West of the country, as against the Midlands and Eastern counties and the North. This may be partly accounted for by natural causes, and the distribution of the larger centres of population and the larger number of upper middle-class people who build country residences in the Southern counties, but it is to be hoped that the time will soon come, which has been foreshadowed by the President of the Local Government Board, when all the rivers and streams in the country will be under a Rivers Board.

DISCUSSION OF MR. TUKE'S PAPER.

Mr. W. Kaye Parry (Dublin) said he had been associated with the question of sewage purification for a great many years, and there was one observation he desired to make on the whole subject, so far as it related to country houses and isolated institutions, and that was that the younger men there would perhaps learn something by looking back and seeing how the question was handled by early reformers in sewage purification. In his early days Mr. Rogers Field, Mr. Bailey Denton and others dealt very successfully indeed with the sewage treatment of country houses, and many of the installations which they put in were excellent models, which could even be followed with advantage at present. They believed as he believed then, and did still, that sewage purification could be dealt with in a country house without putrefaction, for the reason that the sewage came down within three or four minutes from the time it entered the drain. What Mr. Rogers Field did was very simple. He screened out the solid matter as well as he could, and he allowed the liquid, which at that period was inoffensive, to flow over the land where the land was suitable. Mr. Bailey Denton put it through a process of intermittent filtration, which was really the [illegible] although he [illegible] Most excellent installations were carried out, and were working well at the present day. Twenty-five years ago he himself installed a system on a large estate. The sewage was screened and the liquid was put on the land and was still being put on the land. From that day to [illegible] he never [illegible] a good many of these cases under the septic tank heresy, [illegible] was that they could not really sewage without putrefying it first. In one case the sewage was pumped before it reached the works, but he was satisfied that the question of the pumping or not pumping had practically nothing [illegible] to deal with the liquid when it came there. They [illegible] put the tank before they had any [illegible] which they could run into the earth and put on the ground with the greatest possible advantage. [illegible] that was done by the liquid [illegible] and that was impossible in [illegible] He [illegible] bitten with the septic tank heresy, as he thought it must be right, but he tried it, and had never been half so successful as with the earlier work he did, and he was inclined in his old age to go back to the lines on which he started work. He thought that to a large extent Mr. Tuke was with him.

Dr. Tempest Anderson said he considered that trouble arose because the whole system of sewage treatment was wrong in theory, and possibly because it had been forced upon the world by practice. In the large towns it was impossible to use any other system, but the difficulties increased in proportion to the size of the installations put in. But to put these installations in small villages seemed to him absolutely repugnant, and if the same ingenuity had been expended in getting the manure on the land the results would have been fifty times better. He supposed, however, that sanitary engineers found it more profitable to put in large installations on which they got a large commission.

Mr. Costain (Great Crosby) said he well remembered attending a congress where Dr. Cameron introduced the septic tank theory, which it was expected would create a new heaven on earth. He did not think it had done all that was expected of it, but for a large country house, or for a number of smaller houses, he considered an adaptation of the septic tank principle absolutely superior to the system described by Mr. Kaye Parry. The solid matter required very constant dealing with, and it was not possible to get it satisfactorily dealt with. By the septic tank and subsequent filtration they got a liquid matter which could be easily dealt with, while the solid matter could be dealt with once in six months.

Mr. Burleigh (York), as an architect, thought local authorities were making a big mistake in insisting on water-closets in country districts, and having large sewage works which entailed a lot of money. Dr. Poore had told them that in Holland they had no water-closets, and the Dutch were not a weakly lot of people, but, on the contrary, were very energetic, and were able to export a lot of foodstuff, because they took advantage of natural conditions, and used the manure for the land instead of throwing it into the sea.

Mr. Fairbank remarked that with a properly designed sedimentation tank of not too large a size, and with large, coarse clinker and a fine and regular distribution over it, there should be no nuisance with a small installation for a house of ten or fifteen people.

Mr. Tuke said that, while agreeing with Mr. Kaye Parry as to dealing with the liquid when fresh and sweet, he thought it was impossible to arrange for the screening out of the solids for a small house or hamlet. With regard to manurial value, would not efficient treatment in a tank such as the last speaker suggested give a liquid possessing even more fertilising value than crude sewage?

(To be continued.)

Ilkeston Sewage Disposal Works.—We are informed by the town clerk, Mr. Sidney F. James, that, owing to the indisposition of the mayor (Councillor Samuel Shaw), the opening of these works, originally fixed for the 11th inst., has been postponed to October 2nd, at 3.30 p.m.

Rural Council and War Office.—A dispute has arisen between the Chertsey Rural District Council and the War Office with respect to the right of the former to take gravel from Chobham Common for the repair of the roads in the neighbourhood. It appeared that, at the suggestion of the War Office, the council had given up making use of the Folly pit because it was in the line of fire of the Bisley competitions, and that the War Office had attempted to enforce a charge for the use of the Redhill pit. The council recently agreed to the terms of a letter to the War Office, in which it is argued that whether the Crown is or is not bound by the Highways Act of 1835 does not seem to be material to the point in question, because there is a title in the surveyors of highways (that is, the council) by prescription to dig gravel for the requirements of Chobham parish roads at any place on the whole of the common to which they may wish to resort. This right has been exercised continuously for an exceedingly long period without interruption. It could not be said that the rights of the owner had been dredged by the operations being confined to the Folly. There was no likelihood or reason for the surveyor to dig from any part of the common but the Folly, and the gravel in the pit for the time being in use exhausted or unsuitable or difficult to procure.

SOME RECENT PUBLICATIONS.*

Taxation of Land Values as it affects Landowners and Others. By John Orr, M.A. Price 1s. nett. London: P. S. King & Son.

In this little book there has been put forward a higher claim for taxation of land values than any that has been heard in recent controversy. We have been frequently told of the benefits which Labour and Capital would derive from this policy, but, taking the scope and progress of the reform as its advocates depict them, the author here attempts to show that substantial benefits would accrue to the landed classes. This statement is paradoxical to most of us who have been diligently taught that the landlord would be hit hard and hit justly by this scheme. The idea, however, has the merit of not being absolutely new. Quotations from the economists of the eighteenth and nineteenth centuries, and inferences from the effects of the system as established in the colonies, are urged to support the writer's argument that this proposed reform in taxation, far from being simply a class war cry, fulfils the highest demand of statesmanship, in being beneficial to every class. The subject thus gains by being removed from party conflict to the clear air of unbiassed inquiry. Further measures of the land policy introduced in the Budget of 1909 have been promised, and there is a proposal to carry out a reform of the rating system on the single tax basis. It is being asked what this extreme step means, what effects it will produce, and that is the question discussed in this book. Ricardo's definition of rent is shown to be quite inadequate, and a new definition is given. The chapters on Value and on the Principle of Political Economy are interesting in the light of the present labour troubles. In the development of the theory of taxation adopted here the author has gone a long way towards reconstructing the foundations of Political Economy. He bases his arguments largely on some used by Adam Smith and Turgot, and it will be interesting to see how his work stands the criticism of different economists. The book raises in a clear and definite way points that are ripe for discussion in the light of immediate problems in taxation.

Hunt's Law of Boundaries, Walls and Fences. Sixth edition. Revised and substantially rewritten by R. G. Nicholson Combe, M.A., LL.M. Price 15s. London: Butterworth & Co.

Although this book is evidently intended primarily for the legal practitioner, many of the matters dealt with belong to those branches of the law of which the surveyor requires considerable knowledge in his daily practice. For example, the law relating to the right of support for land and buildings, the law of party walls, and the law as it affects the boundaries of highways, are each discussed in separate chapters. The arrangement of the book is exceedingly convenient for the lay reader, inasmuch as the numerous references to decided cases are relegated to footnotes, the text comprising the principles of law which can be deduced from them. The aim of the book is stated to be to furnish the reader with an exposition of the main principles of law which are generally material in the solution of the question of the whereabouts of a boundary, and of the question of the rights and obligations of neighbours in respect of a boundary. This aim has been well achieved, in spite of the difficulty which confronted the author because of the vague character of the limits of the field of his own subject; and surveyors will find, *inter alia*, the topics enumerated above treated in a learned yet clear and concise manner.

Reference-book for Statical Calculations. By Francis Ruff. Price 4s. nett. London: Constable & Co., Limited.

This exceedingly useful little book, which was originally written in German cloth in Germany and in France it has met with great success, now appears in an English translation by the author. Its aim is to enable engineers and others to carry out any desired statical calculation with ease and rapidity. This is attained by giving for every case dealt with a frame and stress diagram, together with a short description showing how the latter has been drawn. The procedure is followed as regards beams and girders, lodge trusses, strut frames, roofs, cantilevers, open web girders, curved beams, suspension bridges, framework columns, earth pressure, retaining walls, and concrete structures. The notation used is very convenient, and the use of Mr. Ruff's work will undoubtedly save the busy practitioner a great deal of time and trouble, as it is not always easy to find in a large text-book just the information which may be wanted for the calculations required in any given cases. Some very useful tables are added at the end of the work, the whole of which is designed to save labour.

Stresses and Strains. By F. R. Farrow, F.R.I.B.A., Price 5s. nett. London: Whittaker & Co.

This work, a second edition of which has just appeared, deals with the various problems of stress and strain which are likely to be of use to the architectural student. The author, who, by the way, has had a large experience in the tuition of architectural students, assumes the very minimum of mathematical knowledge and skill on the part of his readers. The calculations of beams, girders, stanchions, arches, retaining walls, and so forth are treated both graphically and mathematically, and the text is elucidated throughout by an excellent series of worked examples. The several formulæ are collected into a useful list, while the book is completed by a series of tables of the strength of materials and other data useful in making calculations. Well indexed and copiously illustrated with clearly drawn diagrams, this work should prove exceptionally valuable to the architectural student who does not need the more advanced treatment of the subject which is usually to be found in text-books on applied mechanics, materials, or the theory of structures.

The Law relating to Tithe Rent-charge and other Payments in lieu of Tithe. By P. W. Millard, LL.B. Price 4s. 6d. nett. London: Butterworth & Co. and Shaw & Sons.

Although tithes, properly so called, are almost extinct in England and Wales, most land is subject to tithe rent-charge, corn rent, or some other payment in lieu of tithe, and estate agents and surveyors being daily concerned with real property need to know a good deal of the law relating to this subject. Mr. Millard, who is the assistant head of the Tithe and Copyhold Branch of the Board of Agriculture, is a most efficient guide through a somewhat complex field of law. He has dealt with his subject in a clear and practical manner, and each of the thirteen chapters into which the book is divided is concerned with a definite topic. The Tithe Act, together with the rules and forms thereunder, are set out in full in an appendix, and all the decided cases are noted in the text. Mr. Millard's work forms an up-to-date and clear exposition of the law in a consolidated and easily accessible form.

Local Government Case Law, 1911. By R. A. Glen, M.A., LL.B., Barrister-at-Law. Price 7s. 6d. nett. London: "The Local Government Review," Ltd.

This is the second annual volume of "Local Government Case Law" issued by the *Local Government Review*, and the name of its author is sufficient guarantee of the care and accuracy which are necessary in such a compilation. It is exceedingly copious, and contains digests of over 450 cases. The table of cases and index include the cases digested in the first volume, thus much facilitating reference. The digests are grouped under fourteen headings, many of which are of special interest to municipal engineers and surveyors—*e.g.*, Contracts and Compulsory Purchase (forty-six cases), Highways, &c. (fifty-six cases), Public Health, Sewerage and Drainage (twenty-five cases), and Water, Gas and Electricity (twenty-three cases). We know of no other single volume in which so complete a digest of local government case law can be found conveniently and carefully arranged and indexed for easy reference.

The Land Union's Hand-book on Provisional Valuations. Price 3s. nett. London: Vacher & Sons, Limited.

This hand-book is designed to assist owners of land and house property in dealing with valuations under the Finance (1909-10) Act, 1910, as amended by the Revenue Act, 1911. It is not intended as a technical legal hand-book, but it states as simply as possible the main features which property owners ought to understand, and the direction in which they should move if they desire to protect their interests. The object of the Land Union in issuing the book is to give such hints as may be conducive to the protection of the interests of those who are liable to pay the duties and who have not the leisure at their disposal to study the Act in detail or to peruse more technical legal works.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

NEW STREETS AND BUILDINGS.

REVISION OF OBSOLETE BY-LAWS.

A circular relating to by-laws as to new streets and buildings has been issued to district councils by the Local Government Board. The circular points out that in the existing by-laws the ordinary clauses for the laying out of roads do not permit some of the classes of roadway which have been designed in some "garden cities," or the exceptional arrangements which are demanded in certain cases by the configuration of the ground.

Local authorities have from time to time applied to the board for approval of by-laws appropriate to such conditions or circumstances. Other local authorities have obtained express statutory powers with similar objects in view, but there are many in whose districts by-laws have been in force practically unaltered over a long period of years, by-laws which were framed before the modern methods and materials came into vogue, and consequently are not so drawn as to allow or to regulate their use. It therefore behoves all local authorities from time to time to consider the terms of the by-laws in force in their areas, so as to see that they are sufficient to meet present-day requirements. The board will be happy to render assistance to any authorities who may desire to modify their existing by-laws by referring them to clauses which have been embodied in series already adopted or by such other suggestions as may be practicable.

It is recognised that in many parts of the country, and particularly in rural areas, there is great need for better cottage accommodation, and rural district councils should be careful to see that the requirements of their by-laws, while prescribing conditions essential to health, are not such as to offer any impediment to the erection of suitable dwellings. There are some rural districts in which a code of by-laws based on the board's original Model series, which was drawn up with special reference to urban areas, is still in force. These codes are not only more stringent than the board would at the present day consider necessary in a rural area, but are not relieved by the relaxations and modifications which have been embodied in the latest Model code for urban districts with a view not only of meeting special difficulties, but of securing greater flexibility in the administration of the by-laws. The councils of these districts should take the matter into early consideration and see whether a less exacting series of by-laws would not meet the reasonable requirements of their area.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. Thomas, M.Inst.C.E., County Surveyor, Buckinghamshire.

EXAMINATION.

The October, 1912, examination will be held in Birmingham on the 10th, 11th and 12th of that month.

FORTHCOMING DISTRICT MEETINGS.

Eastern District meeting at Grays, September 21st or 28th.

East Midland District meeting at Ilkeston, September 28th.

Eastern District meeting at Gerrard's Cross, April 26th, 1913.

A meeting which had been arranged for September 13th and 14th at Wrexham has been postponed.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

ANNUAL MEETING.

The annual meeting will be held in London in October.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

President—Mr. John D. Watson, M.Inst.C.E., F.R.S.I.

MEETING AT SALFORD SEWAGE WORKS.

To-morrow (Saturday) a visit will be paid by the members of the Association of Managers of Sewage Disposal Works to the works of the Salford Corporation in Borough-road, Weaste, the points of interest in the installation being screening chambers, detritus tanks, roughing filters with special cleansing machinery, final percolating filters with fixed sprinklers, automatic samplers, double-acting plunger and centrifugal pumps of 40,000,000 daily capacity, chemical mixing machinery, Tangye sludge pumps for loading the steamship "Salford," clinker crushing machinery, and media washing and grading machinery.

Programme.

3 p.m.—Meet at sewage works, when members will be received by Mr. Councillor Mather (chairman) and the members of the river Irwell Conservancy Committee. The Mayor of Salford (Alderman H. Linsley, J.P.) will be present later in the afternoon.

Paper, descriptive of the works, will be read by Mr. J. Corbett, borough engineer and surveyor.

View the works under the guidance of the borough engineer, and the manager, Mr. W. H. Duckworth, F.C.S.

Tea at the sewage works, at the invitation of his Worship the Mayor, the chairman, and members of the River Conservancy Committee.

The meeting arranged to be held at Ramsbottom tomorrow has been cancelled.

MUNICIPAL TRAMWAYS ASSOCIATION.

ANNUAL CONFERENCE, WEST HAM: PRELIMINARY NOTICE.

The annual conference of the Municipal Tramways Association (Incorporated) will be held in West Ham on September 25th, 26th and 27th next. De Keyser's Hotel, Victoria Embankment, E.C., has been selected as headquarters for delegates, and the following programme has been arranged:—

September 25th.

10.15 a.m.—Reception by the Mayor and West Ham Council.

10.30 a.m.—Presidential address by Mr. H. E. Blain, tramways manager, West Ham.

Paper: "Tramways Administration by Municipalities: A Retrospect and a Forecast," by Mr. Councillor S. C. T. Neumann, deputy-chairman Bradford Tramways Committee.

1 p.m.—Luncheon.

2 p.m.—Proceed to Tramways Depot, Greengate-street, Plaistow, by special cars.

2.15 p.m.—Discussion on the interim report of the Corrugation Committee.

3.30 p.m.—Inspection of depot and of the Exhibition of Tramway Appliances, &c.

7.30 p.m.—Corporation reception at the town hall.

September 26th.

10 a.m.—Paper: "Tramway Fares and their Basis," by Mr. W. J. McCombe, tramways manager, Hull.

12.15 p.m.—Luncheon.

1.15 p.m.—Proceed by special cars to tramway depot.

1.30 p.m.—Meeting of managers' section.

1.30 to 3 p.m.—Inspection of depot and Exhibition of Tramway Appliances.

3 to 5 p.m.—Garden party in West Ham Park.

7 for 7.30 p.m.—Association dinner at the Liverpool-street Hotel, E.C.

September 27th.

9.45 a.m.—Annual business meeting at De Keyser's Hotel.

ROYAL SANITARY INSTITUTE.

PROVINCIAL SESSIONAL MEETING, LEWES.

At a meeting of the Royal Sanitary Institute, to be held at the Town Hall, Lewes, on Friday, October 4th, at 7 p.m., Mr. D. Roberts, the borough surveyor of that town, will open a discussion on "The New Sewerage System for Lewes, with Special Reference to the Discharge of Effluents into Tidal Streams," among those who are expected to take part in the proceedings being Messrs. John H. Blizard, ASSOC.M.INST.C.E., Southampton, A. J. Martin, M.INST.C.E., Westminster, and A. E. Prescott, borough engineer and surveyor, Eastbourne.

The chair will be taken by Mr. H. Percy Boulnois, M.INST.C.E., chairman of council of the institute.

On the following morning the members will visit the Phœnix Ironworks and the Lewes Portland Cement and Lime works, and in the afternoon inspect the Lewes Victoria Hospital, the borough isolation hospital, the fire brigade station, and the waterworks.

A Town Free from Debt.—It was reported at a meeting of the Malton (Yorks) Urban District Council that the town is now entirely free from debt, the last instalment of borrowed money having just been paid.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

BUILDING INSPECTOR. September 7th.—Corporation of Burnley. £2 5s. per week.—Mr. P. Thomas, town clerk.

ROAD SURVEYOR.—September 7th.—Argyll County Council. £90 per annum.—Mr. D. Maclean, Estate Office, Strontian, Argyll.

SURVEYOR AND INSPECTOR OF NUISANCES. —September 9th.—Haverhill Urban District Council. £131 per annum.—Mr. Thomas Bates, clerk. Applications to be endorsed "Application for Surveyor."

CLERK OF WORKS.—September 9th.—Corporation of Coventry. £4 4s. per week.—Mr. G. Sutton, town clerk.

SURVEYOR.—September 9th.—Rothwell Urban District Council.—£105 per annum.—Mr. A. Tyldesley, clerk. Applications to be endorsed "Surveyor, &c."

JUNIOR ASSISTANT.—September 10th.—Borough of Batley. £80 per annum.—Mr. Oscar J. Kirby, borough engineer. Applications to be endorsed "Assistant."

CLERK OF WORKS.—September 10th.—Tavistock Rural District Council.—Mr. A. Kenneth Johnstone, clerk.

TWO TEMPORARY ASSISTANTS. — September 11th.—Norfolk County Council.—Mr. T. H. B. Heslop, county engineer, The Shirehouse, Norwich.

SANITARY INSPECTOR.—September 11th.—Town Council of Port Elizabeth. £200—£230.—Messrs. Davis & Soper, agents to the municipality, 54 St. Mary-axe, London, E.C. Applications to be endorsed "Abattoir Superintendent."

CLERK OF WORKS AND INSPECTORS. September 16th.—Tredegar Urban District Council. £3 per week. Also three inspectors of works, at £2 10s. per week each.—Mr. H. J. C. Shepard, clerk, Tredegar. Applications to be endorsed "Clerk of Works" or "Inspector."

CHIEF ENGINEER AND COUNTY SURVEYOR.—October 7th.—London County Council. £2,000.—Sir Laurence Gomme, clerk.

DRAUGHTSMAN.—Survey Department of the Federated Malay States. Age between 25 and 35. £300—£400.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W. "M.5,511" to be quoted on left-hand top corner of application.

WORKS FOREMAN.—To construct concrete reservoir, engine and boiler house, mechanical filters, and lay mains in Southern Nigeria, under the direction of Mr. H. F. Peet, waterworks engineer to Southern Nigerian Government, Lagos. £350 per annum.—Messrs. Middleton, Hunter & Duff, consulting engineers, 17 Victoria-street, Westminster.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

CHORLEY.—September 9th.—Designs for a school, for the corporation.—Mr. J. Mills, town clerk.

RANGOON.—September 28th—February 1st.—The date in the conditions in Clause 28 has been altered from August 31st to September 28th and in Clause 14 from January 1st to February 1st, 1913. The latest date for posting letters to reach Rangoon by February 1st will be by the Indian mail of January 10th.

LLANELLY. — September 30th. — Competitive designs and estimates for school buildings for over 1,000 children, also domestic subjects centre, for the Education Committee.—Mr. G. E. Halliday, F.S.A., F.R.I.B.A., Castle-street, Cardiff, will act as assessor and award premium.—Mr. I. W. Watkins, clerk, Education Offices, Coleshill-terrace, Llanelly.

WANDSWORTH.—October 14th.—Competitive designs for public swimming bath at Balham.—Mr. P. Dodd, borough engineer, 215 Balham High-road, S.W.

GLASGOW.—October 29th.—Preliminary sketch designs are invited by the corporation for the extension of the municipal buildings. Honorariums of 100 guineas to five selected designs.—Mr. John J. Burnet, A.R.S.A., 239 St. Vincent-street, Glasgow, is assessor.—Applications to the clerk, Mr. J. Lindsay, town clerk.

HUDDERSFIELD.—October 31st.—Designs for laying out certain areas as a town planning scheme, for the corporation. Premiums of 100, 50, and 25 guineas. —Mr. J. Henry Field, town clerk.

ORSETT (Essex).—January 1st.—For the construction of a sewerage and sewage disposal scheme in the parish of South Ockendon, for the Orsett Rural District Council. Premiums of £50 and £25 are offered.—Mr. James Beck, clerk, 2 Orsett-road, Grays.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

Buildings.

DERBYSHIRE.—September 7th.—For the erection of a school, for the Education Committee.—Mr. G. H. Widdows, architect, County Education Office, St. Mary's-gate, Derby.

ERPINGHAM.—September 7th.—For the erection of three pairs of cottages, for the rural district council.—Mr. J. T. Willis, deputy-clerk, Cromer-road, Sheringham.

LEIGH-ON-SEA.—September 9th.—For the erection of offices and weighbridge foundations at the gas works, for the urban district council.—Mr. J. W. Liversedge, engineer and surveyor.

OAKHAM.—September 9th.—For widening a bridge, for the rural district council.—Mr. A. H. Marsh, clerk.

LEITH.—September 9th.—For the erection of a school, for the School Board.—Mr. G. Craig, architect, 85 Duke-street, Leith.

LUTON.—September 9th.—For the erection of public baths, for the corporation.—Mr. J. W. Tomlinson, town engineer.

OLDHAM.—September 11th.—For the erection of a cart shed and other works, for the corporation.—Borough Surveyor.

LANCASHIRE.—September 11th.—For the erection of a temporary school, for the Education Committee. —Mr. H. Littler, 16 Ribblesdale-place, Preston.

NOTTINGHAM.—September 11th.—For the erection of a school, for the Education Committee.—Mr. F. B. Lewis, city architect, Guildhall.

HACKNEY. — September 12th. — For extension to electricity works, for the borough council.—Mr. W. A. Williams, town clerk.

WEST RIDING.—September 12th.—For additions to farm buildings, for the county council.—The Treasurer, County Hall, Wakefield.

PHILLACK.—September 12th.—For laying down 9 miles of water mains and fittings, the construction of two covered concrete reservoirs, and supplying and fixing machinery, for the urban district council.—Mr. W. G. Kempthorne, clerk.

TOWCESTER.—September 14th.—For the erection of seventeen houses, for the rural district council.—Mr. W. K. Higham, clerk.

TREDEGAR.—September 17th.—For the construction of foundations for a gasholder, for the urban district council.—Mr. D. W. Davies, Tredegar.

GRIMSBY.—September 17th.—For the erection of a council school, for the Education Committee.—Mr. Douglas Chandler, clerk.

HULL.—September 19th.—For the erection of a school, for the Education Committee.—Mr. J. H. Hirst, city architect.

KENILWORTH.—September 19th.—For the erection of a lodge and chapel at cemetery, for the urban district council.—Mr. S. Douglas, architect and surveyor.

LAMBETH.—September 19th.—For repairs, painting and lead roof work, for the corporation. Mr. H. Edwards, borough engineer.

RHONDDA.—September 20th.—For alterations and extensions to schools, for the urban district council.—Mr. W. P. Nicholas, clerk, Pentre, Rhondda.

BLACKBURN.—September 23rd.—For the erection of public halls, for the corporation.—Mr. L. Beard, town clerk.

LANARK.—September 24th.—For the construction of two bridges, for the county council.—Mr. W. E. Whyte, district clerk, District Offices, Hamilton.

SALFORD.—September 25th.—For alterations and additions to town hall and sessions court, for the corporation.—Mr. J. B. Broadbent, 15 Cooper-street, Manchester.

NORTH RIDING.—October 2nd.—For the erection of a cookery and manual instruction room, for the Education Committee.—Mr. J. C. Wrigley, secretary, County Education Offices, Northallerton.

Iron and Steel.

EDINBURGH.—September 11th.—For supplying cast-iron pipes, for the Water Trustees.—Mr. W. Boyd, W.S., clerk to the trustees, Water Trust Chambers, 12 St. Giles-street, Edinburgh.

MALDON.—September 16th.—For laying 2,000 yds. of cast-iron water mains, for the rural district council.—Mr. A. W. Freeman, clerk.

LEEDS.—September 30th—October 7th.—For the erection of steel and corrugated-iron building, and constructing surface-water drainage, for the Tramways Committee.—Chairman of the Tramways Committee.

MADRAS (India).—For the supply of about 9,500 tons of cast-iron pipes and special castings, with valves, and other works in connection with water supply distribution system, for the corporation.—Messrs. J. Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

Roads.

WORSBOROUGH.—September 7th.—For the widening and reconstruction of a road, for the urban district council.—Mr. J. Whitaker, surveyor.

HANWELL.—September 7th.—For wood paving a portion of Boston-road, for the urban district council.—Mr. Percy Scott, clerk.

BEDLINGTON.—September 9th.—For making up a certain street, for the urban district council.—Mr C. D. Forster, 24 Grainger-street West, Newcastle-on-Tyne.

ITCHEN.—September 9th.—For work in ten roads, for the urban district council.—Mr. T. A. Collingwood, surveyor.

LEEDS.—September 9th.—For work of paving and flagging, for the corporation.—Town Clerk.

HENDON.—September 9th.—For making up certain roads, for the urban district council.—Mr. S. S. Grimley, engineer, Council Offices.

MAESTEG.—September 9th.—For works of road improvement and walling, for the urban district council.—Mr. Robert Seale, clerk.

KENDAL.—September 10th.—For making up certain streets, for the corporation. Borough Surveyor.

RABAT (Tangier).—September 10th.—For the construction of two roads, for the Special Committee of Public Works.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

EDMONTON.—September 10th.—For the supply of Guernsey and Aberdeen granite, for the urban district council.—Mr. W. F. Payne, clerk.

BEDFORD.—September 10th.—For the supply of broken granite, ironstone slag and ironstone tarmacadam, for the corporation.—Mr. C. Stimson, town clerk.

CARSHALTON.—September 11th.—For the supply of 300 yds. of 2-in. and 1,100 yds. of 1½-in. granite, either Cleehill, Quenast, Penmaenmawr or Guernsey, and the hire of steam roller, for the urban district council.—Mr. C. P. Lovelock, clerk.

HEMSWORTH.—September 11th.—For making up certain streets, for the rural district council.—Mr. J. Scholefield, clerk.

STOKE-ON-TRENT.—September 11th.—For making up certain streets, for the corporation.—Borough Surveyor.

BIRKENHEAD.—September 11th.—For making up two roadways, for the corporation.—Mr. C. Brownridge, borough engineer and surveyor.

SUTTON.—September 11th.—For laying creosoted deal blocks, for the urban district council.—Town Surveyor.

HESTON.—September 12th.—For relaying wood paving at Hounslow, for the urban district council.—Mr. J. G. Carey, engineer and surveyor, Council House, Hounslow.

FELIXSTOWE.—September 12th.—For the supply of Guernsey granite, for the urban district council.—Mr. H. Clegg, surveyor.

CHELMSFORD.—September 12th.—For paving work with granite blocks, for the corporation.—Mr. W. Smith, town clerk.

PEMBROKESHIRE.—September 12th.—For the construction of 833 lin. yds. of roadway, for the county council.—Mr. R. C. Wheatley, clerk.

OXFORDSHIRE.—September 13th.—For the supply of road materials, for the county council.—Mr. S. Stallard, county surveyor, Oxford.

ALVASTON.—September 14th.—For the supply of slag rejections and granite, for the urban district council.—Mr. W. J. Holbrook, clerk, Full-street, Derby.

GREENFORD.—September 16th.—For the supply of gravel, hoggin, river flints and chalk flints, for the urban district council.—Mr. W. H. Read, surveyor, The Avenue, West Ealing.

ALTRINCHAM.—September 17th.—For widening, kerbing and channelling, for the urban district council.—Mr. H. E. Brown, surveyor.

ACTON.—September 17th.—For making up two roads and resurfacing several carriageways with tar-macadam, for the urban district council.—Mr. W. Hodson, clerk.

WATFORD.—September 18th.—For the supply of 4,480 tons of broken granite, and chippings and dust, for the urban district council.—Mr. W. Hudson, clerk.

REIGATE.—September 18th.—For the execution of private street works, for the rural district council.—Mr. A. J. Head, surveyor, 48 High-street.

HORSHAM.—September 20th.—For the supply of tar for surface treatment, for the rural district council.—Mr. W. Dengate, surveyor.

BURNLEY.—September 21st.—For road improvement work, for the rural district council.—Mr. H. Pritchard, surveyor.

NANTYGLO AND BLAINA.—September 23rd.—For the supply of limestone granite, limestone chippings and granite chippings, for the urban district council.—Mr. H. J. V. Shepard, clerk.

RUNCORN.—September 23rd.—For making-up work with tar-macadam and ordinary macadam, for the rural district council.—Mr. H. Swetenham, surveyor, 49 Northgate-street, Chester.

ST. NEOTS.—September 24th.—For the supply of broken granite, Roemac and Ferromac, for the urban district council.—Mr. J. Edey, surveyor.

TANGIER.—October 3rd.—For the construction of a road 1½ miles long, for the Committee of Public Works.—Specifications may be obtained at the Intelligence Branch of the Board of Trade, 75 Basinghall-street, E.C.

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

Notes from Recent Annual Reports.

Some of the most important of the figures presented with Mr. John Willmot's annual report were recorded in our issue of August 16th, p. 236. The maintenance cost per mile of main roads is just over £111, a moderate figure considering that the average cost for the whole of England and Wales is £75. For the information of our younger readers the conditions that lead to an expenditure considerably above the average may be briefly described. The mileage of Warwickshire "main" roads, or roads maintained directly by the county, is only 457½, or about one-fifty-second of the total for England and Wales, while the area of Warwickshire is about one-sixtieth of the total area of the Kingdom and Principality. If we took into consideration, however, the large areas in the West of England and in Wales in which there are no main roads, and other large areas in which there is a very small mileage of such roads, we should find that the Warwickshire main roads serve a much larger proportion than one-sixtieth of the area *really served* by main roads. Secondly, the density of population in Warwickshire is such that the main roads of the county, having only one-fifty-second of the total mileage of main roads, serve a population which is one-thirty-seventh of the total population—a very significant comparison. Thirdly, the character and distribution of a considerable proportion of the population of Warwickshire and adjoining areas is such as throws a heavy burden upon rural roads, the Black Country where Worcestershire, Staffordshire and Warwickshire meet being notably of this class. Fourthly, the county, in the heart of the Midlands, has a considerable through traffic, a large proportion of which traverses this relatively small mileage of main roads. Lastly, it may be noted that the service required of the roads is to some extent indicated by the rateable value of the area, which is nearly £8 10s. per acre, compared with about £6 5s. per acre for England and Wales, although the latter figure takes into consideration the great industrial areas of London, Lancashire and Yorkshire. The principal geological systems are the lias and the new red sandstone, both of which include strata which sometimes add indirectly to the cost of main-road maintenance. All these factors would result in a still higher cost of maintenance if the county were not favourably situated as regards materials suitable for main-road crusts, the cost of hard road metal having been during the year 8s. 1d per ton, and slag and rubble, chiefly used for foundations, costing 4s. 9½d. and 3s. 5d. per ton respectively.

As regards the traffic now carried upon rural roads it is worthy of note that the annual census taken on Surrey roads shows, as pointed out by Mr. H. Dryland, county surveyor, an increase of about 11½ per cent in motor vehicles, and a decrease of some 4 per cent in horse-drawn vehicles; and in this connection it may be pointed out that in addition to the through traffic from London to the south and south-east coasts, there has recently been some extension in the local use of motor vehicles for trade purposes in this part of the country. As regards roads in East Suffolk, the cost of maintenance of the 306 miles of main roads in that administrative county was just over £119 per mile; but the present is not a favourable opportunity for making comparisons involving this figure, since the roads of the county have passed through a severe crisis, involving exceptional expenditure, as will be seen by a reference to p. 282 (August 23rd), where the gist of this portion of Mr. W. Jervis's annual report is given. In a report by Mr. James Bee, Superintendent of the Blackpool Cleansing Department (p. 213, August 9th), the advantages of street watering are urged on the ground of efficiency and reliability as well as economy. Mr. Bee has found sea water very efficacious in laying dust, and the fact that the sea never dries up, even in the worst droughts, is beyond cavil. The cost of street watering in Blackpool during the year was only £7 per mile. In Bristol (p. 220, August 9th) surface tarring has proved successful, the cost of maintenance of broken stone roads having increased very little during the past five years, while the decrease in the amount of sweepings and slop removed since surface-tarring was adopted is some 20,000 loads per annum.

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Tarred Roads and the Weather.

While the way in which a surface-tarred road is affected by the weather depends very largely upon the situation of the road and the nature of the roadside conditions, there are possibly some generalisations which may be of value as regards the effects of different kinds of weather upon tarred roads generally. The extent to which tarring is followed in certain areas is no doubt partly due to favourable conditions of soil and climate, but is also very largely dependent upon other circumstances, such as the proportion of motor traffic to the whole, and the extent to which the available crust materials are suitable for such traffic without surface tarring. While, therefore, the effects of climate and weather upon tarring policy may be properly studied by comparing one area with another, it is necessary also to take into consideration the information which may be gained by a study of the effects of different kinds of weather in the same area, or over the country as a whole.

The long hot spell of last year seems to have been, on the whole, favourable for tarred roads, the wastage of tar having been, in some cases, smaller than might have been expected, and the sliminess of certain roads in the autumn wet weather partly the result of the presence of an unusually large amount of tar at and near the surface. Partly, no doubt, it was to be ascribed to a lack of heavy showers and the resulting formation of tarry emulsion. A longish spell of mild and damp but not wet weather in the winter seems also to have a very favourable influence, and, if we except drizzling weather or prolonged and gentle rains, the kinds of weather that persist in spells of con-

siderable length seem to be, on the whole, favourable to the life and efficiency of surface-tarred roads. The hot summer of last year was due to the dominance of an open type of weather, with brilliant sunshine, and the breezes that are due to the effect of hot sunshine in warming up the land; and the condition of daily land and sea breezes was, in fact, in action for a considerable part of the summer, at any rate in the South of England. The hot sunshine being tempered by persistent breezes, the most serious damage done to tarred surfaces was mainly confined to roads unfavourably situated as regards cross currents and the play of wind upon the crust of the road. A comparison of last summer with the summer before—1910—and especially with regard to some hot June days, suggests that the worst kind of weather for tarred roads in summer is sultry weather. A few hours of hot, calm conditions, even with gradually weakening sunshine, on the morning of a summer day may cause more wounding of the surface than a whole day of hot sunshine and refreshing breezes.

Turning next to a consideration of the spell of wet, cool weather which has just been experienced, it seems to have been very favourable for tarred roads; the low temperature prevented softening of the surface, and the sharp showers which occurred at frequent intervals washed away the gritty mud formed during gentle rains, a material which is very damaging to tarred surfaces under a considerable volume of traffic, unless it be removed artificially or naturally at frequent intervals. Other factors, small perhaps in themselves, but of some importance if taken together, may also be noted, all tending to a reduction of traffic. In some districts the effects of the coal strike may still have been felt, but a more general cause of a reduction in traffic was the failure of harvests—the hay harvest over large areas in the Midlands, the second crops of hay in the South (after light first crops), and the general failure of the corn harvest. Besides the direct effects in a reduced amount of carting, the effect upon local trade and the farmers' purchasing power must have been considerable. Lastly, the wet spell included the holiday month of August, and the amount of pleasure traffic has doubtless been unusually small. Taking a year as a whole there is usually a good deal of give and take as regards conditions favourable and unfavourable to the maintenance of road crusts, but if we are to study the behaviour of tarred roads in the autumn in the light of our experiences in the summer, we must go into the matter somewhat closely, and consider all factors affecting the results.

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The Local Government Board and Isolation Hospitals.

Some time ago, in consequence of a number of complaints which had been received regarding the large and increasing cost of construction of isolation hospitals, the Local Government Board instituted an inquiry in order that local authorities submitting schemes apparently too costly in character might be referred to more economical examples of what was needed. This inquiry has now been concluded, and a report containing a large body of information which will be very valuable to sanitary authorities and their officers in preparing plans for isolation hospitals has just been issued. It is now generally conceded that every populous district should be provided with hospital accommodation for the reception of cases of infectious disease, at least for such as are without proper lodging and accommodation, or which occur under circumstances involving special danger to the public health. The proportion of cases which it may be desirable to isolate in hospital will vary to some extent with local circumstances. When not in use for the acute infectious diseases isolation hospitals may be used for the treatment of cases of pulmonary phthisis. With the more general provision of isolation hospitals in recent years, however, there has been an undoubted increase in the cost. Although the common practice of estimating the cost of hospitals as so much per bed is not wholly satisfactory, it provides a rough basis for comparison. At the present day the cost per bed varies from £300 to £500, but even the latter figure is not infrequently exceeded. In the case of small districts, the report points out that considerable economy can be effected by combination. In this way duplication in site, fencing, water supply and drainage, administrative accommodation and offices may be avoided, since the provision for these matters which would be necessary for a hospital, however small, may suffice with but little increase for a considerably larger one. Moreover, combination facilitates the classification of patients in respect of the diseases from which they may be suffering, and it enables a competent staff to be more easily maintained.

With the exhaustive information contained in this report at their disposal, it will in future rest chiefly with the local authority to keep the cost of providing a hospital within reasonable and moderate limits. The chief suggestions which are made to meet this end are (in addition to the combination for hospital purposes of small districts into suitable areas of sufficient size) careful selection and judicious purchase of a site; the employment of a competent architect; the avoidance of superfluities and unnecessary ornament, and careful supervision over the progress of the erection; and the reduction of the space in some instances to 1,872 cub. ft. for each patient. The second part of the report contains a description of a number of the hospitals which were visited in the course of the inquiry, with comparison of their cost, mention being made of any circumstances which may have tended to raise or lower it. The report is very exhaustive, and should be in the hands of every official who is called upon to advise in the matter of the provision of a hospital for his district.

* * *

The Drainage of Isolation Hospitals.

The use of the earth-closet in rural districts and places where a proper system of drainage does not exist is very general, and is in some cases resorted to where water-closets might be adopted. It has been assumed that the earth-closet is a satisfactory method of dealing with the excrement, and that its adoption facilitates the disposal of the liquid wastes, but its use is now condemned by Dr. H. Franklin Parsons in his report to the Local Government Board upon the cost of construction of isolation hospitals. In this document it is stated that—"Earth-closets are not suitable for hospital use. There is no objection to admitting hospital sewage into sewers, and no need for any preliminary sterilisation." This statement is amplified in another paragraph which we print, together with other extracts from the report, on another page. In addition to the reasons given by Dr. Parsons, there are others which confirm his opinion that earth-closets are not suitable for isolation hospitals. Recent investigations with regard to the dissemination of disease germs by flies lead to the conclusion that earth-closets may even become dangerous when used in isolation hospitals. Unless they are always kept closed (except when in use), so that the interior is dark, and unless extreme care is used in disposing of the contents, it does not need great imagination to understand the possibilities of infection being conveyed from them to the inhabitants of the immediate neighbourhood by flies.

That these possibilities of infection are enormously reduced when the water-carriage system of drainage is adopted is clearly shown by the evidence in connection with the bacteriology of sewers and drains which appears in the recently published report of the Departmental Committee of the Local Government Board upon the intercepting trap. In any case, the earth-closet deals only with the excreta, and, as Dr. Parsons points out, the urine, washing water, and other liquids are also infec-

Construction of Isolation Hospitals.

REPORT TO THE LOCAL GOVERNMENT BOARD.

The following report by Dr. H. Franklin Parsons gives the results of an inquiry, directed by the board int the cost of construction of isolation hospitals. This inquiry has been carried out by Dr. Parsons from time to time as opportunities occurred during his official connection with the board, and has been completed by him since his retirement in 1911. The primary objects of the inquiry were to investigate complaints received by the board concerning the large and increasing cost of construction of isolation hospitals, and to furnish instances of satisfactory hospitals which had been erected at a reasonable cost, in order that local authorities bringing proposals before the board, apparently too costly in character, might be referred to more economical examples of what was needed.

In an introduction Dr. Arthur Newsholme, the board's medical officer, remarks that Dr. Parsons' report contains information which will be very valuable to sanitary authorities and their officers in preparing plans for isolation hospitals.

Recent improvements in means of communication and transport, it is pointed out, enable a hospital to serve a considerably larger area than was formerly thought practicable. The provision of a single joint hospital for a number of small districts enables important advantages, as regards both economy and efficiency, to be secured which are seldom practicable for small separate hospitals. This is especially the case for small-pox hospitals which may conveniently serve a larger area than those for other acute infectious diseases.

In a chapter on the cost of isolation hospitals, Dr. Parsons shows that the common practice of estimating the cost of hospitals at so much per bed gives rise to fallacious comparisons unless the size and suitability of the hospital are taken into account, a small hospital costing more per bed than a large hospital, as the cost of the site and the administrative buildings cannot be proportionally less in the former case.

It is contended that temporary buildings, such as iron hospitals, though apparently much cheaper than permanent buildings of brick or stone, are in reality less so than they appear. Dr. Parsons suggests that a practical comparison between temporary and permanent buildings can only be made when the cost of site, foundations, water supply and drainage, furniture and other requisites is included; and these, he observes, may sometimes be more expensive than the building itself. The ready inflammability and the imperfect protection against extremes of weather afforded by temporary buildings have also to be borne in mind.

The chief suggestions which have been made by Dr. Parsons with a view to keeping the cost of providing a hospital within reasonable and moderate limits are—the combination for hospital purposes of small districts into suitable areas of sufficient size; careful selection and judicious purchase of a site; the employment of a competent architect; the avoidance of superfluities and unnecessary ornament, and careful supervision over the progress of the erection; and the reduction of the space in some instances to 1,872 cub. ft. for each patient. In this connection a memorandum by the board's architect appended to the report should be carefully studied.

The second part of the report contains a description of a number of the hospitals which were visited by Dr. Parsons in the course of the inquiry, with comparison of their cost, mention being made of any circumstances which may have tended to raise or lower it.

In a chapter on compartment and cubicle blocks Dr. Parsons describes some of the more modern methods of hospital pavilion which have been designed with a view to the prevention of cross-infection.

An appendix to Dr. Parsons' report contains (*a*) The board's memorandum of 1902 "On the provision of isolation hospital accommodation by local authorities," with appendix issued in 1908. This memorandum sets forth the board's requirements in the case of isolation hospitals erected under their sanction, (*b*) an account by Dr. Theodore Thomson of the cubicle wards at the Pasteur Hospital and at the Hospital for Sick Children, Paris, (*c*) a comparison, by Dr. Parsons, of the cost of isolation hospitals and lunatic asylums, (*d*) a memorandum by the board's architect, Mr. Kitchin, on the cost of isolation hospitals.

HOSPITAL AREAS AND ADVANTAGES OF COMBINATION.

Discussing in his report the advantages of the combination of districts for the purpose of hospital provision, as compared with the establishment of a separate hospital for each district, Dr. Parsons mentions the following:—

By the establishment of a single hospital in place of two or more hospitals, one site only has to be obtained, and the number of possible or feared foci of infection is limited; the duplication of various buildings and appliances is avoided, and the cost of fencing and other requirements, proportionately to the number of beds, is reduced.

Thus an isolation hospital, however small, would require provision for—(1) A ward block for patients, (2) quarters for the staff, (3) laundry and other out offices, and these, it is recommended, should be in separate buildings. "Hence, having regard to the need for placing these buildings at a proper distance from the boundary and from each other, and, it may be, for ground on which to dispose of sewage and refuse, the site for a hospital, however small, can rarely be less than 1 acre. But the administrative and laundry accommodation which would be required for a hospital of only one small ward block would suffice, with comparatively small increase, for a larger ward block, or for two or even more ward blocks; and a site of 2 acres would thus afford space for buildings capable of holding many more than twice the number of patients who could be placed on a site of only 1 acre. A site of 1 acre, if rectangular and measuring 40 by 121 yds., would require 322 yds. of fencing to enclose it, but a site of the same length, if 80 yds. wide, would contain 2 acres instead of 1, and yet would require only 80 yds. additional fencing. Similarly with water supply, sewage disposal and other matters, works which would be necessary for a hospital, however small, would serve with comparatively small additions for one considerably larger. . . ."

Dr. Parsons continues: "Notwithstanding these obvious advantages, it is often difficult to induce local authorities to combine for hospital provision. Sometimes the objection arises from a desire to manage their own affairs independently, or from the jealousy and mistrust of one another, which are, unfortunately, too commonly met with among neighbouring local authorities. Sometimes local authorities fear that if a joint hospital district were formed the hospital for the combined district might be placed in or near their district, so that patients from other places might be brought into their own district or conveyed by road through it, involving, as they think, greater risk of infection than if the hospital were for the use of their own district alone. The experience of the board's medical department does not, however, support either of these objections. Except in the special case of hospitals for small-pox, there is no evidence that infectious disease ever spreads to the surrounding population from an isolation hospital at which the buildings are placed at a suitable distance from the boundary and are enclosed by a proper fence in accordance with the board's requirements, and which is properly administered.

"Local authorities sometimes contend that they can provide their district with sufficient means of isolation at less expense by separate action than by entering into a combination. This, however, generally means that they consider that a cheap temporary or existing building will suffice, or that some makeshift arrangement can be extemporised when infectious disease has broken out. Such expedients, however, are rarely satisfactory. The cost of procuring and adapting a site, providing water supply and drainage, and procuring furniture and other necessary equipment greatly reduces the apparent advantage on the score of economy of a wooden or iron building over a permanent one; existing buildings erected for other purposes cannot readily be adapted to make satisfactory hospitals, and extemporised arrangements, such as tents and huts, which have to be erected when an outbreak occurs, are frequently not ready until too late to be of much use."

DESIGN OF ISOLATION HOSPITALS.

The principle by which the Local Government

Board have been guided in cases where their approval of the construction of an isolation hospital is necessary are set forth in a memorandum issued last in 1902, with an appendix in 1908. Compliance with the board's requirements as here set forth is, however, Dr. Parsons remarks, obligatory only when the hospital is to be erected by means of a loan sanctioned by the board, or when for some other reason the board's approval is needed. In other cases local authorities have under sec. 131 of the Public Health Act, 1875, the power to "provide for the use of the inhabitants of their district hospitals or temporary places for the reception of the sick" without the approval of the Local Government Board or of any other Government department being needed, the responsibility for the suitable design position and construction of such places resting solely upon the local authority themselves. The plans in the hospital memorandum are intended as suggestions only, and it is open to local authorities to vary them in view of the requirements of their districts. But, except as regards the number of beds in the ward blocks, any deviation from the board's plans which is not inconsistent with the principles set out in the memorandum usually involves additional expense per bed, and it is claimed in the report that some of the cheapest hospitals have been those which have most nearly followed the board's plans.

COMPARTMENT AND CUBICLE BLOCKS.

Dealing with the subject of compartment and cubicle blocks, Dr. Parsons recalls that the construction of a ward block in such manner that each patient should be enclosed in a separate glass cell or compartment was suggested so long ago as 1871 by Mr. Henry Greenway, medical officer of health for Plymouth. It consisted of a double row of cells with glass sides and ceilings, placed back to back down the centre of a ward block, so as to leave a corridor on either side and at each end between the cells and the outer walls, and also a space above the cells under the roof. In 1890-1 the Plymouth Town Council sought sanction to a loan for the erection of a fever hospital on a modification of this plan. The glass compartments were for two or four beds each, and were in a single row having windows into the open air on one side and opening into a corridor on the other side. This corridor was divided by doors, one between every two compartments, with the intention that different infectious diseases could be treated in the block at the same time, and more or fewer beds be allotted to each disease as occasion required. The plan was, however, not approved by the Local Government Board.

The first hospital block on the compartment plan erected in this country with the sanction of the Local Government Board was that at the Walthamstow Hospital. In this, a one-storey block, the central corridor is omitted, access being obtained from an open verandah only, and the compartments are placed back to back in a double row, cross ventilation being provided for by a special arrangement of underground air ducts. Similar blocks have since been erected at other isolation hospitals, as at Norwich, Enfield, and Croydon.

In the Croydon block cross ventilation of the compartments is provided for by a series of decussating air shafts at the top of the compartments instead of underground ducts. One half of the top of each compartment forms a shaft which crosses obliquely over the adjoining compartment in the other row to open on the opposite side of the ridge of the roof.

In the board's plan, in which the compartments are in a single row, the difficulty as to cross ventilation, says Dr. Parsons, does not occur, as windows are provided on both sides of each compartment, and the same advantage is afforded by a block designed by Mr. Chart which has been erected by the Croydon Rural District Council at their hospital at Beddington Corner. This block is of a cruciform shape, the duty room forming the centre, and each wing containing three rooms separated by glass partitions, and opening on to a verandah.

At the East Ham Isolation Hospital a block has been erected in which the compartments are approached from a central corridor, but the block is a single storey one, and the roof of the corridor is raised and furnished with louvres on either side and with openings at each end for the purpose of cross ventilation.

The advantages and disadvantages of the glass compartment system are discussed in the report: "The advantages claimed for the system are that, with proper nursing precautions, it enables patients with different diseases to be treated in one block without risk of cross infection; that the cost of erection is less per bed than that of a block with small separate wards of the usual kind; that every one of the beds can be used at any time irrespective of how any other beds may be occupied; and that the glass partitions facilitate supervision and promote the contentment of the patients, who feel less lonely when they can see others than in separate wards. The disadvantages of the system as compared with a pavilion of the ordinary kind are that the capital cost per bed is greater; that more nurses are required for the same number of patients; and that the nurses must be of a high standard of discipline and assiduity. Hence a block on this system is not to be recommended as the sole provision in a small hospital, in which the nursing staff is often reduced to a minimum at times when the hospital is empty and fresh nurses are engaged from time to time, as current needs require."

DETAILS OF CONSTRUCTION.

Commenting on the suggestion that for the sake of cheapness the walls of hospital buildings might be constructed, in lieu of brick or stone, of the more recently introduced materials, such as concrete, concrete blocks, Frazzi, &c., Dr. Parsons says: "The Local Government Board have in one instance (at Acton) sanctioned a loan for the construction of a ward block built of blocks of clinker concrete, keyed together in cement mortar and rendered outside with a coat ¾ in. thick of cement and sand, the structure being supported by steel stanchions 12 ft. apart, which carry the roof. The cost of the walls was 5s. 10d. per super. yard complete, and the total cost of the block for thirty-six beds, including roads and drains, but not furnishing, was £4,000, or £111 per bed. The cost per cubic foot was 4·66d., that of the original pavilions, which have hollow walls of brick, having been 6·9d. per cubic foot. But the comparison is not quite fair, as the new block is much longer, the main wards containing eighteen and sixteen beds respectively, whereas those in the older blocks contain only six and eight, and, the centre and ends of the block being nearly similar in each case, increased length of the wards does not add to the cost of the block proportionately to the increased number of beds."

COST OF CONSTRUCTION.

The cost of isolation hospitals is frequently reckoned as so much per bed, the total cost, with or without site, being divided by the number of beds provided. But this method, while useful for purposes of comparison where the circumstances are similar, is, in Dr. Parsons' view, very fallacious, if certain important considerations are neglected. Of these the chief are: (1) That a large part of the cost of providing an isolation hospital is made up of items which are necessary for a hospital, however small, such, for instance, as site, fencing and road making, water supply and sewage disposal, quarters for staff, and offices; and the cost of these items does not increase in proportion to the number of beds. Hence a small hospital must be expected to cost more per bed than a larger one. (2) That, in view of the need for classification of patients, according to sex and disease, the usefulness of an isolation hospital depends not merely upon the total number of beds which it contains, but also upon their being available for use at any time under the varying contingencies of infectious disease that may occur in the district which it serves. (3) That it is the total cost of the hospital which is of concern to the ratepayers of a district rather than the cost per bed.

"It would be easy," the report continues, "to diminish the cost per bed of a small hospital by making the wards larger, but this would add to the total cost of the hospital, and, if the smaller building were sufficient for the needs of the district, without making it more useful. In a small district, for which a hospital of four beds, with facilities for classification, would suffice for the needs likely to arise, it will be cheaper to erect such a hospital at a cost of £2,000, or £500 a bed, than to erect a larger one of twelve beds at a cost of £3,000, although in the latter case the cost per bed would be only £250.

"But, in view of the disproportionate cost per bed of small hospitals, it is advisable to avoid their erection wherever possible, and, as already pointed out, the best way of doing so is usually by the combining of small districts into larger areas for the purpose of hospital provision.

"Assuming that the hospital authority possess a suitable site, with facilities for obtaining a water service and for drainage, the cost of erecting a permanent hospital of medium size, say twenty to thirty beds, in accordance with the principles set out in the board's memorandum, may be estimated at somewhere

about £400 per bed, varying from £350 to £500, according to circumstances, such as the size of the hospital, the facilities afforded by the site, the style of the buildings, and the local prices of labour and materials. Where circumstances are favourable and strict economy is exercised, it may be sometimes as low as £300 per bed, or even lower; and, on the other hand, £500 per bed has often been much exceeded."

Dr. Parsons points out that the most frequent cause of excessive cost of isolation hospitals, and the hardest to avoid, is the difficulty of obtaining a suitable and convenient site. A local authority desiring to erect a hospital, in order to get a site at all, often has to buy a larger and more costly one than is necessary for the purpose, to give a higher price per acre than the land would be worth for any other purpose, and to incur heavy legal expenses in meeting opposition;* and not only so, but any site obtainable is often so situated as to involve much further expense in adapting it for hospital use.

The report continues: "It has to be pointed out that the influence of the site upon the cost of an isolation hospital is by no means eliminated by reckoning the cost per bed as exclusive of site. If the site is remote from sewers and water mains, the cost of drainage and water supply may run into several hundreds of pounds, whether these wants are supplied by making connections of considerable length with the nearest public services or by constructing independent works on the site. Similarly, remoteness from gas or electric mains may involve expense in works for lighting. If the site is not on a good road expensive works of road making may be needed in order to secure a proper access. Sometimes the only site obtainable has been an old quarry or other excavated ground where much expense was involved in clearing and levelling the surface and in securing stable foundations; or, in other cases, the soft and treacherous nature of the ground or the risk of subsidence from undermining has added to the cost of foundations. If the site is far from a railway station, with bad or hilly roads, the cartage of building materials will add much to the cost of building, and may render it difficult to procure labour. All these extra expenses are liable to be debited to the cost of the buildings and are not included in that of the site."

COMPETITIONS.

Dr. Parsons adds: "Our experience would also lead us to agree with the Board of Education report that competitions for plans are, as a rule, a waste of time and money. If the criterion adopted by the adjudicators be that of economy, there is a risk that the cost of the scheme may have been underestimated by the successful competitor; if the criterion be theoretical completeness, it may tend to adoption of schemes having features not useful in proportion to their cost. In some cases schemes which have been adopted after competition have been found by the board to require modifications which have brought them into resemblance with other schemes which had been passed over, and this has caused dissatisfaction."

TEMPORARY v. PERMANENT HOSPITALS.

Comparisons, it is remarked in the report, are sometimes made between the cost of a permanent hospital, which may be £400 per bed, with that of the temporary hospital blocks sold by makers of iron buildings, who offer a ward block, professedly for twelve beds, for about £400, or the price of one bed in a permanent hospital. But it is insisted that in making this comparison several points have to be taken into consideration:—

(1) The maker's list price includes only the bare building above the foundations. Site, fencing, water supply, drainage, foundations, concrete under floor, furniture and fittings are all extras, and the building, of which the nominal price is £400, may come to cost £1,000, or more, before it is completed and ready for occupation.

(2) The hospital blocks offered by makers of iron buildings do not usually afford the board's standard amounts of linear distance between beds, floor area, and cubic capacity per bed. Thus a ward 30 ft. long, 20 ft. wide and 12 ft. mean height may be intended for six beds, giving only 10 ft. of wall space, 100 sq. ft. of floor space and 1,200 cub. ft of capacity per bed, as against the board's standards of 12 ft., 144 sq. ft., and 2,000 cub. ft. per bed. If the amounts of space were rendered equal by placing more beds in the permanent building, or fewer in the temporary one, the difference in their apparent cost would be proportionately reduced.

(3) The accommodation in a temporary block is usually available for one disease only, and affords no facility for classification of patients suffering from different diseases.

(4) The administrative accommodation in the temporary hospitals on the market is at a minimum. There is only one room for the nurse, or, at most, a duty-room and a bed-room, and that in the same block as the wards, and the provision for washing, &c., if any, is of the scantiest.

It is admitted that temporary hospitals are sometimes useful in an emergency, as during an epidemic, in view of the short time needed for their erection, provided that a suitable site is available. They may be used on occasion to supplement an existing permanent hospital, which will afford the necessary administrative accommodation, and the board have in some cases sanctioned short loans for their provision for this purpose. The objections to them are the deficiencies in space and accommodation already mentioned, their less durability as compared with brick buildings, and their need of frequent repairs, the imperfect protection which they afford against vicissitudes of weather—iron hospitals are hot in summer, cold in winter, and noisy in heavy rain or hail storms—and especially their liability to destruction by fire and storm.

The substitution for match-boarding of hard plaster—preferably on a base of wire netting or expanded metal instead of wooden laths—or of an incombustible material in sheets, as at the Capel hospital near Tonbridge, with means of protection against excessive changes of temperature, would, it is stated, go far to obviate the objections to wooden framed buildings, and the Local Government Board have in fact offered to sanction loans for buildings so constructed, provided that, as regards standards of space and other matters, they complied with usual requirements. The report makes it clear, however, the period allowed for repayment of loan in such cases would be shorter than for buildings of brick or stone; and such buildings would probably cost somewhat more than the ordinary match-boarded ones, so that the immediate advantage as regards annual cost of repayment of loan might not be great.

The report adds: "Apart from special circumstances, there may be advantages in the adoption of a somewhat lighter form of hospital construction with a shorter period of loan, as changes in the incidence of a disease, or in the methods of dealing with it, may affect the future usefulness of a hospital, so that it may be obsolete for the purpose for which it was erected before the time when, as a building, it is worn out. The useful life may be shorter than the structural life. Durability for all time need not therefore be aimed at in the construction of an isolation hospital. For the same reason a period of loan longer than thirty years for a brick building appears undesirable. As regards the durability of frame buildings covered with wood or corrugated iron, much will depend upon the original strength and careful construction of the buildings, and much also upon the care taken of them and the due execution of repairs as the need arises."

Timber buildings, it is remarked, deteriorate more rapidly than brick or stone ones when unoccupied. "For a frame building covered externally with weather-boarding or corrugated iron, and lined internally with plaster or incombustible material (not match-boarding) a period of loan of ten or twelve years, or perhaps even fifteen years, might appropriately be allowed. (The period allowed by the Board for a building of brick or stone is thirty years.) But in the later years of its life a frame building would require frequent expenditure on repairs to keep it in a habitable condition, and it would be undesirable that instalments of repayment of loan should have to be made at the same time."

SPECIAL MATERIALS.

The Board would no doubt be willing, says the writer of the report, to sanction the use in hospital construction of the more recently introduced materials and methods in any case in which they could be shown to be cheaper than the ordinary materials in use in the locality. The report of the Departmental Committee of the Board of Education recommended that local education authorities should be encouraged to submit proposals for the use of novel materials or methods of construction for public elementary schools, and that a loan period of thirty years should be regarded as

* In the Sevenoaks district the Cuddingstone Hospital Committee, by taking advantage of a suitable piece of land being in the market, were able to obtain a site of 6 acres for £300, whereas in order to obtain a hospital site for the remainder of the district the rural district council had to seek compulsory powers of purchase and to pay £2,250 for a site of five acres.

normally appropriate to such cases, instead of the period of fifty years allowed in cases where ordinary methods are used, but that it should be made a condition of approval that provision should be made for the periodical inspection of the structure.

"It must be remembered," he says, "that as many of these special materials are not impervious to moisture, buildings constructed of them require to be coated with cement on the outside, and that, owing to the thinness of the walls, more ample provision for warming is necessary than in brick or stone buildings. Until experience has been obtained of their durability, the loan period for such buildings should probably be shorter than for those of brick."

AIR SPACE.

In a further paragraph in his report, Dr. Parsons says: "I do not feel justified in recommending a less distance than 12 ft. between bed and bed in wards for acute cases, unless the beds are separated from one another by a fixed screen, but perhaps some concession might be made in other dimensions. It will be observed that the board's present standards are not commensurable one with another, and that while a ward 24 ft. wide might conveniently afford 12 ft. of wall space and 144 sq. ft. of floor space per bed, it would have to be made nearly 14 ft. high (13 ft. 10·36 in.) in order to give 2,000 cub. ft. per bed. But in practice the additional space required in order to obtain the required 2,000 cub. ft. per bed is more useful if given as width of ward than as additional height above 13 ft., and the dimensions commonly adopted are therefore 26 ft. in width and 13 ft. in height, which give 156 sq. ft. and 2,028 cub. ft. per bed. But an increase of width from 24 ft. to 26 ft. involves a corresponding increase in floor, end wall and roof, as well as a longer bearing and consequently increased strength of roof timbers.

"Seeing, therefore, that the board's standard would be complied with by a floor space of 144 sq. ft. per bed, with a height of 14 ft., and that the additional height from 13 ft. to 14 ft. is of comparatively little value for purposes of isolation and ventilation, I suggest that the board might allow a standard of 1,872 cub. ft. instead of 2,000 cub. ft., with a floor space of 144 sq. ft. and a wall space of 12 ft. as at present. In single-bed wards, or compartments in which one patient is entirely separated from another with efficient cross-ventilation, a less amount of space might be allowed. Thus in the appendix to the board's Hospital Memorandum the dimensions of the single-bed cubicles are 12 ft. by 12 ft. and 10 ft. high = 1,440 cub. ft."

WARMING AND VENTILATION.

In the opinion of the writer of the report, open fireplaces suffice for the warming of small wards, but in large wards these may conveniently be supplemented by radiators warmed by hot water, especially when a considerable elevation of temperature has to be effected. Hot-water radiators are not recommended as the sole method of warming, and central stoves may be dispensed with where radiators are provided. Natural ventilation by windows is considered to suffice for occupied wards, but the heat of stoves may be usefully employed as a supplementary means of introducing warm air and extracting foul air.

HOSPITAL SEWAGE.

Earth-closets are not regarded as suitable for hospital use. The report states that there is no objection to admitting hospital sewage into sewers, and no need for any preliminary sterilisation. Dr. Parsons says in this connection: "The water-carriage system of excrement disposal should, if possible, be always used in connection with isolation hospitals; earth-closets are not found satisfactory owing to the large amount of liquid which finds its way into them, the labour which their use entails upon the nurses, and the difficulty of providing a supply of suitable earth and of disposing of the contents. Sometimes sawdust impregnated with a disinfectant has been used in place of dry earth, and after use burnt in a furnace with the view of obviating the supposed danger of spread of infection of small-pox or enteric fever if infected excreta entered the sewers. There is, however, no evidence that these diseases can be thus spread if the contents of the sewers are properly disposed of, and even if the danger existed it would not attach solely to the faeces, but also to the passage into the sewers of infected liquids as urine and washing water. Sterilising tanks for sterilising the hospital sewage in bulk by steam or chemical disinfectants have in some instances been constructed, but I believe in the cases of which I have knowledge have, in course of time, been in practice abandoned."

MUNICIPAL WORK IN CANADA.

(From a SURVEYOR *Canadian Correspondent.)*

Although the British firms doing business in Canada have largely increased in numbers, there is room for many more, for Canada is still an importing country. She is a large buyer from the United States of many articles (especially those used by municipalities) which might be supplied by the Motherland. This applies to such commodities as concrete mixers, filtration plant, sewage pipes, and a hundred and one things which are used by contractors and municipal authorities. Conditions, it is true, are somewhat different to those in Great Britain, but those who desire to cultivate business may be strongly advised to visit Canada, to go from coast to coast and to study the position on the spot. Agents are all very well in their way, but no firm can really realise what is required unless a representative finds out for himself the conditions as they affect his particular business. The chairman of one of the largest English companies importing into Canada put it this way: "I now understand, as the result of my visit, the requirements of your market in a way which no number of letters from our agents could have stated it. I know exactly what is wanted; how the goods are to be packed; how they must be made for Canada; and although the trip has been expensive, it will in the end mean a larger trade and better service." Recently several firms who have business relations with this side have sent out special representatives, among them being Mr. Adams, a director of Adams-Hydraulics, Limited, of London and York.

* * * *

The good roads movement in Canada is making great headway. The roads in most of the rural districts are atrocious, but with the extended use of motor cars and the settling of many new districts, more attention is being given to the construction of decent highways. The Quebec Government propose to spend £2,000,000 in making new roads and improving the existing ones, the various municipalities being called on to pay only one half of the interest on the money borrowed for the purpose. An international highway from Montreal to the boundary line is also being made. The Ontario Government, too, is devoting large sums to better roads, while in the West there is a distinct improvement. It is, however, slow work, owing to the vast territory and the smallness of the population. In Westmount, a suburb of Montreal, Mr. A. Currie, the city engineer, a Scotsman, who has had a wide experience in South Africa and other parts of the world, is putting down a large number of tar-macadam roads, which are practically unknown in Eastern Canada. Mr. Currie, drawing on his British experience of these roads, decided to try one road last year and he was so satisfied that he is now making up many other roads with the same material. The difficulty hitherto has been to get dry stones, but this has been overcome by the employment of an improved hot mixer. The roads wear well, have a nice appearance and are practically dustless. It remains to be seen whether they will stand the intense frost, which in Montreal and other Canadian cities is probably the greatest difficulty with which road engineers have to contend.

Housing Arbitrations. — The Local Government Board, under the provisions of the first schedule of the Housing and Town Planning Act, have, with the concurrence of the Lord Chancellor, issued an Order making rules for the purpose of fixing the scale of costs to be applicable on an arbitration under the schedule.

Derwent Valley Waterworks.—The opening of the first section of the Derwent Valley waterworks was performed last week by Alderman Sir E. H. Fraser, chairman of the Derwent Valley Water Board. The scheme, full particulars of which have appeared in our columns, embodies the construction of five storage reservoirs in the Peak district, of which the first—Howden—is now completed and opened, while the Derwent reservoir is nearing completion. The others will be the Hagg Lee, Ashopton, and Bamford. There is also a service reservoir at Ambergate. The total capacity of the five reservoirs will be, roughly, 10,000 million gallons, and they will be supplied by a drainage area of 31,946 acres. The total available yield of water is estimated at 50,000,000 gallons a day, of which 33,333,333 gallons will be available for supply to the authorities benefiting under the scheme.

British Practice in Sewage Disposal.*

By ARTHUR J. MARTIN, M.INST.C.E., F.R.SAN.I., F.G.S., President of the Institute of Sanitary Engineers.

British practice in sewage disposal as it exists to-day is the outcome of many influences, social as well as physical, chief among these being the density of population over large areas of the country, the absence of great rivers, the generally retentive character of the subsoil, the humidity of the climate, and a widespread desire for uniformity and regard for precedent. The sewers are mostly on the combined or partly separate system, and it is exceptional for the whole of the storm water to be excluded from them. Purification works are therefore designed to deal fully with a certain amount of storm water in addition to the sewage proper, three times the dry-weather flow in all being the ordinary allowance. Excess flows over and above three volumes are usually passed through subsidence tanks and discharged without further treatment.

HISTORY.

The history of the sewage problem in England may be summed up in a few sentences. The earlier sewers were merely covered watercourses, or conduits laid for the conveyance of surface water, but on the introduction of water-closets in 1810 they began to be used as outlets for foul drainage also. Nothing in the shape of purification was attempted. The Towns Improvement Clauses Act of 1847 expressly legalised the discharge of sewage into a river or the sea. Eventually, however, the rivers became so foul from the increasing quantities of sewage poured into them that an outcry arose against their pollution. A series of Royal Commissions was appointed to inquire into the subject, with the result that the Public Health Act of 1875 and the Rivers Pollution Prevention Act of 1876 prohibited the discharge of crude sewage into a stream. For the better enforcement of the law, Rivers Boards were established in the basin of the river Thames and the populous valleys of Lancashire and Yorkshire. Nowadays, wellnigh every town possesses its purification works, and in many parts of the country villages, public institutions, and even mansions, are compelled to purify their sewage.

LAND TREATMENT.

The irrigation of land with sewage has been practised for more than a century, at first merely with a view to profit, but later as a means of purification. Where the area available was insufficient for irrigation, intermittent downward filtration was resorted to, one or other of these two methods being recognised as the standard mode of purification. The tendency to rely on land for this purpose was fostered by the conditions under which public sewage works were laid down. The cost of such works is almost invariably defrayed out of a loan, which can only be contracted with the sanction of the Local Government Board for the country concerned, and the English Local Government Board were in the habit of stipulating that treatment on land should form a part of every scheme of sewage disposal submitted to them. In many parts of the country, where the land was unsuitable in character or restricted in area, this requirement presented a serious difficulty, and in some cases urgently needed works were delayed in consequence.

ROYAL COMMISSION, 1898.

To deal with the situation thus arising, another Royal Commission on Sewage Disposal was appointed in 1898. This commission, which is still sitting, has issued seven reports, and the present British practice is largely founded upon the recommendations which these contain. Those recommendations have now been embodied in a series of informal but well recognised rules, to which new sewage works are expected to conform. The result has been to discourage the study of the special requirements of each individual case, and to produce works of a more or less stereotyped character.

For this reason, and because of the absence of great rivers, the purification of sewage by admixture with a large volume of fully oxygenated water has received comparatively little attention, and the fine mechanically operated screens which are used in Germany and the United States as a preliminary to purification by dilution are practically unknown in Great Britain.

* A paper read in the Engineering and Architectural Section of the Berlin Congress of the Royal Institute of Public Health, July 26th last.

Coarser screens, built up of parallel bars with intermediate spaces ½ in. or more in width, are frequently employed, more particularly where the sewage has to be pumped, and in large works they are generally considered an advantage. In such cases the screens are frequently cleared by means of continuously moving rakes. In small installations the amount of solid matter removed by screens is hardly sufficient to justify their employment, and their tendency to choke and to pond the sewage back in the sewers is a serious drawback to their use in any case in which a man is not constantly in attendance.

DETRITUS TANKS.

Whatever method is adopted for the purification of the liquid, it is usual as a preliminary to remove as much of the solid matter as possible by deposition. This is generally effected in at least two stages. The sewage is first passed through small chambers, known as "grit chambers" or "detritus tanks," designed for the interception of road grit and other heavy material. It is generally considered advisable to discourage the retention in these chambers of the ordinary sewage solids. The chambers are accordingly kept small, an ordinary allowance for their capacity being a quarter or half an hour's average dry-weather flow. In many large works provision is made for the continuous removal of the grit by mechanically operated dredgers.

Such diversity as exists in British practice in sewage disposal is chiefly manifested with regard to the means adopted for the deposition of the suspended solids and their disposal. For the interception of suspended solids other than grit, recourse is had to sedimentation tanks, precipitation tanks, septic tanks, hydrolytic tanks, or slate beds.

SEDIMENTATION TANKS.

Where simple sedimentation is adopted, the sewage is generally allowed to flow through the tanks continuously. The Royal Commission recommend that it should take from ten to fifteen hours to pass through the tanks, and that the latter should be cleaned out at least once a week. On the quiescent flow plan the tanks are filled and emptied alternately, the sewage being allowed to remain in them from two to three hours. To get the best results the sludge should be removed not less frequently than after every second filling.

CHEMICAL PRECIPITATION.

The precipitation of the suspended matters by means of chemicals has been comparatively neglected of late years in favour of methods which do not require chemicals or involve the production of so large a quantity of sludge, but the Fifth Report of the Royal Commission on Sewage Disposal has brought it once more to the front. The chemicals most in use are lime, alumino-ferric, ferrous sulphate (in conjunction with lime) and ferric sulphate. For purely domestic sewage alumino-ferric is most in favour. Experiments carried on by the commissioners with this precipitant point to the conclusion that it gives better results mixed with lime than when used alone. Where large quantities of trade refuse are present special precipitants will often be required.

If the sewage runs through the tanks continuously, it should remain in them about eight hours, but where quiescent settlement is adopted a stay of two hours will generally suffice.

Sedimentation and chemical precipitation aim merely at the separation of the suspended solids from the sewage, their disposal being effected by a subsequent operation. The biological methods go further, for they not only arrest the solids, but dispose of their more putrescible constituents by the agency of micro-organisms cultivated for the purpose.

SEPTIC TANKS.

The septic tank is the oldest of the biological tanks now in use, and it is still the most widely employed. Its essential features are a capacity approximating to one day's dry-weather flow (though good results have been obtained where the stay in the tanks has not exceeded twelve hours), and an arrangement of inlets and outlets which does not involve any undue disturbance of the tank contents.

It is often supposed that septic tanks should be hermetically sealed, but Mr. Cameron pointed out in

the early days of septic treatment that the tanks might be either closed or open, and this observation is confirmed by the Royal Commission.

SHAPE OF TANK.

The large majority of sewage tanks, whether used for sedimentation, chemical precipitation or septic treatment, are rectangular. Six feet is a very usual depth, and 5 to 1 an ordinary proportion of length to width. The rectangular form probably owes its general adoption rather to considerations of convenience in construction than to its efficiency for the purpose in view. Where the sewage is allowed to come to complete rest in the tank, the precise form of the latter is doubtless a matter of minor importance, but with continuous flows the shape of the tank has a marked influence on the results.

DORTMUND TANKS.

Considerable attention has been given to deep tanks in which the direction of flow is upward, as in the well-known Dortmund tank. The original Dortmund tank is cylindrical, with a conical bottom, the total depth being about 45 ft. Tanks of this type are used by Mr. Watson at Birmingham, not in this case, however, as primary tanks, but for the interception of the suspended matter in the effluents from septic tanks and trickling filters respectively.

WEDGE-SHAPED TANK.

In view of the need which there is for securing a minimum velocity of outflow, and the importance which many authorities attach to the avoidance of septic conditions, it is remarkable that more attention has not been given to wedge-shaped tanks. In such a tank, triangular on plan, and with the inlet at the apex of the triangle, it is far easier to secure a uniform distribution of the flow through the whole body of the sewage than in an oblong tank, and a much longer outlet weir (and consequently a lower velocity of outflow) can be provided in the former than in the latter.

The writer is not aware of any wedge-shaped tanks already at work, but a number of schemes involving their use are now before the English Local Government Board.

HYDROLYTIC TANKS.

The tanks hitherto referred to consist in each case of a single chamber, but of late years compound tanks, in which each unit consists of two or more compartments, have come into use. Among the earliest of these is Dr. Travis's "hydrolytic tank," of which not the least remarkable feature is the association of a theory (the well-known "Hampton doctrine"), according to which "the physical operations constitute the Alpha and Omega of all sewage purification processes," with a device expressly designed to promote hydrolysis.

The hydrolytic tank consists essentially of a "sedimentation chamber," into which the sewage is first led, a liquefying chamber, into which the heavier solids are swept through openings in the bottom of the first chamber, and a "hydrolysing chamber," containing concrete slabs, wooden splines, or other bodies, to the surfaces of which the colloidal matter in the effluent from the first two chambers may attach itself. A large installation of hydrolytic tanks has recently been completed at Norwich, and others are being laid down elsewhere.

EMSCHER TANK.

A new tank has recently been devised by Dr. Imhoff for use in the Emscher sewerage district. In form it presents a strong resemblance to Dr. Travis's tank, but its depth (30 or 40 ft.) is greater than that of the generality of hydrolytic tanks, the liquefying chamber is much larger, and the sedimentation chambers much smaller, and there are no "colloiders." The essential difference, however, between the two tanks is that, whereas Dr. Travis maintains a steady flow from his sedimentation chamber through the liquefying chamber, there is no flow through the liquefying chamber of the Emscher tank. Great importance is attached to the absence of any outflow from this chamber, whereby it is claimed that the sewage passing away from the tank is maintained in a fresh condition, and uncontaminated by products of decomposition. The Emscher tank has attracted very favourable notice in Great Britain, as well as in America.

CULTIVATION TANKS AND COARSE BEDS.

The various biological tanks above described, while differing in detail, have one feature in common—namely, the retention of the deposited solids in one continuous mass. It is held by many investigators that better results can be obtained by spreading these solids in comparatively thin layers over a large surface, upon which liquefying organisms are cultivated. This idea has found expression in Mr. Scott-Moncrieff's "cultivation tank" and Mr. Dibdin's "coarse beds," both consisting of chambers filled with coarse material, such as flints, broken bricks, or clinker, the interstices of which are filled with sewage. There is an essential difference, however, in the way in which these two appliances are worked. The cultivation tank is kept full of sewage, which flows through the interspaces of the filling material continuously, and is consequently treated under anaërobic conditions. The coarse bed, on the other hand, is alternately filled and emptied, the periodical recharging of the interstices with air being claimed to secure a constant aërobic condition.

SLATE BEDS.

The accumulation of sewage solids in the interstices of a mass of coarse material is attended by serious practical difficulties, which are more or less overcome by Mr. Dibdin's slate bed. The latter, while in principle identical with the coarse bed, differs from it in substituting for a labyrinth of irregular spaces, bounded by rough surfaces, a regular series of cells of uniform shape, and with smooth walls and floors, from which the deposited material readily comes away. The mode of working a slate bed is similar to that of a coarse bed. The bed is filled and kept full for a period of about two hours, during which the suspended solids are deposited by sedimentation on the slates, and the liquid is then drawn off.

The Royal Commission in their Fifth Report express "the tentative conclusion that primary beds containing large slabs of slate must be regarded more as preliminary settling or septic tanks than as contact beds." Mr. Dibdin has entered a strong protest against this view of the slate bed, the aërobic condition maintained in the latter, and the character of the organisms cultivated therein, effectively differentiating it in his judgment from the tanks to which it is likened by the commissioners. They, however, in an appendix to their Seventh Report, issued in 1911, and giving the results of their further observations of slate beds, adhere to the conclusion at which they had previously arrived. They do so on the following grounds: "The effluent from a slate bed is, for practical purposes, indistinguishable from a tank effluent. It contains about the same amount of suspended matter, and requires subsequent treatment similar to that which would be necessary for a tank effluent from the same sewage."

Slate beds have been favourably reported on by a number of well-known observers.

CHOICE OF TANK TREATMENT.

The commissioners consider that the choice of a preliminary treatment should depend mainly upon local facilities for the disposal of sludge, and upon the type of filter to be used, and the fineness or otherwise of the filtering material. They regard chemical precipitation as more suitable for strong domestic sewages, or sewages liable to give rise to nuisance, and septic tank treatment or sedimentation for weak sewages. In cases where the reduction of smell is of primary importance, the claims of the slate-bed process deserve consideration. The presence or absence of trade wastes should also be taken into account.

Other considerations which affect the choice are discussed. The opinion expressed by various eminent chemists and others that septic sewage is more amenable to filtration than fresh sewage is regarded as unfounded, but for sewages liable to great variations in strength and composition the value of the smoothing action of the septic tank is recognised.

Considerable controversy has taken place as to the proportion of the sewage solids which is digested in a septic tank. Having regard to the differences in the composition of the various sewages, and the difficulty of measuring accurately the amount of suspended matter in a sewage or tank effluent, the results recorded by the commissioners are fairly accordant, and agree very closely with Mr. Cameron's original estimate of the amount of digestion which takes place in the Exeter tank. There is a wide divergence of opinion with regard to the percentage of the sewage solids which is digested in a slate bed. The stress which has been laid on the question of sludge digestion is, however, out of proportion to its real importance, for the thing that matters is not the precise quantity of sludge which remains to be disposed of, but its character, and it has been clearly established

that any of the biological processes is capable of yielding a residuum which is free from the unpleasant characteristics of ordinary sewage sludge. On the other hand, it has been shown that septic tanks and slate beds alike can be so managed as to produce a very offensive sludge.

A more serious point is the amount of suspended matter in the effluent. This varies greatly in different works, even of the same class, and some far-reaching conclusions have been based on the amount of suspended solids coming away from particular tanks. The fact is often lost sight of that there is no need to send on to the filters all the suspended matter which comes away from the tanks, and the filters have suffered in consequence. A practical consideration of some importance is the amount of fall which is required by various preliminary processes. This is practically nothing in the case of continuous flow tanks, and several feet in that of quiescent flow tanks and slate beds.

SLUDGE DISPOSAL.

In the case of works situated on or near tidal water, like those of London, Glasgow and Manchester, the sludge is generally barged out to sea. In inland works burial in the ground is the usual mode of disposal, but in some of the larger installations the sludge is pressed into cake, which is either given away to farmers or sold at a nominal price. The Royal Commission carried out three series of experiments with seven sludges, all of which were artificially dried. Dr. Voelcker found that none were worth 10s. per ton for wheat-growing purposes. At Bradford, however, where the sewage contains a large proportion of wool-scouring liquor, and is consequently of a very greasy nature, the grease is extracted and sold. The receipts from grease in 1911 were between £20,000 and £30,000. The dry cake from which the grease has been extracted is exported for use as a manure. The present price at the works being 14s. per ton.

TRICKLING FILTERS.

Preliminary treatment.	Strong sewage.		Sewage of average strength.		Weak sewage.	
	Coarse or medium material.	Fine material.	Coarse or medium material.	Fine material.	Coarse or medium material.	Fine material.
Detritus tanks	15		25	—	40	
Septic tanks	45*		70	—	100	100
Settlement tanks (continuous flow)	45*	—	70	—	100	100
Settlement tanks (quiescent)	50*	25	100	70	130	130
Precipitation tanks (continuous flow)	65	50	100	80	150	175
Precipitation tanks (quiescent)	100	65	130	130	170	200

Notes as to filtering material.—A filter may be regarded as "coarse" if the material will not pass through a 1-in. sieve; as "medium," if it will pass through a 1-in., but not through a ½-in. sieve; and as "fine" if it will pass through a ½-in. sieve.

* If "medium" sized material were used in these cases the figures should be reduced by about 10.

CONTACT BEDS.

Preliminary treatment.	Strong sewage			Sewage of average strength.			Weak sewage.		
	Single Contact	Double Contact	Triple Contact	Single Contact	Double Contact	Triple Contact	Single Contact	Double Contact	Triple Contact
Detritus tanks		—	25	—	25	—	—	38	
Septic tanks ...	—		33		38		75	66	—
Settlement tanks (continuous flow)	—		33		38		75	66	—
Settlement tanks (quiescent)		—	33		50		100	—	—
Precipitation tanks (continuous flow)	—	33	—	—	50	—	133		
Precipitation tanks (quiescent)	—	33	—	—	66	—	133		

Notes.—The beds should not be less than 2½ ft. nor more than 6 ft. in depth. The different series of beds, in double and triple contact, should have an equal cubic content, failing any evidence to the contrary. Where a blank is left in the tables the particular treatment indicated would only be desirable in exceptional circumstances, as the method would not generally be economical.

FILTERS.

During the past few years trickling filters have been steadily growing in favour, as compared with contact beds, and this tendency has been emphasised by the findings of the Royal Commission. Taking into account the gradual loss of capacity of contact beds, they consider that a cubic yard of material in a trickling filter will generally treat about twice as much tank liquor as the same amount of material in a contact bed. The effluents from the former are usually much better aërated and of a more uniform character. On the other hand, the risk of nuisance from smell is greater with trickling filters that with contact beds, and there is also a danger of nuisance from flies.

CAPACITY OF FILTERS.

In arriving at the quantity of filtering material required to deal with a particular sewage, regard is had to the strength of the sewage, the nature of the preliminary treatment which it has undergone, and the size of the material. The foregoing tables give the number of gallons of dry-weather sewage which a cubic yard of filter may be expected to treat in the cases specified.

DETAILS OF FILTERS.

Considerable attention has been paid to the details of filters, particularly to those of trickling filters. Liberal provision is generally made for drainage and aëration, and a good deal of money is sometimes spent in covering the floor of a filter with drainage tiles of a somewhat costly type. It is worth noting in this connection that ordinary bricks are considered good enough for the draining floor of a waterworks filter. It was usual at one time to make the wall of a filter of perforated brickwork, or even to omit it altogether, in the supposed interest of free aëration, but the commissioners have shown that there is very little advantage in doing so.

Many excellent distributors for trickling filters are on the market. The rotary type are most in favour, but travelling distributors can also be obtained for rectangular beds. In the best practice the filter is fed continuously; but to meet the needs of distributors not capable of working with the small flows which this involves, dosing chambers are often used. Fixed jets which spray the effluent on to the filter are also employed, the head required ranging from 3 ft. to 7 ft. Where the fall is not sufficient to work a rotary sprinkler, fixed perforated pipes are used, in combination with an automatic ponding valve. In other cases an upper layer of fine material is relied on to distribute the effluent.

Where contact beds are employed, the filling and emptying are often controlled by automatic apparatus of various types, but in many large works it is thought desirable to be able to vary the periods of filling, contact and discharging, and the inlet and outlet valves are operated by hand.

A good deal of controversy has taken place with regard to the best size of the material for trickling filters, some authorities recommending diameters of 4in. and over, and others ¾ in. or less. Coarse material is generally considered desirable where the effluent to be filtered contains much suspended matter. In such cases a great deal of the suspended matter finds its way through the filters, and humus tanks or sand filters must be provided to intercept it.

STANDARDS FOR EFFLUENTS.

A desire has been expressed in many quarters that standards, chemical and bacteriological, should be laid down, to which sewage effluents should conform. This desire the commissioners have not seen their way to gratify. The futility of attempting to discriminate between a good and a bad effluent by means of chemical standards has been shown by Prof. Dr. Dunbar, who has obtained stable effluents containing as much as 3·55 grains of organic nitrogen per gallon. A weak point, moreover, of all such standards is that they take no account of the volume or circumstances of the body of water into which the effluent is discharged. A remarkable instance, showing the importance of regard to local conditions rather than to any arbitrary standard, occurs at Belfast, where the nuisance complained of arises, not from the foul constituents of the sewage, but from the decomposition of the seaweed (ulva latissima) which thrives upon it, and where consequently what is required is not a highly purified effluent, rich in nitrates, but one in which the amount of nutrient materials is reduced to a minimum.

STERILISATION.

The sterilisation of sewage effluents is not considered necessary or desirable. It is recognised that

sterilisation, to be of any practical value, must be applied, not only to the sewage effluent, but also to the whole of the storm water from the sewers, wherever discharged, and to all other contaminated liquids which may reach the streams, and that unless this is done the sterilisation of the sewage effluent can only produce a false sense of security.

PROPOSED CENTRAL AUTHORITY.

Questions connected with the alleged pollution of watercourses by sewage or sewage effluent not infrequently come into the law courts, where they are tried at great length, and with a formidable amount of highly conflicting expert evidence. The Royal Commission recommend the formation of a central authority, one of whose duties it would be to determine questions of this kind.

CORRESPONDENCE.

"Be calm in arguing; for fierceness makes
Error a fault and truth discourtesie."
—Geo. Herbert, "*The Temple*"

INTERCEPTING TRAPS.

To the Editor of The Surveyor.

Sir,—The recently published report of the Departmental Committee of the Local Government Board is one of such great importance that it should not be passed over or accepted without some discussion among those who are responsible for the public health.

The report is the result of four years' work by an expert committee, and should be carefully studied in every detail by those who are interested in this important subject. The results of the investigations that were made are very surprising, and will come as somewhat of a shock to those of us who for many years past have advocated the complete isolation of the dwelling-house from the public sewer.

But what can we say when Mr. Robson's careful experiments show that the trap is a veritable "trap" which catches and retains the solid matters which should otherwise reach the sewer. He proves by his experiments that from 40 to 79 per cent of the solid matters are thus caught and retained, even with the best designed and most carefully fixed traps.

Further than this, the accusations that initiated the work of the committee—*viz.*, that the trap frequently caused the complete chokage of the house drain—appear to have been established by the investigations of the medical officer of health of Willesden for, as the report says: "Many will be of opinion that the facts, indicating as they do that in modern intercepting traps over 23 per cent, or nearly one in every four, are likely to have been blocked at one time or another unknown to their users, show at least the necessity of finding an efficient remedy if the trap is essential, or of considering its abandonment if it is not essential."

Such an expression of opinion as the result of these examinations and experiments is extremely alarming, and on the face of it should be sufficient to shake our faith in the use of the intercepting trap. If the trap is to be retained, it would appear from the report that iron drains and traps should only be employed, and that this would only increase the cost over stoneware to an extent of from 9 to 12 per cent, spread over the whole cost of drainage and sanitary fittings—a mere trifle when the great advantages over iron for such purposes is considered.

The investigations and conclusions with regard to sewer air and drain air are also of extreme interest, and it would appear that we have hitherto much exaggerated the danger arising from sewer air.

Personally, I have been an advocate of the house drain trap for many years. I have always looked upon the sewer as a danger that should be kept at arm's length and that should my neighbours be suffering from a zymotic disease, it was safer to isolate my house by careful trapping and air disconnection from the public sewer; but in view of the report I feel that my opinions must be considerably modified. It would appear that the danger arising from the breathing of sewer air is not so great as I had feared, and that the trap even of the most approved form and design is more a hindrance than a help. In the report it is stated that the Local Government Board will not insist in the future on the insertion of the provision in the by-laws regulating the erection of buildings of the trap and fresh air inlet. It will be interesting to see if this will be so or not.

It occurs to me, however, that there may still be cases where the isolation of a house from the sewer may be necessary where the sewer is badly constructed and is a "sewer of deposit"; in this case surely there might be some risk if the sewer was ventilated through the soil pipe? The report seems to me to be one of the greatest importance, for, if we have been living in a "fool's paradise," trusting in the trap and so-called isolation from the sewer to give us security, and now find that the trap is an evil and is worse than useless, the sooner we wake from our dream and do away with this evil appliance the better.

It would be exceedingly useful if this very important subject could be further discussed in your columns.—Yours, &c.,

M.Inst.C.E.

[We agree with our correspondent that the subject is of first importance and well worthy of exhaustive discussion.—Ed. Surveyor.]

To the Editor of The Surveyor.

Sir,—The report of the Departmental Committee of the Local Government Board on the question of the intercepting trap presents, I think, very fairly all the useful evidence on the subject that is likely to be obtainable, and, by its pretty even balance of pros and cons, leaves the municipal engineer in the happy position of being able to adopt or refuse that much discussed piece of apparatus just as his predilections so dispose him. The report also contains some valuable information on that other unending controversy, sewer ventilation, the subject in which I was more particularly interested.

The conclusions summarised in the report were those I arrived at after numerous observations, and a long consideration of the matter some quarter of a century ago, and it was to give effect to those conclusions that I devised the sewer ventilator, a description of which I embodied in a paper read at a meeting of the then Incorporated Association of Municipal and County Engineers in January, 1903, which appears in vol. xxix. of the "Proceedings."—Yours, &c,

T. Caink

City Engineer's Office,
Guildhall, Worcester.
September 10, 1912.

AGE LIMITS FOR APPOINTMENTS.

To the Editor of The Surveyor.

Sir,—I cannot agree with your leader with regard to age limits for municipal appointments, and especially with regard to the appointment of head surveyor.

It must be remembered that a municipal surveyor is a servant of the public (and that of a prescribed area), and is paid by the public, but he is not a civil servant, responsible to a Government department. The work is a branch of engineering quite distinct from other branches, and a man having this training would not have much chance of taking up estate surveying or becoming an engineer, for instance, to a railway company.

Presuming all the papers and magazines of the country were controlled by councils, such as we have to deal with, and presuming you were of the age of forty-three, and that you rather thought of improving your position—or perhaps your leading article did not meet with the approval of your council, and you found yourself seeking another post—you would soon see it was more difficult to get a public position than one of a private character. The age limit would tell with treble force then.

I cannot quite appreciate your argument, for if a surveyor is treated at forty for a place of some responsibility, why are men of sixty years of age appointed as judges, Government officials in high places, and officers in the public services, posts of greater responsibility?

The age limit for chief appointments defines the age limit of assistants also. No assistant would not [illegible] that he knew that the time was coming when he would be at the running for a chief's position. He would more thoroughly learn the various branches of his profession, and would feel more confidence when appointed to a headship. At present, however, a man, after having served his articles and put in a year or so as an assistant, feels that he must be on the look-out for a chief's post. Councils naturally say, "Oh! it is one of the younger men can

do the work, well, next time we advertise we will have a young man and pay him a less wage."

I think, Mr. Editor, there are two reasons which weigh with councils:—

(1) They are not willing or prepared to pay for older and more experienced men.

(2) Where a council is governed by a majority of owners, they think a younger man is more tractable than one of riper years.

In reading your paper from week to week, I think my first contention is proved by comparing the salaries paid to surveyors with that of the general navvy ganger on public works. I think the latter would have the best of it by a good many pounds in a year.

A comparison of salaries paid by councils to their officials (more especially in urban and rural districts) with other classes of work might make interesting reading in your columns.—Yours, &c.,

UNKNOWN.

September 7, 1912.

[We are indebted to our correspondent for his letter. He employs the *argumentum ad hominem*, but this does not really touch the point at issue. The whole of our "Minute" last week was based on the supposition that the age limit and salary should bear some relation to the responsibilities of the position advertised.—ED. THE SURVEYOR.]

FACILITIES FOR PROFESSIONAL EDUCATION.

To the Editor of THE SURVEYOR.

SIR,—The season for evening lectures and classes will shortly be upon us, and many of your readers, especially the younger members of the profession, will be arranging their programme of work for the winter.

The lack of an authority co-ordinating all the educational efforts of the Metropolis, or of a central bureau of information, renders it difficult for students in and around London to ascertain all the numerous lectures and classes available, apart from those of their own immediate locality.

May I therefore call attention to the fact that in addition to the excellent L.C.C. Technical Institutes at Westminster (Vincent-square), Paddington (Saltram-crescent), Hackney (Dalston-lane), &c., the L.C.C. School of Building at Brixton and the Regent-street Polytechnic, the following bodies provide evening lectures in civil engineering, building subjects, or surveying?—

(1) Holloway Polytechnic, Holloway-road, N. (building and surveying).

(2) University College, Gower-street, W.C. (architecture and construction only).

(3) East London College, Mile End-road, E. (engineering).

(4) City of London College, Moorfields, E.C. (building and surveying).

(5) Battersea Polytechnic, Battersea Park-road, S.W. (engineering, building and surveying).

(6) Goldsmiths' College, New Cross, S.E. (engineering, building and surveying).

(7) King's College, Strand, W.C. (engineering and building).

(8) City and Guilds' Technical College, Leonard-street, City-road, E.C. (engineering).

(9) L.C.C. Central School of Arts and Crafts (Southampton-row, W.C. (building).

(10) Birkbeck College, Chancery-lane, E.C. (engineering physics).

Complete A.M.I.C.E. courses are provided by the Westminster and Hackney Institutes, and by Nos. (3), (5), (6), (7) and (8). Complete courses for the examinations of the Surveyors' Institution are provided by the Hackney Institute and by Nos. (1) and (4). The full A.R.I.B.A. course is provided by No. (1).

Lectures on reinforced concrete are given at the School of Building and the Westminster Institute.

The fees are very reasonable, and a full prospectus can in every case be obtained on application to the principal or secretary.—Yours, &c.

T. GUY NEWCOMEN.

Council Offices,
Finchley, N.
September 10, 1912.

[We are obliged to Mr. Newcomen for his letter, the useful information contained in which will, we are sure, be greatly appreciated by students in and around the Metropolis.—ED. THE SURVEYOR.]

THETFORD PROPOSED WORKMEN'S DWELLINGS.

To the Editor of THE SURVEYOR.

SIR,—With regard to the particulars published in your issue of yesterday as to the fifty cottages which it is proposed to erect at Thetford, I should be extremely obliged if Mr. Wearing would favour me, through the medium of your journal, with the following information:

(1) The amount paid for the 3 acres of land, including legal charges.

(2) What will be the rateable value of the cottages and the amount of rates in the £?

(3) What allowance is made for—(*a*) empties, (*b*) insurance, and (*c*) repairs?

(4) Will the sink wastes be drained to a cesspool or sewer? If the former, who will be responsible for the cleansing?

I have recently been preparing a scheme for providing workmen's cottages at a rental of 4s. 6d. per week, the accommodation being similar to that shown on Mr. Wearing's plans, but so far I have not been able to satisfy myself that the scheme would be self-supporting.—Yours, &c.,

ERNEST E. RYDER.

Council Offices,
Bushey, Herts.
August 31, 1912.

[Mr. Wearing, to whom we submitted our correspondent's queries, has courteously replied as follows to the points raised: (1) £750; (2) average assessment £7 2s. 6d., rates (general district) 2s. 6d. in the £; (3) (*a*) 3 per cent, (*b*) 1s. 6d. per cent, (*c*) 30s. per house per annum; (4) sink wastes drain to sewer.—ED. THE SURVEYOR.]

THE UNITED STATES GALLON.

To the Editor of THE SURVEYOR.

SIR,—In many papers appearing in your journal in connection with bituminous road construction in the United States, I note the frequent occurrence of the term "gallon." It may be that some of your readers are not aware, or perhaps fail to bear in mind, that the measure here indicated—namely, the United States gallon—is different from ours.

Roughly, the United States gallon contains 8·33 lb. of water, while the British gallon contains 10 lb.—Yours, &c.,

JOHN HUTCHINSON.

11 Tothillstreet,
Westminster,
London, S.W.
September 9, 1912.

[We thank Mr. Hutchinson for his timely reminder that we have not recently noted this difference in our references to United States gallons. The relation may also be expressed: Six United States gallons are equal to five British gallons. The United States gallon is not, however, a foreign measure; it is our own Winchester gallon.—ED. THE SURVEYOR.]

GARDEN CITIES AND TOWN PLANNING.

To the Editor of THE SURVEYOR.

SIR,—May I ask you to draw the attention of your readers to the fact that this association is prepared to send lecturers to any part of the country to deal with the great and increasingly important question of garden cities and town planning?

The housing of the workers demands more and more attention as time goes on, and the inquiries which we receive from all parts of the world show how genuine is the desire that something shall be accomplished.

In order to focus these aspirations, lecturers competent to deal with all aspects of the case have been secured, and dates may be booked up.

Lectures may be either singly or in series, and I shall be glad to hear from anybody interested with a view to making arrangements.—Yours, &c.,

LEWART G. CULPIN,
Secretary.

3 Gray's Inn-place,
London, W.C.
September 4, 1912.

Sanitary Association of Scotland.—The annual meeting of the Incorporated Sanitary Association of Scotland takes place at Montrose next week, commencing on the 18th inst. The membership of the association is now 457.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

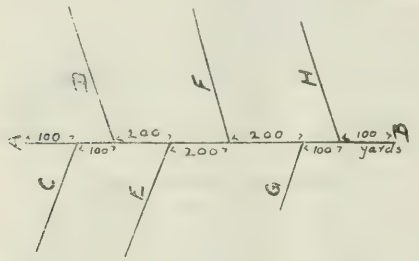
Mr. H. F. Wilkinson, of Tottenham, to whom the premium for August was awarded, has selected "Water Supply of Towns," by Burton (Crosby Lockwood), and a copy of this work has been duly forwarded to him.

QUESTIONS.

This week answers are invited to the following questions:—

271. Bending Moments.—If a straight prismatic baulk of timber floats in a horizontal position with a weight of 4 cwt. hung to each end, what will be the bending moment at the centre of its length?

272. Surface-Water Drainage.—State, showing the method of working out, the sizes of pipes necessary to take the surface water from streets as per sketch.



Streets are 36 ft. wide, and tar paved; all the houses are drained on the combined system, so that no surface water from the forecourts, &c., need be reckoned. Rainfall ½ in. per hour.

Street.	Length.	Fall
A–B	1,000 yds.	1 in 40
C	200 ,,	1 in 20
D	300 ,,	1 in 10
E	200 ,,	1 in 20
F	500 ,,	1 in 30
G	100 ,,	1 in 15
H	150 ,,	1 in 50

(F. H. S., *Sheringham*.)

273. Cast-Iron Stanchion.—Calculate the size of a cast-iron stanchion 12 ft. in height alongside an external or party wall to carry a load of 54 tons. (T. R.)

274. Administration.—What is the best arrangement of the columns in a surveyor's cash-book (also wages-book), to show, in addition to the usual items, separate columns for the workmen's and the council's contributions under the National Insurance Act? ("R. D. C.")

275. Cantilever.—A cantilever of uniform cross-section and length L carries a concentrated load W at the free end. A prop is placed at a point $\frac{L}{4}$ from the free end, bringing this point to the same level as the fixed end. Find an expression for the reaction at the prop, and the deflection of the free end of the cantilever. Neglect the weight of the cantilever. (B.Sc.Eng. Final.) (H. F. W., *Tottenham*.)

276. Roof Design.—It is found necessary in designing the steel trusses for a roof to adopt some system of wind bracing. Explain in detail how the cross-sectional area of the wind ties is determined. (H. F. W., *Tottenham*.)

REPLIES TO QUESTIONS.

267. Road Making.—Will some reader kindly give the heads of a specification for the conversion of a macadamised into a wood paved road? ("Inquirer.")

The following are the chief heads of a specification for the conversion of a macadamised into a wood-paved road.

(1) Interpretations.

(2) General Stipulations and Conditions.—Contractor to sign plan and specification; Extent of contract; Period, commencement and completion of work; Penalty for non-completion of work in time specified; Setting out work, contractor's responsibility; Contractor to keep work in repair for — months; Contractor to provide all labour and materials; Contractor to provide all lights, fences, watchmen, and take precautions against accidents; Improper materials; Alterations and additions; Sub-letting; Disputes; Foreman and workmen; Control over works; Measurement of works; Bankruptcy of contractor; Contractor to give security; Tender and schedule of prices; Terms of payment; Night work; As to Employers' Liability Act; Insurance by contractor.

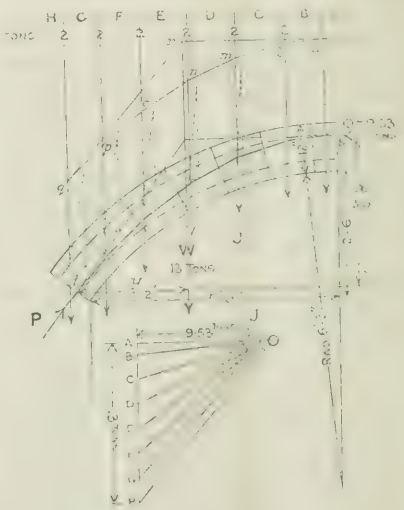
(3) Specification of Works.—Excavation of existing macadam; Macadam to be screened and suitable material left, used for concrete; Surplus rubbish; Cement and cement mortar; Portland cement concrete; Foundations, 6 in. Portland cement concrete, floated off with Portland cement mortar, ½ in. thick, to exact contour of roadway; Wood blocks, and how bedded; How the joints are to be laid and grouted; Width of expansion joint parallel with kerb filled with sand or puddled clay; pavement completed, surface to be strewn with sharp sand or fine gravel. (W. D., *Dudley*.)

[W. D. has answered the question proposed, but it would be interesting if some correspondent would send a complete "Specification of Works."—Ed. The Surveyor.]

269. Masonry Arch.—Draw the line of least resistance in a stone segmental arch of 10 ft. span with a rise of 2 ft. 6 in., the voussoirs having an equal thickness of 12 in. and each being equally loaded. (A.M.I.C.E.)

The graphic method of trial and error is the simplest way to determine the line of least resistance. This method is only approximate, but is accurate enough for practical purposes.

As the arch in question is to be symmetrically loaded, it is only necessary to deal with one-half. The load on each voussoir is to be equal. Let this load be taken as 2 tons, made up as follows: Weight



of voussoir, 2 cwt.; superincumbent load, 38 cwt.; the actual position of the vertical force being obtained as indicated on the diagram. The total or resultant load on the half arch will thus be 13 tons.

To find the position of the resultant load, draw the force polygon A---H. Then select a polar point O somewhere in a horizontal line from A, and join AO, BO, &c. Now construct the linear arch diagram *klm---r* by drawing *kl* parallel to BO, *lm* parallel to CO, &c. Now *kr* and *qr* will intersect at *r*, which point is in the pathway of the resultant load W.

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
Age Limits for Appointments	356
Appointments Vacant	372
Assistants' and Students' Section	358
Association of Managers of Sewage Disposal Works	372
British Practice in Sewage Disposal	343, 353
Construction of Isolation Hospitals	342, 349
Correspondence	356
Diss New Water Supply	359
Drainage of Isolation Hospitals	342
Drain Blocked by Roots of a Tree	347
European Contributors to the Road Congress, 1913	343, 369
Facilities for Professional Education	357
Garden Cities and Town Planning	357
Horbury Sewage Works	360
Institution of Municipal and County Engineers	371
Institution of Municipal Engineers	372
Institution of Water Engineers	371
Intercepting Traps	356
Law Notes	362
Local Government Board and Isolation Hospitals	342, 349
Local Government Board Inquiries	363
Manchester and its Refuse "Tips"	344
Meetings	376
Mid-Lothian Roads	367
Municipal Competitions Open	373
Municipal Contracts Open	373
Municipal Tramways Association	372
Municipal Work in Canada	352
Municipal Work in Progress and Projected	364
Notes from Recent Annual Reports	341
Personal	366
Royal Sanitary Institute	372
Salford Sewage Works	348
Sewer Ventilation	361
Tarred Roads and the Weather	341
Tenders for Municipal Works or Supplies	375
Thetford Proposed Workmen's Dwellings	357
The United States Gallon	357
Third International Road Congress	343, 369
Three Point Problem in Surveying	343, 344

The half arch is kept in equilibrium by:

(1) W, which is the total or resultant load on the half arch.

(2) Q, which is the horizontal pressure at the crown, and which balances W.

(3) P, which is the pressure or reaction at the abutment, and which is equal and opposite to the resultant of the forces W and Q.

The line of least resistance required will be that line of resistance which is just included within the middle half of the arch ring consistent with the least value of Q.

Now, as Q will be least when y is least, and x is greatest, as a trial select a point of application, S for force Q, slightly within the middle half, and a similar point of application for force P at t.

Then, as Q balances W:

$$Q \times x = W \times y$$

and

$$Q = \frac{W \times y}{x}$$

$$= \frac{13 \times 2{\cdot}2}{3{\cdot}0}$$

$$= 9{\cdot}53 \text{ tons.}$$

Now construct the stress polygon A, B, ---J, by drawing AJ = 9·53, and joining BJ, CJ, &c. Then, by drawing the reciprocal lines of the polar polygon on the arch diagram, commencing at vertical force k, a line of resistance will be indicated. As this is just inside the middle half of the arch ring, and is consistent with the least possible value of Q, it is the line of least resistance required. (I. W. S., *Clapham Junction.*)

Terrors of the Madras Streets. A citizen of Madras thus describes, in a letter to a local paper, one of the perils of the pedestrian in that city: "Sir,—It is my longfelt *desideratum*, nay, rather avidity, to contribute a few lines to your worthy and widely circulated daily regarding the censorious inconveniences to which the pedestrians are constrained inveterately to circumscribe into owing to the cows being allowed to prowl in swarms, especially during nights, in the main and heavy-traffic centres, to the deterioration of many sarcastic accidents of personal danger, and no wonder the other day, while I was passing along the Mint-street I had to come across with a terror as an old man was about to be gored by a gigantic cow, and but for not the sudden alarm that was raised by others his condition would have been otherwise."

DISS NEW WATER SUPPLY.

DETAILS OF PLANT.

The new waterworks at Diss, which are almost completed, are based on the supply of 20 gallons per head per day to 4,000 people. There are two bored tube wells, 400 ft. deep, lined with steel tubes 10 in. in diameter to a depth of 160 ft. below the surface. These boreholes enter below the lining tubes a further 240 ft. into chalk, the upper surface of which was found about 97 ft. below the surface of the ground. In each borehole is a pump 8 in. in diameter, and with a 3-ft. stroke. A gas engine supplies the motive power for each pump. When the two pumps are running at the slow speed they will throw 80,000 gallons in ten hours. In case of overhaul to one pump the other can be run at a higher speed so as to deliver 80,000 gallons in under fourteen hours. From the pumps the water passes to the softening plant, and thence back to soft-water pumps, which raise the softened water to the tower. The water tank measures 34 ft. 6 in. by 27 ft. 6 in., by 5 ft. 3 in. deep, and is designed to contain 30,000 gallons. It is carried by steel girders disposed as a grillage upon a tower of brick 33 ft. by 26 ft. over all, and 46 ft. high from the ground to the tank bottom.

The tower, which is built of Fletton bricks, is of plain design, with four corner piers, fourteen intermediate piers, and eight solid panels. The remaining panels, ten in number, are lightened with windows or doors, and each of the eighteen terminates in a circular arch, which is flush with the outer face of the piers, and serves to carry the straight emblature upon which the wall plates of the tank girders are bedded. Inside the tower is a floor 12 ft. above the ground. One-half of the ground floor is occupied by an office, workroom, &c., and the other half by the engine-room, in which are two gas engines to drive the two pumps respectively. On the north side of the tower a lean-to roof covers the gas producers.

The softening plant stands about 20 ft. north of the tower. The town mains start with a diameter of 6 in., and they are ultimately reduced to 3 in., at which they reach the twelve terminal points. Valves are provided by which the town can be cut off in sections. The elevation of the site of the waterworks is 138 ft. above sea level, and the maximum additional head of water is 51 ft., the tank roof being nearly 200 ft. above sea level. The head of water will exceed 100 ft over a great part of the town.

The engineer is Mr. William H. Booth, F.G.S., London, and the following contractors have been employed: Wells, Duke & Ockenden, Littlehampton, and Perkins, McIntosh & Co., St. Albans; tower, F. & H. Higgs, Loughborough, S.E.; pumps, Perkins, McIntosh & Co.; gas engines, Rushton, Proctor & Co., Lincoln; softening plant, J. W. W. Boby, London; mains, G. C. Tilley & Co., London; tank, Gimson & Co., Leicester; sundry work, J. Aldrich & Co., Diss.

WATER SUPPLY ON THE GOLD COAST.

PUECH-CHABAL SYSTEM FOR ACCRA.

The Crown Agents for the Colonies have placed a contract for the erection of a complete multiple filtration plant on the Puech-Chabal system for the water supply of Accra, the capital of the Colony. The consulting engineers are Messrs. Middleton, Hunter & Duff, of Westminster, and the works will be carried out by Mr. Walter Clemence, of Westminster, for Monsieur Puech.

The system of multiple filtration introduced and patented by M. Armand Puech has been devised mainly with the object of improving the method of purifying water by slow sand filtration. With a complete Puech-Chabal installation, it is found that the final sand filters run on an average for more than twelve months without scraping, when dealing with turbid waters, as the suspended matters are entirely removed by the Puech degrossisseurs and pre-filters. These are provided with apparatus for rapidly cleansing the gravel or sand, so that one man can easily control a plant with a capacity of from 15,000,000 to 20,000,000 gallons per twenty-four hours. The saving in labour and in cost of sand washing is, of course, very great, while the yield of the sand filters is, in most cases, doubled, and the risk of having a large portion of the plant out of action for cleaning is avoided. The system has now been adapted for sewage treatment, the sludge being easily and rapidly removed by means of the patent apparatus for cleaning by air.

HORBURY SEWAGE WORKS.

FERRO-CONCRETE CONSTRUCTION.

An extensive series of structures in ferro-concrete comprised in the sewage disposal works designed by Mr. J. H. Drew, M.Inst.C.E., for the Horbury Urban District Council, when acting as the engineer and surveyor to that body, is described in the September issue of *Ferro-Concrete*.

The works are designed to treat a dry-weather sewage flow of 295,000 gallons daily, including 50 per cent of manufacturers' trade effluent from dye works, wood scouring mills, and oil works. The complete scheme, which has been approved and loans sanctioned by the Local Government Board, involves an outlay of £10,000, and comprises alterations and additions to the existing pumping and other plant, and the construction of equalising chambers, detritus and screening chambers, percolating filters, effluent channels, Venturi meter, humus tanks, storm water and sludge drains, and appurtenant works.

Fig. 1 is a general plan of the equalising tanks and detritus chambers. Commencing at the top of the drawing, we have first a channel 2 ft. wide by 9 in. deep with connection to the existing sewer. Next

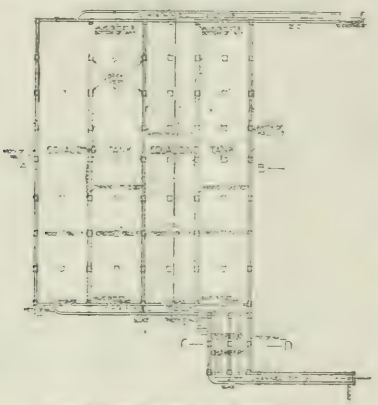


Fig. 1.—Plan of Equalising Tanks.

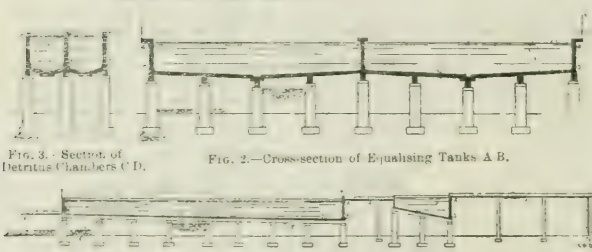


Fig. 3.—Section of Detritus Chambers C D.

Fig. 2.—Cross-section of Equalising Tanks A B.

Fig. 4.—Section E F.

Horbury Sewage Works.

come the equalising tanks constructed in duplicate, so that either of them can be filled and emptied independently, thus providing a safeguard against any interruption of work as the result of breakdown, and affording facilities for the effectual cleansing of the tanks.

The two tanks measure 81 ft. 6 in. long by 63 ft. wide over all, and are divided by a centre wall 5 in. thick at the bottom and 4 in. thick at the top, the outer walls being of the same thickness. Each tank has the capacity of 70,000 gallons. The floors are of ferro-concrete, 5 in. thick, supported on beams 7 in. wide by 8 in. deep, carried on brick piers, 11 ft. 6 in. square in cross section, founded on plain concrete footings, 2 ft. 6 in. square by 12 in. thick, and finished at the top by a ferro-concrete template 4 in. thick. At the [illegible] was found to be capable of supporting a load of 2 tons per square foot, so that [illegible] ample provision [illegible]. The floor of each tank slopes to a centre channel, 12 in. wide by 3 in. deep, as shown in Fig. 2, and the whole floor has a longitudinal fall, as represented in Fig. 4.

At the outlet end of the equalising tanks there is another channel, 2 ft. wide by 9 in. deep, communicating with the detritus chambers. The latter, which are in duplicate, measure 16 ft. long, and each chamber is 6 ft. wide by 6 ft. 3 in. deep over all, the bottom sloping to a centre channel, as shown in Fig. 3, and having a longitudinal fall, as represented in Fig. 4. The chambers are built upon brick piers 1 ft. 6 in. square, founded on plain concrete blocks 2ft. 6 in. square by 12 in. thick, the top of each pier being finished by a ferro-concrete template, as in the case of the equalising tanks. The detritus chambers provide an additional precaution for the removal of mineral or other substances, and, being in duplicate, either of them can be used independently.

Fig. 4 is a section on the line E F passing through the entire series of tanks and channels and making the whole arrangement clear.

Fig. 5 gives a plan and section of the filter-bed, the floor of which has a diameter of 91 ft. 6 in. and is 5 in. thick, being supported by main beams, 7 in. wide by 13 in. deep, running from pier to pier, with secondary beams, 5 in. wide by 11 in. deep, at right angles to the main beams. The beams and flooring are reinforced according to Hennebique standard practice, the whole forming a monolithic unit. Around the periphery of the floor is a continuous ring beam supported at intervals by brick piers, and from this projects a cantilever channel, measuring 24 in. wide by 6 in. deep.

As the soil was capable of carrying the load of 1½ tons per square foot, the supporting piers were built up in brick from plain concrete foundation blocks, the interior piers being 2 ft. square, and those for the ring beam 1 ft. 6 in. square, the foundation blocks 6 ft. square by 15 in. thick. The piers are 4 ft. 6 in. high, and completed by ferro-concrete templates carrying the main beams and the ring beam of the floor. The filter is completed by a circular brick wall, 9 in. thick by 7 ft. high, strengthened by two encircling ferro-concrete bands, 9 in. square in cross section. The floor was designed for a superload of 6¼ cwt. per square foot, and is covered by a layer of Limmer rock asphalt ½ in. thick.

The contractors are the Yorkshire Hennebique Contracting Company, Limited, of Leeds, and the consulting engineers for the ferro-concrete work are Messrs. L. G. Mouchel & Partners, of Westminster.

Street-watering Appliances.—The borough engineer of Grimsby, Mr. H. Gilbert Whyatt, has been instructed to report on motor-driven street-watering appliances, and will be glad to receive particulars from makers.

Electricity from Refuse.—The city refuse of Minneapolis, Minn., is being utilised to generate electric current for 150 arc street lamps of 6·6 amperes each, which have recently been put in service, and the city council have now authorised the installation of fifty additional ones.

Joint Sewerage System.—At a conference of representatives of local authorities recently proposals for a joint sewerage scheme for the districts of Finchley, Hendon, Friern Barnet, and East Barnet Valley were discussed, and a resolution was passed adopting the principle of discharging the sewage of the above-mentioned districts into the London County Council's system, [illegible] upon the cost and conditions being satisfactory to the local authorities.

Antrim Roads. The county surveyor of Antrim, Mr. John H. Brett, in his report to the county council last week, stated [illegible] roads projected amounted to £24,131. Of those sufficiently advanced to be dealt with at present, the amount is £15,749 which [illegible] £10 for [illegible] £562 for ordinary road repairs and £1,000 to qualify the county for a grant of £3,000 from the Road Board. The [illegible] [illegible] during the past quarter have [illegible] [illegible] The [illegible] work in connection with last year's Road Board grant has been proceeding very slowly owing to unfavourable weather conditions, but it was hoped that it will be completed before the end of next month.

SEWER VENTILATION.

THE REEVES SYSTEM.

In the recently issued report upon the intercepting trap, the Departmental Committee of the Local Government Board pointed out that exceptional conditions may exist under which foul air from sewers may cause a nuisance, even when it is discharged at a considerable height above the ground, as, for example, at the top of ventilating shafts. Under such circumstances, it was considered that intercepting traps would still be required in order to prevent a public nuisance. Three years ago we described in these columns (THE SURVEYOR, June 11, 1909) the new system of ventilators supplied by Mr. R. Harris-Reeves, of Walton-on-the-Naze, Essex, by the use of which the emission of foul gas from sewers may be prevented. Several instances were then quoted where these ventilators had been fixed and had proved entirely successful, even in the case of the unbearable stench due to the discharge into the sewers of the boiling liquid from a bone-boiling works. Since that time further testimony as to the efficiency of the Reeves system has been received. In October, 1910, the Royal Borough of Kensington, after having had three in use for some time, decided to order an additional ventilator, at an estimated cost of £19, with an anticipated annual outlay of £3 10s. for maintenance. One member of the council, replying to an inquiry, stated that the first ventilator, which was fitted up at a very awkward place in South Kensington, "had been found to be a very great success."

A number of residents near a third ventilating column on the London County Council sewer in Dawes Road, Fulham, have, on several occasions, testified to the success of the Reeves ventilator installed there. Prior to its installation there had been an almost constant stench arising from the gratings, but this has been entirely absent since the apparatus was fixed.

Recent orders for these ventilators have been received from the London County Council engineers department, the borough engineer of Lambeth, the engineer of the Water of Leith Purification and Sewerage Commissioners, Edinburgh (a repeat order for four ventilators), and the borough engineer of Hampstead (a repeat order for three sets).

The above quoted evidence as to the practical efficiency of the Reeves system of sewer ventilation will doubtless be interesting and useful to the large number of municipal engineers and others whose attention has been drawn anew to the vexed problem of sewer ventilation by the publication of the report upon the intercepting trap.

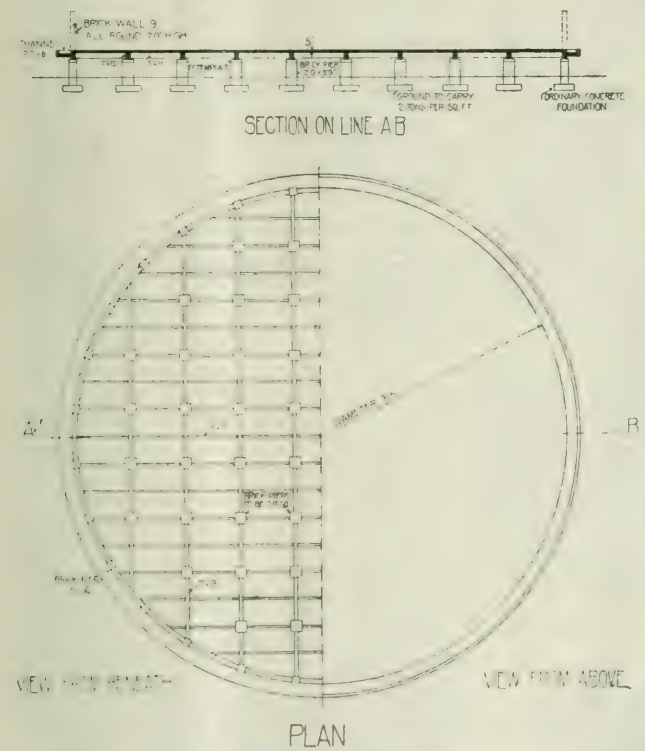


FIG. 5.—Plan and Section of Filter Bed.

HORBURY SEWAGE WORKS.

WOOD SEASONING.

THE POWELL PROCESS.

Having regard to the enormous quantities of wood that are made use of while in an unsatisfactory state for the purposes for which it is employed, some particulars of the Powell process of seasoning and preserving appearing in a pamphlet which has reached us will be read with interest.

In all newly-felled timber, as is well known, there are present the elements of decay and an excess of moisture which render it unfit for use until it has been seasoned. In so-called "natural" seasoning—that is to say, by simple exposure to air—there is no certainty that the process is complete, and the long period required before wood is fit to use necessitates the locking up of a large amount of capital in stocks, as well as the payment of heavy rentals for storage. There is also a serious loss due to wood warping and splitting, owing, in a great measure, to the fact that nothing is put in to take the place of the moisture removed. The Powell process—which, it is claimed, converts sappy "green" timber into dry, firm, seasoned wood within a few days, and at the same time enhances every valuable quality, improving the wood in strength, durability and appearance at small cost—consists essentially in treating the wood in a saccharine solution, otherwise "liquid timber," for which wood has a decided affinity. The solutions vary in composition, and to them are added certain other substances to suit the special purpose for which the wood is required. When the wood has been specially dried the process is complete, and the wood is ready for immediate use. The timber is not subjected to any external pressure or vacuum at any stage of the process; none the less, complete impregnation with the saccharine matter is effected, however hard and close grained the wood under treatment may be.

It will be apparent that the process is one that is specially adapted for the treatment of wood-paving blocks, and municipal engineers desiring further particulars with regard to it may be recommended to communicate with the Powell Wood-Process Syndicate, Limited, 718-719 Salisbury House, London-wall, E.C.

Tar no Improvement. The sewage from certain tarred roads in Newport (Mon.) find their way into the river, and Mr. H. S. Lane, clerk to the Usk Board of Conservators, in a letter of complaint to the Newport Corporation Works Committee, said that the pollution from the town sewage would be had to beat, but he does not consider the tar washings improve the sewage.

Law Notes.

Edited by J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

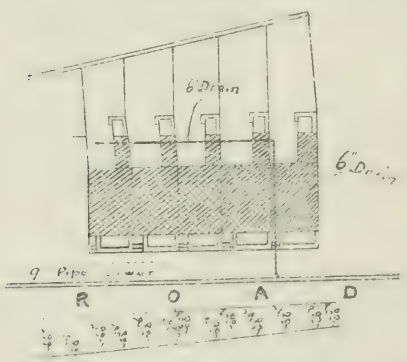
The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, one side only) should be addressed to "The Law Editor," at the office of The Surveyor, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

Drainage Works: Obstruction of Access to Shop: Claim for Compensation: Public Health Act, 1875, sec. 308.—The decision of the King's Bench Divisional Court in *Lingke* v. *Christchurch Corporation* (noted at p. 769 of vol. xli.) has been reversed by the Court of Appeal (July 11th). This was an action for compensation for the obstruction of the plaintiff's house and shop by a heap of rubbish and gravel thrown up in the course of the execution of certain drainage works by the corporation. The claim was based on the award of an arbitrator under sec. 308 of the Public Health Act, 1875. The Divisional Court held that the corporation were not liable to pay any compensation, on the ground that the access to the premises had not been interfered with to an unreasonable extent or for an unreasonable time, and that the work had been reasonably and properly carried out. The Court of Appeal, however, were of opinion that, inasmuch as the obstruction was of such a nature that if it had been caused by a private individual the plaintiff would have had a good cause of action against him, the plaintiff could recover against the corporation under the section, which provides that "where any person sustains any damage by reason of the exercise of any of the powers of this Act, in relation to any matter as to which he is not himself in default, full compensation shall be made to such person by the local authority exercising such powers."

QUERIES AND REPLIES.

In order to avoid confusion queriists are requested to use distinctive words as nom de plume. The letter X, combinations such as X Y Z., and words such as "engineer" and "surveyor," should never be used.

Combined Drainage.—"Sewer" writes: The five houses shown on the accompanying tracing belong to one owner, and the 6-in. pipe drain running at the back of the houses is very defective and insufficient for effectual drainage. The owner has been served with notice requiring him to reconstruct the defective drain, but he declines to do it, arguing that the



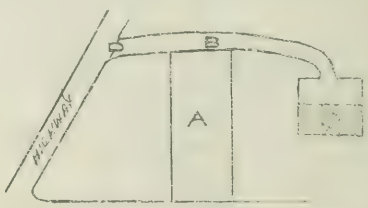
drain from its connection with the 9-in. sewer in the road up to the point where it is receiving the drainage of two houses is a sewer. Seeing the council have a 9-in. sewer in the road, is it necessary for them to recognise this drain at all? The drain is insufficient, and cannot the owner be required to drain each house separately to the sewer? I shall be glad of your opinion on the point.

In my opinion the 6-in. pipe is a sewer from the point at which it receives the drainage of more than one house. Being a sewer the council can no doubt close it under sec. 18 of the Public Health Act, 1875, but any new drains or any work connected with drains thereby rendered necessary would have to be done at the council's expense. See *Marriage (Estate) v. Local Board* [L.M.C. 121; *Vestry of St. Martin in the Fields* v. *Ward* (1881, 7 Q.B.D. 81).

By-Laws. New Street. "Cul-de-sac." "Ultra" writes: Some time ago my council approved a plan similar to the accompanying pencil sketch (not for publication). There is one entrance only to a back street, which is 18 ft. wide throughout, and, as shown, ends in a *cul-de-sac*. The length of the street is 360 ft. The owner of one house was the builder for the whole of the houses, and sold them to the people who now occupy them, and they object to the wall between his premises and the houses, contending that it ought to have been left open so as to have an entrance to the back street at both ends. The above houses are built on the side of the main road, and, owing to the nature of the surface of the ground at the rear, it will be impossible to build any more houses, consequently the 18-ft. street may be regarded as a secondary means of access for the purpose of scavenging, &c. Does this arrangement comply with our by-laws (copy forwarded)?

Assuming that the back street is not intended to form the principal approach or means of access to any building, but is intended for use solely as a separate means of access for the purpose specified in by-law 5, there does not appear to be any contravention of the by-laws. The street is of the width required by by-law 5, and it has an entrance *at one end* equal to the width of the street, as required by by-law 7.

Right of Way.—"Old Subscriber" writes: My client has bought a field A, with a right of way along accommodation road B. The house C was originally a farmhouse, and, with additions, has been converted into a villa residence. This also is approached by accommodation road B. The owner of the villa residence has planted shrubs and trees along the road,



placed a pair of entrance gates (D) at the end, and is now using it as a carriage drive. He does not deny my client's right of way, but contends that it is for agricultural purposes only, although he himself habitually uses it for all kinds of traffic. As my client is desirous of building, will you kindly say if he is entitled to use road B for that purpose?

This depends upon whether the owner of A has a general right of way or a right of way limited to a particular mode of user. If he acquired the right of way under an express grant, the deed of grant would show the nature of the right—*i.e.*, whether it is general or limited. If he acquired it by implied grant or by prescription (*i.e.*, user for a long period) it is impossible to say whether it is general or limited without knowing all the facts, such as the circumstances under which it arose, the mode in which it has been heretofore used, &c.

Telegraph Poles on Highways. "S. R." writes: Will you kindly tell me what power the district council have over the Post Office Telegraph Department fixing poles by the side of public highways? Can they object to the position of a telegraph pole either (1) when it is fixed on a causeway, causing an obstruction to pedestrians, or (2) in the centre of a ditch or dyke which has been formed to take the surplus water?

(1) Under sec. 12 of the Telegraph Act, 1863, posts must not be erected by the Postmaster General on highways without the consent of the highway authority. If consent is not given within twenty-one days after it is requested the matter is to be referred for settlement to a stipendiary magistrate or county court judge, under secs. 3 and 4 of the Telegraph Act, 1878. (2) If the ditch is part of the highway the foregoing sections will apply.

We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Bradford T.C. (August 27th. Major J. Stewart).—£11,000 for the building of an annexe to the municipal baths in Morley-street, £640 for a filtration plant for the West Bowling baths, and £1,459 for the provision of bowling greens at Girlington, Greengates, Idle Recreation Ground, Harold Park, and Edge House Field, Thornton.—With respect to the proposed filtration scheme the inspector was informed by the deputy town clerk that the system was already in operation, and had proved a success, at the Manningham baths. It cleared the water of a peaty appearance and enabled the same water to be used over and over again after it had been purified. The inspector said he did not think that more than ten years could be given for repayment of the loan. With regard to bowling greens Alderman Horsfall said that the Parks Committee had proceeded very cautiously in the matter. They had started with bowling greens in the parks nearer to the centre of the city, and now they were extending to the suburbs. They were so well appreciated that the committee were simply meeting a popular demand.

Cannock U.D.C. (August 30th. Mr. Courtenay Clifton).—£4 240 for the purposes of the making, channelling, and paving of certain new streets.—Mr. R. Blanchard, surveyor, said that there were over 56 miles of road in the urban area. Of those 27 miles were paved and channelled. The new scheme embraced 11¼ miles. It was hoped to carry out the work within the next two years. Probably it would extend to three years. He would be thankful if the board could allow an extra 10 per cent for contingencies. The price of bricks and tiles had risen by 15 per cent, and further rises might occur.

Mallow U.D.C. (August 29th. Mr. A. D. Price).—£800 for the purpose of providing working capital in connection with the gasworks which they have acquired recently.—It was stated that the amount of the entire loan for the purchase of the gasworks was £12,000, of which £10,000 was repayable in thirty-five years and £2,000 in five years. The council borrowed the money at 4 per cent, and paid a negotiation fee of 2 per cent. The present price of gas was 5s. 3d.; the maximum price was 5s. 9d. There was nothing to prevent the council from raising the price of gas to 5s. 9d. for the first few years to meet the deficit. It would have to be brought up to that for the first five years. After ten years it would be possible to bring the price of gas under 5s. 3d., so that one would balance the other.

Salford T.C. (August 26th. Mr. H. Shelford Bidwell).—£1,084 for sewerage work in Eccles New-road, Pendleton, and £830 for the purpose of acquiring a piece of land adjoining Bolton-road and Eccles Old-road, Pendleton, with a view to making a new road.—Mr. J. Corbett, borough engineer, explained that the proposed new sewer would discharge into the sewage works. He proceeded to say that if that piece of land was made it would provide a splendid route to the docks. The heavy motor traffic had now to go a roundabout way and damaged the roads.

Shrewsbury T.C. (August 28th. Mr. H. Shelford Bidwell).—£12 000 for the widening of the English Bridge. It was explained that at present the bridge was exceeding... [illegible] was altogether unsuitable for present-day requirements, and the greatest possible care was necessary to direct traffic over the bridge.

Stone (Staffs) U.D.C. (August 23rd. Mr. Edgar Dudley).—£592 for the purchase of six cottages in North-street, for the purpose of street widening.—Mr. S. Watson (clerk) presented the case for the council, together with Mr. A. R. Ridout (surveyor). North-street, it was explained, is the principal street from the station to the town and is used by heavy traffic from both breweries and from a timber yard, while there is also considerable motor traffic to and from the station. The present width of the street varied from 16 ft. to 30 ft., while the new roadway, when the improvement was effected, would have an average width of 40 ft.

West Ham T.C. (August 24th. Mr. W. O. E. Meade-King).—£12 430 for the provision of public baths at Oriental-road, Silvertown; and a further sum of £1,030 for the extension of the council offices at The Grove, Stratford.—The loan for the extension of the municipal offices, which was first dealt with, was in respect of supplemental requirements. It was stated that the largest item in the account (£680) was due to the increased cost of building material. As to the proposed loan for public baths, the deputy town clerk, Mr. G. E. Hilleary, said the council desired a sixty years' loan of the price of the land, amounting to £430, and thirty years for the building. The land was situated in Silvertown, near St. Mark's Church, and the area was about 1,200 sq. yds. The frontage was 113 ft. 10 in., and the depth from 89 ft. 3 in. to 97 ft. 6 in. The borough surveyor, Mr. J. G. Morley, said the council had previously agreed to purchase a similar site for £680, but the negotiations fell through. Subsequently the present site was offered, and the result was that it was purchased for £380, or less than £4 per foot frontage. The £430 included the purchase price, surveyor's fees, investigation of the title and other charges.

APPLICATIONS FOR LOANS.

Cuckfield U.D.C.—£625 for the purchase of a site for industrial dwellings.

Dover T.C.—£580 for works of road widening.

Halifax T.C.—£11,812 for paving works with granite setts.

Haworth U.D.C.—£1,350 for alterations to Sowden's Farm.

Keighley and Bingley Joint Hospital Board.—£3,000 for a cubicle isolation pavilion.

Leeds T.C.—£7,837 for sewage disposal works.

Scarborough T.C.—£3,020 for public conveniences and shelters.

Stockport T.C.—£15,000 for new police buildings.

Stourport U.D.C.—£1,400 for the construction of water mains.

Wigan T.C.—£9,000 for new gas meters.

LOANS SANCTIONED.

Antrim R.D.C.—£3,570 for a housing scheme.

Bacup T.C.—£8,200 for water supply purposes.

Barnsley T.C.—£2,000 for wood paving works.

Bridlington R.D.C.—£260 for extending water mains.

Chester-le-Street R.D.C.—£2,400 for a pavilion at the infectious diseases hospital.

Congleton R.D.C.—£1,241 for sewage disposal works, £1,000 for cookers and meters (for ten years), and £700 for retorts (for fifteen years).

Guildford T.C.—£800 for road improvement works for sixty years.

Hunstanton U.D.C.—£803 (for twenty years) for shelters and a bandstand.

Kenilworth U.D.C.—£3,700 for laying out a burial ground.

Spennymoor U.D.C.—£23,000 for a sewage disposal scheme.

Warminster U.D.C.—£780 for improving main road footpaths.

Wolverhampton T.C.—£11,690 for a new school.

Worthing T.C.—£3,770 for electricity extensions.

Yeovil R.D.C.—£550 (for thirty years) for sewerage and sewage disposal works.

FORTHCOMING INQUIRIES.

SEPTEMBER.

	£
17.—**Cosport.** For works of drainage and the provision of the water carriage system (Mr. M. K. North)	1,671
17.—**Kingsbridge.** For the purchase of market rights (Mr. Edgar Dudley)	400
18.—**Frome.** For sewage disposal purposes (Mr. M. K. North)	686
18.—**Yeovil.** For the construction of a new street (Mr. Edgar Dudley)	1,225
19.—**Bristol.** For electricity and road purposes (Mr. M. K. North)	8 037
19.—**Hay.** For sewage disposal purposes (Mr. A. A. G. Malet)...	4,000
19.—**New Forest.** For road improvement purposes (Mr. Edgar Dudley)	800
20.—**Farnborough** For the provision of a recreation ground and depot (Mr. Edgar Dudley)	1,650
20.—**Wokingham.** For sewage disposal purposes (Mr. M. K. North)	2,500
24.—**Wimbledon.** For the provision of fire alarms and street works (Mr. M. K. North)	3,542

Municipal Work In Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Abercarn, Barnsley, Cardiff £50,000, Essex £42,000, Newport (Mon.), Torquay, £15,000; housing and town planning—Altrincham, Blackburn, Shrewsbury; refuse collection and disposal—Colwyn Bay, roads and materials—Shoreditch, Waterlooswith-Seaforth; sewerage and sewage disposal—Leeds, Marple, Spennymoor £23,000; water, gas and electricity—Bangor, Dunbar.—Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

ADMINISTRATION.

Preesall U.D.C.—A resolution, passed in 1909, that the surveyor be in an adjoining room during the meetings of the council until called upon to explain any matters that might arise, has been rescinded by the casting vote of the chairman.

BUILDINGS.

Abercarn U.D.C.—The Sanitary Committee has been requested to consider the question of providing a public abattoir.

Ashton-under-Lyne T.C.—A new school has been completed, at a cost of £18,000, from designs by Mr. E. Woodhouse.

Barnsley T.C.—The provision of municipal offices and a town hall has been referred to a committee of the council.

Belfast T.C.—The provision of a site for a new electricity station is under the consideration of a committee.

Bourne R.D.C.—A consumptive shelter is to be provided at a cost of £350.

Builth Wells U.D.C.—The tender of Mr. S. Speake, at £213, has been accepted for building a fire station.

Cardiff T.C.—It is proposed to build a technical school in Cathays Park at an estimated cost of £50,000

Durham T.C.—A scheme for the provision of workmen's dwellings has received the approval of the council.

Erpingham R.D.C.—It has been ascertained that the bridge restoration work rendered necessary by the floods is estimated to cost £1,000. The council have asked the Local Government Board to sanction a loan to cover this and to expedite matters as much as possible.

Essex C.C.—Plans have been approved of new county buildings to be erected at Chelmsford at an estimated cost of £42,000.

Herne Bay U.D.C.—The East Cliff pavilion is to be enlarged by the addition of a concert hall and an amphitheatre.

Louth T.C.—A proposal is under consideration for building a public bath on the site of the skating rink on Ramsgate-road, at a cost, exclusive of the site, of £650.

Newport (Mon.) T.C.—The borough architect is preparing plans for a new town hall.

Northwich U.D.C.—The tender of Mr. Thomas Astles, of Northwich, at £7,850, has been accepted for the erection of public baths.

Poole T.C.—The tender of Mr. H. W. King, at £670, has been accepted for a new disinfector, a mortuary, and alterations to the laundry at the Alderney isolation hospital.

Rhyl U.D.C.—The council on Monday last confirmed the Finance Committee's resolution on the question of the future of the pier. The result was that the resolution passed last April, adopting the modified scheme at a cost of £52,780, is rescinded, and the council renew their application for sanction to borrow £7,500 to buy the pier as it stands.

Teignmouth U.D.C.—Plans have been prepared for the extension of the sea-wall and the erection of a groyne, at an estimated cost of £2,100.

Torquay T.C.—Medical baths and a swimming bath are to be provided at an estimated cost of £15,000.

HOUSING AND TOWN PLANNING.

Altrincham U.D.C.—The surveyor, Mr. H. E. Brown, has prepared the plans of a scheme for the provision of fifty-six houses, which the council have adopted.

Blackburn T.C.—The council have approved a town planning scheme embracing an extensive residential area covering several miles.

Falmouth T.C.—The borough surveyor, Mr. J. S. Walton, has received instructions to prepare detailed plans and specifications for the twenty-two artisans' dwellings which it is proposed to build on the Trevethan site, with a view to tenders being obtained.

Leek U.D.C.—The surveyor, Mr. W. E. Beacham, has received instructions to prepare an estimate for a housing scheme.

Morpeth T.C.—The tender of Mr. G. Douglas, of Newcastle-on-Tyne, at £5,855, has been accepted for the erection of thirty-three workmen's dwellings.

Pollokshaws T.C.—A committee has been appointed to interview a committee of the Glasgow Corporation (Pollokshaws having been annexed to Glasgow recently) with respect to the scheme for building three tenements on ground belonging to the burgh in Factory-street and M'Arthur-street, at a cost of between £8,000 and £10,000.

Shrewsbury T.C.—The preliminary details have been prepared of an extensive town-planning scheme to cover 138 acres, entirely in the country, though quite near the town, and it has been agreed to serve the necessary notice on the owners of the properties of the proposed application to the Local Government Board for authority to promote the scheme.

Sidmouth U.D.C.—The Local Government Board called some time ago the attention of the council to the fact that more suitable accommodation was wanted for the working classes, and asked what had been done in the matter. Mr. Michelmore said that a reply had been sent that the council had been unable to secure suitable land at a reasonable price. The board replied that if so the council should consider taking compulsory measures to procure accommodation. The matter has been referred to the General Purposes Committee.

Swaffham R.D.C.—A special meeting is to be held in a month to consider a letter from the Local Government Board in which they state they are advised by their inspector, Mr. W. H. Collin, that additional accommodation was immediately required in the parishes of Great Cressingham, Holme Hale, and North Pickenham. The information before them went to show that there was no prospect of the required accommodation being provided by private enterprise, and they considered that the council should at once proceed with the preparation of schemes, under Part III. of the Housing Act, 1890, for the erection of six houses in each of these parishes. They were also advised that such houses should consist each of a large living-room, three good bedrooms, a scullery (with copper), a food larder and coal-store, and a pail closet placed at a suitable distance from the house). These houses might be erected in blocks of six.

Walthamstow U.D.C.—It is stated that the Local Government Board have given authority for the preparation of a town-planning scheme by the council. The proposals apply to various areas situated within the urban district.

PARKS AND OPEN SPACES.

Felixstowe U.D.C.—Schemes and designs are being invited for dealing with Hamilton Cliffs and the "enclosed beach" from Swiss Cottage to Cliff House fence. A prize of 50 guineas is offered for the accepted scheme and a prize of 20 guineas for the next best scheme.

Llandudno U.D.C.—The deputy surveyor has been requested to prepare a plan and estimate for levelling, excavating, filling, turfing, and seeding the promenade from Penmorfa to Dale-street; also an estimate for the proposed extension of the yacht pond.

Rutherglen T.C.—The public bowling greens have been so successful during the past season that it has been decided to form two new greens.

REFUSE COLLECTION AND DISPOSAL.

Colwyn Bay U.D.C.—A refuse destructor is to be built on the land between the railway and the cemetery. Mr. William Jones, engineer to the council, in a report

on the matter, advised that the system to be adopted should be the continuous grate type of construction, with back feed. Mr. Jones estimates the cost of burning at ¾d. per ton, inclusive of renewals, repairs, and maintenance, as compared with 5·24d. per ton, the present cost of disposal on the tips.

Shoreditch B.C.—The refuse destructor account shows a nett charge on rate account of £5,869, including loan charges, the cost of cartage of clinker having been increased by 6d. per ton. From 28,408 tons of refuse destroyed, 729,745 units of electricity were generated, for which the department paid £1 167.

ROADS AND MATERIALS.

Brandon and Byshottles U.D.C.—Back Bowdney-lane is to be made up, at a cost of £514.

Brentford U.D.C.—The council have received a letter from the Road Board stating that the board had considered the suggestion of the council that an alternative to the new road to the north of Brentford would be the widening of the existing Brentford High-street. The board had obtained approximate estimates of the difference in the additional cost as compared with the construction of the new road, and found it would be £350,000. That would appear to place the matter beyond doubt. The board, however, would be prepared to meet representatives of the council and discuss the matter. Mr. Dorey said the board were absolutely at sea when they talked about £350,000 extra. It was decided to submit dates on which the council's committee would wait on the Road Board.

Clydebank T.C.—It has been agreed to widen Dumbarton-road, at an estimated cost of £1,487.

Hursley (Hants) R.D.C.—The surveyor, Mr. H. C. Phillips, has presented a statement showing that an expenditure of £1,100 would be necessary in order to overtake a fair proportion of the arrears of work on the roads. The council in the circumstances have agreed to an excess expenditure of £355 upon road improvement works, including steam rolling.

Larne U.D.C.—Steps are to be taken to purchase property necessary for the widening of Cooper's-lane.

Leek U.D.C.—A sum of £275 is to be spent on improvements in Ashbourne-road.

Lynton U.D.C. It has been decided to proceed with the construction of a new road over Lyn Down, and a road from the Rookery to a spot below Park Derry, thereby giving a direct road to the station, provided contributions are received from the Road Board and the county council.

Malvern U.D.C.—It was reported at the meeting last week that representatives of the council had conferred with members of the Highways and Bridges Committee of the county council with reference to the damage caused to the roads in the district from traction traffic and the unsuitable material. It was suggested that the Local Government Board should be asked to confirm a by-law authorising the laying of any road which under repair, and for such further period as might be necessary for the material to get thoroughly set before putting it again to traction traffic. During the conference a point was raised as to making a special road for traction traffic at the, leading from Little Malvern Quarry to the Midland Railway Station, by opening up an old road which existed years ago. This road, it was stated, had been known as Cook Hore-shire, but there was no trace of it on the present ordnance sheets. The Malvern Council undertook to look into the question and to inform the county authority as to the result of their researches. The chairman of the county council desired information as to the number of times the traction traffic passed a given point each day. It was understood that when this information was obtained the county council would consider the whole matter.

Nottingham T.C.—A scheme has been adopted for widening Hucknall-road for a distance of 2,400 ft., at the cost for the purchase of lands of £860.

Oxford T.C.—A scheme of street improvement, to cost £504, has been approved.

Saltash T.C.—A scheme is being promoted for the extension of the town quay.

Shoreditch B.C.—It is proposed to proceed with the remainder of the scheme for the widening of Hoxton-street to a width of 40 ft. for a length of 220 ft., and the London County Council has been asked to contribute a proportion of the cost, estimated at £14,368.

Sunbury U.D.C.—For steam rolling and road scarifying the tender of Messrs. E. Parry & Co., of Putney, has been accepted at 2s. 11d. per day for rolling, and ¾d. per yard for scarifying.

Teignmouth U.D.C.—Levelling operations are to be carried out at the Den, at an estimated cost of £420.

Waterloo-with-Seaforth U.D.C.—Property of the value of £10,750 is to be purchased for the purpose of road improvements.

SEWERAGE AND SEWAGE DISPOSAL.

Barnet U.D.C.—Drainage works, costing £118, are to be carried out.

Bucklow R.D.C.—A sewerage scheme is to be carried out at Plover Superior, at an estimated cost of £300.

Docking R.D.C. Surface drainage works are to be carried out at Brancaster.

East Cowes R.D.C.—A sewer is to be laid in Maresfield-road, at a cost of £135.

Leeds T.C.—The council have adopted a resolution of the Sewerage Committee authorising them to acquire from Colonel Spencer-Stanhope an area of 10 acres of land adjoining the existing Rodley sewage works, and approved of the plans submitted by the sewerage engineer, Mr. G. A. Hart, for additional sewage tank accommodation, the diversion and enlargement of the existing Rodley main outfall sewer, also additional tanks for the treatment of storm-water, and to under-drain 30 acres of the sewage farm lands. Tenders are also to be invited for the construction of the portion of the proposed high-level intercepting sewer, commencing on the new sewage works estate near Thorpe Stapleton, and terminating in Meanwood-road, together with the necessary branch sewers, the total length being 4½ miles, in accordance with the plans submitted by the sewerage engineer. The sewerage engineer has also been instructed to prepare and submit an estimate of the cost of carrying out the work by administration. The corporation secured Parliamentary powers to construct this sewer by special Act in 1908, as a necessary part of the scheme for the extension of the sewage disposal works at Knostrop, sanction to borrow £1,277,000 being obtained.

Marple U.D.C.—Consideration is being given to a sewage disposal scheme for Low Marple, which is estimated to cost £3,000.

Oldham T.C.—Dr. Wilkinson, medical officer of health, in his annual report, states that during 1911 there were 1,089 pan-closets converted to water-closets, and at the close of the year there were in the town 5,295 sanitary pans, 21,521 waste-water closets, and, including latrines, 7,480 slop-water closets. The resolution passed by the council two or three years since that wherever possible each house should have separate closet accommodation is being gradually carried out. For many years no new houses have been allowed to be built without having each a separate closet.

Oulton Broad U.D.C.—A letter has been received from the Local Government Board pointing out that the council would be incurring serious liability by declaring to provide a drainage scheme and, as to the financial aspect, the council could consider what portion of such scheme might be declared. As a result of this letter the Drainage Committee have been authorised to obtain a preliminary report as to the best means of draining the district.

Spennymoor U.D.C.—The sewage disposal scheme, estimated to cost £23,000, which has received the sanction of the Local Government Board, is to be carried out under the direction of Mr. C. Franklin Murphy, of Morpeth.

WATER, GAS, AND ELECTRICITY.

Bangor U.D.C. The question of the introduction of electric lighting is to be brought before the council.

Birkenhead T.C.—Terms have been agreed upon by the special sub-committee appointed by the Water Committee in connection with the carrying out of the provisions of the water scheme for the acquisition by the corporation of land required near Thingwall for the proposed Cross Hill tanks, and easements for the aqueduct to Birkenhead.

Dudley T.C.—It was decided on Tuesday night to sell the electrical undertaking to the district tramway organisation. The works, costing £98,000 were opened in 1899, and the council are now faced with an annual loss of £1,000, partly through the result of an arbitration regarding charges for current to the tramways, and partly through the plant becoming obsolete. The

purchasers, who take over the concern as from last March, undertake to maintain the present rates for current for three years.

Dunbar T.C.—Land costing £21,000 is to be purchased for the construction of a service reservoir.

Exeter T.C.—The water undertaking during the past year yielded a nett surplus of £1,292, and the electricity undertaking showed a profit of £1,431.

Gourock T.C.—Satisfactory borings have been made in connection with the proposed new reservoir at Daff Burn.

Ludlow T.C.—The Watch Committee are considering the advisability of installing a system of automatic lighting and extinguishing.

Settle R.D.C.—The water main is to be extended at a cost of £600.

Shoreditch B.C.—Owing to the reduction in the price of current to consumers and the higher cost of coal due to strikes, the nett surplus on the year's working of the electricity undertaking was reduced from £6,810 in 1910-11 to £5,328.

Stourport U.D.C.—Steps are to be taken to obtain a water supply from Bewdley by laying the necessary pipes at a cost of about £1,400. At present water is obtained from the Kidderminster Corporation at a charge of 6d. per 1,000 gallons. The charge for the water from Bewdley is to be 5d. per 1,000 gallons.

MISCELLANEOUS.

Ayr T.C. The surplus balance upon the past year's working of the tramways was £3,214.

Darlington R.D.C.—The tender of Messrs. Ord & Maddison, at £250, has been accepted for the supply of a mechanical dryer for the slag works.

Harrogate T.C.—Despite the adverse weather at Harrogate last month, the municipal enterprises have yielded most satisfactory results, the receipts showing large increases in every department.

Little Lever (Lancs) U.D.C.—The surveyor of highways, Mr. G. Seddon, has made an inspection of all the disused pit shafts and open ponds in the district, and the council have decided to serve notices that dangerous places must be safely fenced off.

PERSONAL.

Mr. J. W. Liversedge, surveyor to the Leigh (Essex) Urban District Council, has had his salary raised £25 per annum.

Mr. F. B. Lewis, who has been associated with the Corporation of Nottingham for a very long period as city architect, has sent in his resignation

Mr. A. J. Martin, M.INST.C.E., has been appointed by the Orsett Rural District Council assessor to judge the competitive schemes for the sewerage of the parish of South Ockendon.

Mr. Francis F. Longley, A.M.AM. AND CAM.SOCS.C.E., has been admitted to partnership in the firm of Hazen & Whipple, consulting civil engineers, 103 Park-avenue, New York.

Mr. John Thomas Eayrs, M.INST.C.E., of West Bromwich, president of the Institution of Municipal and County Engineers from 1893-4, and formerly borough surveyor of West Bromwich, left estate valued at £17,061, with nett personalty £9,428.

Mr. J. Diggle, borough surveyor of Hyde, has been voted an increased salary of £102 per annum. When the borough surveyor was appointed the corporation engaged a consulting engineer at a salary of £150 a year. This engagement recently expired.

FOR OTHER ADVERTISEMENTS
See End of Paper.

BOROUGH OF SOUTHEND-ON-SEA.

PUMPING STATION AND DESTRUCTOR BUILDINGS, INCLINED ROADWAY, TWO COTTAGES AND OTHER WORKS.

TO BUILDERS AND CONTRACTORS

The Corporation of Southend-on-Sea is prepared to receive Tenders for the Erection of Pumping Station and Destructor Buildings, Inclined Roadway, Two Cottages and other works at the Sewage Disposal Works, Prittlewell, Southend-on-Sea.

Plans and Sections may be seen, Specification, Bill of Quantities and Form of Tender obtained, upon application to the Engineer, Mr. Ernest J. Elford, M.INST.C.E., Municipal Buildings, Clarence-road, Southend-on-Sea, on and after Monday, 16th September, on payment of a deposit of Five Guineas, which will be returned on receipt of a *bonâ fide* Tender upon the form supplied, and the return of all documents. In the event of a Tender being accepted the Five Guineas deposited will be retained until after the signing of the Contract, and will be forfeited should the Contractor withdraw his Tender, or refuse or fail to execute the Contract

Sealed Tenders, endorsed "Pumping Station and Destructor Buildings," to be delivered at my office on or before 12 o'clock noon on Wednesday, October 2, 1912.

No Tender will be considered unless made on the prescribed form.

The Corporation do not bind themselves to accept the lowest or any Tender.

(By order)
H. J. WORWOOD.
Town Clerk.

Town Clerk's Office,
Southend-on-Sea.
September 10, 1912.

BOROUGH OF KINGSTON-UPON-THAMES.
SULPHURIC ACID.

The Corporation invite Tenders for the Supply during the ensuing twelve months of about 300 tons of 80 per cent Sulphuric Acid for their Sewage Works.

Further particulars and Forms of Tender may be obtained of the Borough Surveyor, Mr. R. Hampton Clucas, at the Municipal Offices.

Sealed Tenders, endorsed "Sulphuric Acid," to be delivered at this office not later than Saturday, the 28th September, 1912.

The lowest or any Tender will not necessarily be accepted.

HAROLD A. WINSER,
Town Clerk.

Municipal Offices,
Kingston-upon-Thames.
September 12, 1912.

CORPORATION OF CALCUTTA.
CITY ARCHITECT AND SURVEYOR.

Applications are invited for the post of City Architect and Surveyor to the Corporation of Calcutta on a salary of Rs. 1,350, equivalent to about £90, per month inclusive of travelling and other allowances. The duties of the post will be to (*a*) design and superintend the construction of all Municipal buildings; (*b*) generally supervise the Building Department and give advice regarding plans to which objection has been taken; (*c*) personally sanction and check the construction in cases of large and important buildings; (*d*) control and advise on the general scheme of architecture throughout the town, with a view to securing harmony of design, dealing incidentally with questions of town planning, street improvement, &c., and (*e*) to perform the duties incident to his post as Municipal Surveyor.

The appointment is subject to the Provident Fund, leave and other service rules of the Corporation and may be terminated at any time by six months' notice being given on either side. The selected candidate will be required to devote his whole time to the duties of his office and will not be allowed to take up any outside work. He will be required to submit to a medical examination before joining his appointment. The Corporation will pay his passage (1st class) from London. He will be required to take up his appointment by about the 1st January, 1913.

Applications will be received in England by the Honourable Mr. S. L. Maddox, C.S.I., I.C.S., Chairman of the Corporation of Calcutta, East India United Service Club, 16 St. James' Square, London, S.W., up to the 28th inst.

Applications will also be received in India by the undersigned up to the 1st November, 1912.

C. C. CHATTERJEE,
Secretary,
Corporation of Calcutta.

August 19, 1912.

Mid-Lothian Roads.

COUNTY SURVEYOR'S REPORT.

In his annual report to the County Road Board on the state of the roads in Mid-Lothian, and on the expenditure for the year to May 15th last, Mr. John Robb, county surveyor, states that the total quantity of metal quarried and paid for was 96,072 tons or cubic yards, as against 92,777 last year. The excess of 14,408 tons of materials quarried and paid for beyond the original estimates was in order to provide an adequate supply of gravel and small materials required for tar work during the ensuing year, authority having been obtained to continue quarrying and breaking beyond the estimated quantity. This, to some extent, accounts for the large excess of materials produced, but it is also attributable to the great quantities of bottoming used in widening and reconstruction authorised under the Road Board grants. The gravel required cannot yet be produced with the existing plant, and large quantities have to be obtained from sale quarries at enhanced prices.

QUARRYING.

The Town Council of Edinburgh and the county council submitted a special case to the Court of Session regarding Blackford Quarry, and the decision was to the effect that the county council are entitled to quarry stone from the ground belonging to Colonel Trotter, of Mortonhall, within the city boundaries, and to carry stone from that ground over the ground belonging to the corporation, but that they had no statutory authority to lay down over the city property a tramway for the transport of stone taken from Colonel Trotter's ground. The joint sub-committee in charge of Blackford Quarry thereafter entered into negotiations with Colonel Trotter's agents for the acquisition of 2 acres of additional ground on his property for quarrying purposes, and on this being agreed to instructions were given to proceed as soon as possible with the erection of the stone-breaking machinery on the ground leased from Colonel Gordon Gilmour. A twenty-one years' lease was accordingly entered into for two additional acres of ground, at a rent of £90 per annum, so long as materials are taken from the ground, and £15 per annum in perpetuity for surface damage.

The formation of a tramway and winding gear being disallowed, considerable surplus power was available in the suction-gas plant, and the joint sub-committee considered the question of utilising this for boring by compressed air, instead of by steam as formerly. Estimates were obtained for the best kind of compressors and rock drills for this purpose, and the county surveyor visited the new Naval Base at Rosyth and Hailes Quarry, where a large number of hand hammer drills were in use. The economy in boring by this method is, says Mr. Robb, quite apparent, and the joint sub-committee decided to purchase an air compressor and one hand hammer drill, with the necessary piping required, at a cost of £265. This machinery has only been in operation for a short period, and the cost of working cannot yet be determined.

The erection of the new breaking machinery was continued after the settlement of the case with the city of Edinburgh, but the deletion of that part of the scheme which included the tramway to the quarry necessitated the lowering of the screening apparatus, so that an easy cart road to the feeding platform could be formed, and a very good working arrangement has now been secured.

The sample of metal produced, owing to the introduction of bar screens for extracting the flaky pieces of stones, is much superior to what was anticipated, and cannot be distinguished from hand-broken metal. Although the percentage of small flaky stones taken out is high, this was to be expected from such a brittle rock as that from Blackford Quarry. It is proposed to put this residue material through a granulating machine to produce small gravel for tar work purposes. The altered arrangement necessitated elevating to the top screens all the materials broken, and in consequence the fine dust produced is troublesome during high winds. A scheme for extracting and collecting the dust is being considered by the joint sub-committee.

The power provided for working the proposed tramway is now utilised in driving the air compressor, and there is still sufficient margin of power remaining to drive the tar-mixing plant and the granulator before referred to, should the district committees adopt these in the future.

As most of the operations in working the existing and suggested plant could be automatically carried out, the cost of production would be very much lower than is paid at present for prepared tar materials from private quarries. The cost of breaking per ton during the limited period the machines have been at work is about the same as at the other quarries, but a proper comparison cannot be made until the completion of a full year's work.

The total expenditure on the works, including alterations up to May 15th, 1912, amounts to £3,642, and is equally divided between the Suburban and Lasswade District Committees.

MAINTENANCE.

The roads in the county have been well maintained throughout the year, and, with the continued aid of the Road Board grants, it is hoped that the expenditure proposed in the estimates submitted by the four District Committees to the County Road Board will prove sufficient for ordinary needs during the ensuing year. It will be noted that the road assessment is not increased in any of the districts except the suburban, where an addition of 1d. per £ is required, but this is accounted for by the loss in valuation of the Leith Docks, the reduction in the Road Board grant, and the increased prices for carting.

The weather throughout the year was generally dry and favourable for maintenance, and was very suitable for the carrying out of tar work.

The reconstruction of the Pathhead and Soutrahill-road, and the Gala-Water-road, was continued successfully, after the new rolling and traction plant was obtained. The extra expenditure allowed, and high-class metal applied to both these roads, is making a marked improvement. Those sections, however, remaining to be dealt with are showing the destructive effect of motor-car traffic on weak surfaces, and it is now quite obvious that this particularly large increase in expenditure was urgently required.

The cost of snow cutting was practically *nil* throughout the whole county, and, as shown, very little extra expenditure was incurred under this head.

Considerable delay occurred in settling the question between the Road Board and highway authorities generally as to the method of allocating the grants under the Development and Road Improvement Funds Act, 1909, and previous to this instructions had been given to proceed with the work on account of the favourable weather at the time. On finally stating the amount of the grant, the Road Board intimated that only 1d. per square yard for tar spraying or painting, instead of 1·75d. as estimated, would be allowed, and the cost of the work in carrying out tar-spraying on 36 miles, at 1·73d. per square yard, was £2,750, and on pitch-grouting, about 11·2 miles, at 7·6d. per square yard, was £4,355 over water-bound macadam.

The claims for grants for 1912-13 amounted to £13,703, and were made up on similar lines to those of the previous year, but the Road Board state that sums available for distribution would be much less than last year, and that £4,500 only had been allowed to Mid-Lothian.

The committee have addressed the Road Board urging the necessity of an increased grant, and have also recommended to them an application from the Suburban District Committee for a special grant towards the construction of a new bridge over the Water of Leith at Colinton, estimated to cost £7,000.

The results obtained from tar-spraying were generally very satisfactory, although several complaints were made regarding the slipperiness of the surface. The sub-committee, on inquiring into this matter, desired to point out that great benefit had resulted from tar-spraying, which had practically abolished the dust nuisance on the main roads so treated, while it also had effected a considerable saving in wear.

The continued drought during the summer, and an insufficient supply of gravel, tended to make the roads more slippery than under normal conditions. Instructions were given to provide for an adequate supply of gravel for the ensuing year's work, and that in the vicinity of all gradients on tar-sprayed

roads small heaps of gravel should be put down, to be applied by the roadmen when necessary, and as far as possible, without incurring extraordinary expenditure, this was given effect to.

The weather was exceptionally favourable during the month of May last, and with three of "Aitken's" spraying machines, and the tar plant in possession of the District Committees, the spraying was carried out rapidly at about the same price per square yard as last year, notwithstanding the rise in the price of tar. It was, however, thought advisable to apply a slightly thinner coating than previously, so that the tar might be exhausted before winter, as after the effects of frost the cost of labour in scraping was materially increased.

On outlying roads subjected to fast-going motor traffic the prevention by tar-spraying of the ravelling of the surface, in Mr. Robb's opinion, more than compensates for the wear which formerly took place.

In the month of June last Sir George Gibb, and several members of the Advisory Committee of the Road Board, inspected roads in this and other counties, for the improvement of which grants were given. In view of the very small cost, varying from 9d. down to 5d. per square yard, at which water-bound macadam could be renewed in many counties in Scotland, they expressed the opinion that the treatment for county roads for dust prevention, except where traffic was heavy, was surface tarring, rather than the more expensive methods of tar-macadam or pitch-grouting.

Following the completion of tar-spraying, pitch-grouting for the year 1911-12 was completed by September 9th.

Of the 12 miles of roads proposed to be pitch-grouted, several sections, extending altogether to about 1 mile in length, were not carried out on account of the increase in the cost of tar and gravel previously referred to. With the exception of a few parts, the whole of this work was satisfactory, and although roads so treated cannot be said to be dustless, the amount of dust produced is comparatively small, and the superiority of the surface, compared to that of ordinary water-bound macadam, is distinct, especially in wet weather and after thaws in winter. On the portions so treated very little expenditure was incurred for surface labour throughout the winter, as there was practically no mud, but from a sanitary point of view tarred surfaces require more cleansing.

The county surveyor is still of opinion that this system is the best yet devised for tarring county roads, and is the most suitable for all kinds of heavy traffic.

Several members of the Advisory Committee to the Road Board suggested that in renewing the surface the interstices should be keyed by smaller-sized metal, such as is now being produced at Blackford by machinery, and that this should be sealed by tar-spraying and a covering of gravel to render it dustless, and prolong the life of the road by making it thoroughly waterproof. They also agreed with the opinion of the sub-committee, that both horses and drivers would gradually become more accustomed to the altered condition of the roads. It is proposed to give effect to the above suggestions on some of the sections now being carried out.

As it was obvious that many improvements could be effected on the method of hand pouring the boiling pitch, Mr. Robb devised a system of grouting pipes, attached to the boilers, by which the hot mixture could be sprayed direct into the metal. The District Committees approved of this, and purchased ten new boilers, of 570 gallons capacity each, in addition to the existing plant. With these machines and boilers, drawn by a tractor or roller, as much grouting can be done in five minutes with one man in attendance as three men could do formerly by hand labour in one hour. These machines can also be used for surface spraying. As grouting can only be successfully accomplished in dry weather the necessity for having sufficient plant, and quick handling, can be readily understood.

Although the delivery of the boilers was long delayed on account of the coal strike, a considerable part of the work for the year was begun in the middle of May, and continued steadily on for some time. Owing to the continuous wet weather since the beginning of June, the work of grouting has been hampered to a very great extent, and it is doubtful if it will prove so satisfactory as that of last year.

The several short stretches of tar-macadam laid down with prepared tarred materials in five villages have stood very well, and as long as the surface is not made too smooth, this method of maintenance may be extended to roads where traffic is not heavy at very little extra cost over that of grouting. It has the advantage over grouting that it can be laid in damp weather. No tar-macadam has yet been laid on any heavy-traffic roads in the city, and Mr. Robb is informed by the city surveyor that on the asphalt and tar-macadam laid on the side streets on the west end of Edinburgh, which are superior examples of road construction, sanding has to be resorted to on every frosty morning.

A section of road through Corstorphine village laid with Rocmac over two years ago is still in very good order, and the material has proved to be a durable binder. A considerable amount of dust rises from it in dry weather with heavy fast-going traffic, and it was found desirable to tar-spray the section referred to in the spring of this year. "On the other hand," says Mr. Robb, "Rocmac produces comparative little mud in winter, and judging from several fine examples of county roads laid with this material which I have inspected during the past year, I am confirmed in my opinion that Rocmac can be successfully used in damp situations."

The tarring of footpaths during the past year has given general satisfaction, and where the surfaces were in good condition tar-painting only was resorted to in the meantime, but tar matrix was applied to those portions which were uneven or required remaking. An extension of this work is now proposed in all the districts, and the county surveyor confidently recommends its adoption, particularly in populous neighbourhoods.

MOTOR TRAFFIC.

The Road Board requires a census of the traffic on each of the roads in the county towards the improvement of which a grant is made, and desires that the figures be taken for a week in summer and for a week in winter, for seven consecutive days, between the hours of 6 a.m. and 10 p.m. This was done in the beginning of August last year, and by instructions of the County Road Board was repeated this year. An extract from the census of the daily traffic in tons for both years shows that, although the total tonnage is practically the same, the total daily average of motor vehicles is increased by 1,800 tons, while the horse and other traffic has decreased.

Motor traffic on fourteen main roads converging towards Edinburgh is now 56 per cent of all vehicular traffic. The heaviest traffic is on the Corstorphine or Glasgow road, with 1,489 tons per day, while several other roads exceed 1,000 tons per day.

EXPENDITURE.

Exclusive of improvements, establishment charges, repayment of capital and interest on capital works, and sums received for materials sold, the nett expenditure on maintenance amounted to £49,316, against £41,286 last year, and the cost per mile for the year is now, in the Suburban District, £211, against £149 on the average of the last five years, in the Calder District £70, against £59, in the Lasswade District £102, against £88, and in the Gala-Water District £37, against £33.

The total road expenditure for all purposes was £57,539, against £47,658 last year. The increased expenditure was principally incurred in carrying out the tar work and reconstruction of roads, towards which the Road Board agreed to pay the sum of £5,447, out of an estimated extra outlay of £8,000.

A large amount of new and relaying existing kerb and channelling was carried out during the year, chiefly being preparatory work for tar-painting and laying footpaths with tarred materials. The only other new works of outstanding importance were the widening of Bow Bridge in the Suburban District, and the completion of the breaking and screening machinery works at Blackford Quarry.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangement well suited for easy reference.—*The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By Sydney G. Turner, of the Middle Temple, Barrister at Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

THIRD INTERNATIONAL ROAD CONGRESS.

LIST OF EUROPEAN CONTRIBUTORS.

Mr. Rees Jeffreys has communicated to us the following list of the writers of papers for the International Road Congress in 1913, which has been furnished to him by Monsieur Mahieu, secretary to the Permanent International Association of Road Congresses.

It will be remembered that the list of American contributors appeared in our issue of August 16th last.

Question 1.

GERMANY.
M. SCHMIDT, Stadtbaurat in Essen.
M. NESSENIUS, Landesbaurat, Geheimer Baurat in Hanover.
M. MAYR, Ministerialrat im Koniglich Bayerischen Staatsministerium des Innern in München.

AUSTRIA.
M. MASIK (Emil), Ingénieur, Professor der bohmischen technischen Hochschule in Brünn.

HUNGARY.
M. DE LIPTHAY (Auguste), Conseiller de Section près du Conseil Supérieur des Travaux Publics métropolitains (Dobrentey ter 4) Budapest.
M. SOLTY (Louis), Conseiller technique de la ville de Budapest. (Központi városhàz) Budapest.

BELGIUM.
M. VERSTRAETE, Ingénieur principal des ponts et chaussées, Rochefort.
M. DE VAERE, Conducteur des ponts et chaussées, Gand.
M. EVRARD, Conducteur principal des ponts et chaussées, Rochefort.

DENMARK.
M. NOHR (W.), Ingenieur en Chef des Routes et des Egouts, Copenhagen.

FRANCE.
M. STOCLET, Ingénieur en Chef des Ponts et Chaussées, Lille.

RUSSIA.
M. DOUBELIR, Professeur à l'Institut Polytechnique, Kiew.

SWITZERLAND.
M. ANDER AUER, Chef du Service des Routes, Bâle.

Question 2.

GERMANY.
M. HENNEKING, Stadtbaurat in Magdeburt.
FUCHS (Dr.), Grossherzoglicher Baurat in Karlsruhe, Eisenlohrstrasse 10 a.

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HUNGARY.
M. NAGY (Alexandre), Ingenieur en chef au Ministère du Commerce (Albrecht ut 1.) Budapest.

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M. BYLS, Ingénieur des Ponts et Chaussees, Maeseyck.

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M. VERRIÈRE, Ingénieur des Ponts et Chaussées, Paris.

RUSSIA.
M. KOUNITSKY, Professeur à l'Inst. des Ingénieurs des Voies de Communication, 9 Perspective Zabalkanski, St. Petersburg.

Question 3.

GERMANY.
M. HENTRICH, Stadtbaurat, Königlicher Baurat in Crefeld, Rathaus.
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M. MAYR, Ministerialrat in München.

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M. BELA MENCZEL, Ingenieur en Chef de la Société Anonyme d'Aspindte Hongroise (Nador utca 4), Budapest.
M. ARPAD RAUCH, Ingenieur, Debreczen.

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M. BRONDEEL, Ingénieur des Ponts et Chaussées, Brussels.
M. VANDERSCHUEREN, Ingénieur principal des Ponts et Chaussées, Ostend.
M. CLAES, Ingénieur principal des Ponts et Chaussées, Anvers.

FRANCE.
M. WENDER, Ingénieur en Chef des Ponts et Chaussées, Melun.
M. LE GAVRAIN, Ingénieur des Ponts et Chaussées Versailles.
M. MAYER (E.), Ingénieur des Ponts et Chaussées, Paris.
M. FRONTARD, Ingénieur des Ponts et Chaussées, Fontainebleau.

GREECE.
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RUSSIA.
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Question 4.

GERMANY.
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AUSTRIA.
M. TRNKA (Leopold), Baurat, Wien, Rathaus.
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HUNGARY.
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RUSSIA.
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Question 5.

GERMANY.
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AUSTRIA.
M. BOSCHAN (von) (Arthur Ritter), K.K. Oberinspektor der Nordbahn, Wien.

BELGIUM.
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FRANCE.
M. TUR, Ingénieur en Chef des Ponts et Chaussées, Paris.
M. CHAIX, Président de la Commission de Tourisme et de Circulation générale de l'Automobile Club de France, Paris.

RUSSIA.
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Question 6.

GERMANY.
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M. WALDECK, Landesbaurat, Geheimer Baurat in Munster.
M. RANGE, Königlicher Oberbaurat in Dresden, Finanzhaus.

AUSTRIA.
M. DUHM (Julius), K.K. Ingénieur der Statthalterei, Innsbruck.

BELGIUM.
M. THONET, Ingénieur des Ponts et Chaussées, Anvers.

FRANCE.
M. LUMET, Ingénieur des Arts et Manufactures, Ingénieur de la Commission Technique de l'Automobile Club de France, Paris.

NETHERLANDS.
M. ELZELINGEN (Van) (J. M. W.), Ingénieur en Chef du Waterstaat de la province de la Hollande Méridionale, La Haye.

RUSSIA.
M. ZVETKOVSKI, Ingénieur des Voies de Communication, Direction des Voies de Communication, Varsovie.

Question 7.

GERMANY.
M. BERDTSCHNEIDER, Stadtbaurat in Charlottenburg, Rathaus.

AUSTRIA.
M. BOSCHAN (von) (Arthur Ritter), K.K. Oberinspektor der Nordbahn, Wien.

HUNGARY.
M. BALLO (Alfred), Directeur du Bureau de Propreté publique de la Ville de Budapest (Központi városház), Budapest.

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FRANCE.
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Question 8.

GERMANY.
M. PETERS, Stadtbaurat, Geheimer Baurat in Magdeburg.
M. CASSINONE, Grosserzoglicher Oberbaurat in Karlsruhe, Worholzstrasse 20, III.
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M. MARION, Inspecteur Général des Ponts et Chaussées, Paris.
RUSSIA.
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Question 9.

GERMANY.
M. PETRY, Regierungs-und Baurat in Wiesbaden.
M. TIMME, Regierungs-und Baurat im Ministerium für Elsass-Lothringen, in Strassburg.
HUNGARY.
M. NEMETHY (Joseph), Conseiller technique Royal Esztergom.
M. KEVICZKY (Alexandre), Ingénieur en Chef au Ministère du Commerce (Albrecht ut 1.), Budapest.
FRANCE.
M. BORDAS, Sous-Directeur des Routes et Ponts au Ministère des Travaux Publics, Paris.
MONACO (Principaute de).
GUGLIELMINETTI (Dr.), Secrétaire Général de la Ligue contre la poussière, Paris et Monte Carlo.
RUSSIA.
M. PODGOURSKI, Président de la Société des Chemins Enzeli-Teheran, Ministère des Finances, St. Petersburg.

Communication 1.

GERMANY.
M. RANGE, Königlicher Oberbaurat in Dresden.
AUSTRIA.
M. BRADACZECK (Theodor), K.K. Baurat im Ministerium für offentliche Arbeiten, Wien IX , Porzellangasse 33A.
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M. BALLO (Alfred), Directeur du Bureau de Propreté publique de la Ville de Budapest (Kozponti városház), Budapest.
M. ARPAD RAUCHE, Ingénieur, Debreczen.
FRANCE.
M. GUILLET, Ingénieur en Chef des Ponts et Chaussées Privas.
RUSSIA.
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Communication 2.

GERMANY
M. MINERALOGISCH-GEOLOGISCHES INSTITUT DER KONIGLICHEN TECHNISCHEN HOCHSCHULE in Berlin, Charlottenburg.
AUSTRIA.
M. HANISCH (August) Professor, Sektionsvorstand und Leiter der Versuchsanstalt für Bau und Maschinenmaterial am Technologischen Gewerbemuseum, Wien IX., Severingasse.
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Communication 3.

AUSTRIA.
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HUNGARY.
M. GLASNER (Antoine), Directeur de la Société des Carrières de Kissebes (Wesselenyi utca 2), Budapest.
BELGIUM.
M. CORNET, Ingénieur en Chef, Directeur des Ponts et Chaussées, Liège.
FRANCE.
M. LELIEVRE, Agent voyer d'Arrondissement honoraire, Versailles.
M. PONS, Agent voyer d'Arrondissement, Montpellier.
RUSSIA.
M. TOUKHOLKA, Ingénieur des Voies de Communication, Ialta (Crimée).

Communication 4.

GERMANY.
M. SCHEUERMANN, Stadtbauinspektor in Wiesbaden.
M. RANGE, Königlicher Oberbaurat in Dresden.
AUSTRIA.
M. TRNKA (Leopold), Bourat, Wien, Rathaus.
M. KOSETSCHEK (Leopold), Oberingénieur des Stadtbauamtes, Wien, Rathaus.
FRANCE.
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NETHERLANDS.
WENTHOLT (Dr.) (L.R.), Ingénieur du Waterstaat des Pays-Bas, Hoorn.
RUSSIA.
M. KOUPERSTEIN, Ingénieur de la Direction des Voies de Communication de Vilna, Vilna.

Communication 5.

GERMANY.
M. STADTBAURAT in Stadt, Elberfeld.
HUNGARY.
GLASNER (Antoine), Directeur de la Société des Carrieres de Kissebes (Wesselenyi utca 2) Budapest.
FRANCE.
M. LABORDERE, Ingénieur des Ponts et Chaussées, Paris.
RUSSIA.
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Communication 6.

GERMANY.
M. GAETJENS, Landesbaurat in Kiel.
M. MAYR, Ministerialrat in Munchen.
AUSTRIA.
M. BRADACZECK (Theodor), K K. Baurat im Ministerium für offentliche Arbeiten, Wien IX., Porzenglasse 33A.
FRANCE.
M. LORIEUX, Ingénieur en Chef des Ponts et Chaussées, Directeur de l'Office National du Tourisme, Paris.
NETHERLANDS.
M. GELINCK (W.G.C.), Ingénieur du Waterstaat des Pays Bas, Assen.
RUSSIA.
M. NIKOLSKI, Ingénieur à la Direction des Voies de Communication de la region de Saint Petersburg. St. Petersburg.

Communication 7.

GERMANY.
M. SCHWIENING, Oberbaurat in München.
M. MAYR, Ministerialrat in München.
AUSTRIA.
M. HOFER (Richard), K.K. Hofrat im Handelsministerium, Wien.
HUNGARY
M. HALTENBERGER (Samuel), Conseiller technique des Postes et Telegraphes au Ministère du Commerce (Albrecht ut 3) Budapest.
FRANCE.
M. PERISSE, Vice-President de la Commission Technique de l'Automobile Club de France, Paris.
RUSSIA.
M. TSIMBALENKO, Inspecteur principal a la Direction des Routes et de la Navigation. 17 rue Italianska, St. Petersburg.

Communication 8.

GERMANY.
M. KNIPPING, Stadtbaurat in Bochum.
M. SCHWEITZER, Landesbaurat in Düsseldorf.
M. CASSINONI, Grossherzoglicher Oberbaurat in Karlsruhe.
HUNGARY.
M. NEMETHY (Joseph), Conseiller technique Royal Esztergom, Budapest.

FRANCE.
M. Tourtay, Inspecteur Général des Ponts et Chaussées, Paris.
RUSSIA.
M. Triniunkhin, Directeur Adjoint des voies de communication de la region de Kiew, Kiew.

Communication 9.

GERMANY.
M. Vespermann, Stadtbauinspektor in Frankfurt a Main.
M. Gaetjens, Landesbaurat in Kiel.
M. Range, Koniglicher Oberbaurat in München.
AUSTRIA.
M. Breitenfelder (Karl), K.K. Ingénieur des Ministeriums für offentliche Arbeiten, Wien.
FRANCE.
M. Masson, Ingénieur en Chef des Ponts et Chaussées, Arras.
RUSSIA.
M. Lebedeff, Redacteur en chef à la Direction de la statistique et de la cartographie, 7 Perspective Ismailovski, St. Petersburg.

Communication 10.

GERMANY.
M. Stadtbaurat der Stadt, Elberfeld.
AUSTRIA.
M. Hanisch (August), Professor, Sektionsvorstand und Leiter der Versuchsanstalt für Bau-und Maschinenmaterial am Technologischen Gewerbemuseum, Wien IX., Severingasse.
FRANCE.
M. Limasset, Ingénieur en Chef des ponts et Chaussées, Laon.
RUSSIA.
M. Timonoff (de) Professeur a l'Inst. des Ingénieurs des Voies de Communication, 19 rue Schirokaia, Tsarkoe Selo, près St. Petersburg.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President Mr. R. J. Thomas, M.Inst.C.E., County Surveyor, Buckinghamshire

EASTERN DISTRICT MEETING AT GRAYS.

District Chairman—Mr. A. Fidler, M.Inst.C.E., Northampton.

An Eastern District meeting of the Institution of Municipal and County Engineers is to be held at the council offices, High-street, Grays, on Saturday, September 21st.

Programme.

11 a.m.—Meet at the council offices, High-street. Members will be received by Mr. H. E. Brooks, J.P., chairman of the urban district council.
11.15 a.m.—Formation of District Executive Committee. Paper, entitled "Municipal Works of Grays," by Mr. A. C. James, Assoc.M.Inst.C.E., surveyor to the urban district council (member).
11.30 a.m.—Discussion.
11.45 a.m.—Drive to the "Beach" Recreation Ground and open-air swimming pool, new infant school and school baths, Bridge-road, and thence to the Wouldham Cement Works.
1 p.m.—Light refreshments by kind invitation of the Wouldham Cement Company.
1.30 p.m.—Inspection of the cement works.
3.30 p.m.—Proceed to the works of Messrs. Siegwart, Limited, to inspect the manufacture and testing of their reinforced concrete pipes.
Tea kindly provided by Messrs. Siegwart, Limited.

In order that the necessary arrangements may be made, members must give notice of their intention to be present not later than to-morrow (Saturday), when copy of the paper will be sent in due course.

E. J. Elford,
Hon. District Secretary
Southend-on-Sea. Borough Surveyor

EAST MIDLAND DISTRICT MEETING AT ILKESTON.

District Chairman—Mr. E. G. Mawbey, M.Inst.C.E., Leicester.

An East Midland District meeting will be held at the Town Hall, Ilkeston, on Saturday, September 28th.

Programme.

10.45 a.m.—Reception by the mayor, Councillor S. Shaw, J.P., at the town hall.
11 a.m.—Special cars to Hallam Fields for Stanton Ironworks.
11.30 a.m.—Visit Stanton Ironworks.
1 p.m.—Lunch (kindly provided by the company) at the Stanton Ironworks Company's Hotel.
1.45 to 2.30 p.m.—Formation of District Executive Committee. Discussion on papers (which will be taken as read): "Ilkeston Sewage Disposal Works," by Mr. H. P. Raikes, engineer; "Twenty-eight Years' Municipal Work at Ilkeston," by Mr. H. J. Kilford, borough surveyor; "Ilkeston Tramways and Electricity Supply," by Mr. H. P. Stokes, borough electrical engineer.
3 to 4 p.m.—Inspection of the new sewage disposal works. The party will be conducted over the works by the engineer, Mr. H. P. Raikes.
4.10 p.m.—Special cars to the town hall, where tea will be provided
Should time permit, a visit will be paid to the car sheds, police station, free library, cemetery chapels, lodges, gasworks, &c.

In order that the necessary arrangements may be made, members must give notice of their intention to be present not later than Saturday, September 21st, when copy of the papers will be sent in due course.

R. A. MacBrair, M.Inst.C.E.,
Hon. District Secretary.
Lincoln. City Engineer.

EXAMINATION.

The October, 1912, examination will be held in Birmingham on the 10th, 11th and 12th of that month.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

INSTITUTION OF WATER ENGINEERS.

President—Mr. J. S. Pickering, M.Inst.C.E., Borough and Water Engineer of Cheltenham.

VISIT TO SOUTH WALES.

On Saturday, September 21st, by invitation of Mr. C. H. Priestley, M.Inst.C.E., engineer for the works, a visit will be paid by the members of the Institution of Water Engineers to the Llwyn-on reservoir, in course of construction for the Corporation of Cardiff.

Programme.

9.15 a.m.—Train leaves Cardiff (Rhymney Station) for Merthyr.
10.40 a.m.—Brakes leave Merthyr for Cefn-Coed, whence the party will be conveyed by the contractors' light railway to the Llwyn-on reservoir works, passing the Sychpant limestone quarry *en route*.
11.30 a.m.—Arrive at the works, which will be inspected under the personal guidance of Mr. C. H. Priestley and his staff. The drawings will be arranged for inspection at the office. A paper, descriptive of the reservoir, by Mr. Priestley, will be circulated among those taking part in the visit.
1.15 p.m.—Luncheon served in the mission hall.
2.15 p.m.—Brakes leave the works for the Cantreff reservoir (opened 1892) and for the Beacons reservoir (opened 1897), whence the drive will be continued to the top of the gathering ground, returning to Merthyr *viâ* the Cefn-Coed balancing reservoir, which will be inspected *en route*.
4.30 p.m.—Train leaves Merthyr for Cardiff, arriving at Rhymney Station 5.40 p.m.
6.8 p.m.—Train leaves Cardiff (G.W. Ry. Station), arrives Cheltenham 8.16 p.m., Birmingham 9.50 p.m.
6.43 p.m.—Train leaves Cardiff (G.W. Ry. Station), arrives Paddington 9.35 p.m.
7 p.m.—Train leaves Cardiff (G.W. Ry. Station), *viâ* Hereford, arrives Birmingham 10.20 p.m.

Arrangements have been made with the manager of the Park Hotel, Cardiff, to accommodate members and visitors on special terms: Bed, breakfast and attendance, 7s. 6d.; bed, breakfast, dinner and attendance, 10s. 6d. A smoking and conversation room will be reserved on Friday evening for the use of those taking part in the visit.

Members desiring tickets for the visit (price 10s. 6d.) should apply to the secretary, Mr. Percy Griffith, 20 Victoria-street, S.W., at once.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. E. A. Stickland, assoc.m.inst.c.e., Borough Surveyor, Windsor.

ANNUAL MEETING.

The annual meeting will be held in London in October.

B. Wyand,
Secretary.

39 Victoria-street, S.W.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

President—Mr. John D. Watson, m.inst.c.e., f.r.s.i.

YORKSHIRE DISTRICT MEETING.

By kind permission of Councillor W. G. England, J.P., chairman of the Sewage Works Committee the members of the above association will visit and inspect the Barnsley sewage works on Saturday, September 21st.

Objects of Interest: Screening chamber, suction-gas pumping plant, sedimentation tanks, percolating filters, 100-ft. and 120-ft. diameter distributors, and syphon sewer.

Programme.

2.30 p.m.—Reception in the town hall by his Worship the Mayor, Councillor J. H. Cotterill, J.P., and the chairman and members of the Works Committee.

3 p.m.—Proceed to the works, which are situated about 2 miles from the town. Conveyances will be provided.

3.30 p.m.—Descriptive paper will be given by Mr. J. Henry Tayler, assoc.m.inst.c.e., borough engineer and surveyor, who will also conduct the visitors over the works, assisted by the manager, Mr. Chas. M. King.

5 p.m.—Tea, by kind invitation of the chairman, Councillor W. G. England, J.P., at the Imperial Hotel.

The works have been recently reconstructed, and are well worth a visit. Members intending to be present are requested to notify the district secretary not later than Wednesday, September 18th.

Robert Tyson,
Hon. District Secretary.

Queensbury Sewage Works,
Amblerthorn,
Nr. Halifax.

METROPOLITAN DISTRICT MEETING.

An inspection of the St. Albans sewage disposal works will be made by the members of the Association of Managers of Sewage Disposal Works on Saturday, September 28th, at 2 p.m.

The works comprise sedimentation tanks, sludge receiver, sludge distributing main, coarse contact beds, percolating filters, Fiddian travelling distributors, humus tank, final land treatment, &c. The pumping plant comprises a Teasdale suction-gas plant, two 12 h.p. gas engines, and two 6-in. centrifugal pumps.

Programme.

Assemble at entrance to works near Park-street Station (L. and N.W. Rly.).

The party will be conducted over the works by Mr. A. Eade, the manager, who will explain the system of treatment.

A paper will be read by Mr. H. Howard Humphreys, Westminster.

His Worship the Mayor and other members of the corporation have promised to be present.

Those attending to be present will please notify the undersigned on or before Thursday, September 26th.

Jas Craig,
Hon. District Secretary

68 Empress-avenue,
Manor Park, E.

ROYAL SANITARY INSTITUTE.

PROVINCIAL SESSIONAL MEETING, LEWES.

At a meeting of the Royal Sanitary Institute, to be held at the Town Hall, Lewes, on Friday, October 4th, at 7 p.m., Mr. D. Roberts, the borough surveyor of that town, will open a discussion on "The New Sewerage System for Lewes, with Special Reference to the Discharge of Effluents into Tidal Streams," among those who are expected to take part in the proceedings being Messrs. John H. Blizard, assoc.m.inst.c.e., Southampton, A. J. Martin, m.inst.c.e., Westminster, and A. E. Prescott, borough engineer and surveyor, Eastbourne.

The chair will be taken by Mr. H. Percy Boulnois, m.inst.c.e., chairman of council of the institute.

On the following morning the members will visit the Phœnix Ironworks and the Lewes Portland Cement and Lime works, and in the afternoon inspect the Lewes Victoria Hospital, the borough isolation hospital, the fire brigade station, and the waterworks.

MUNICIPAL TRAMWAYS ASSOCIATION.

ANNUAL CONFERENCE, WEST HAM.

The annual conference of the Municipal Tramways Association (Incorporated) will be held in West Ham on September 25th, 26th and 27th next. De Keyser's Hotel, Victoria Embankment, E.C., has been selected as headquarters for delegates, and the following programme has been arranged:—

September 25th.

10.15 a.m.—Reception by the Mayor and West Ham Council.

10.30 a.m.—Presidential address by Mr. H. E. Blain, tramways manager, West Ham.

Paper: "Tramways Administration by Municipalities: A Retrospect and a Forecast," by Mr. Councillor S. C. T. Neumann, deputy-chairman Bradford Tramways Committee.

1 p.m.—Luncheon.

2 p.m.—Proceed to Tramways Depot, Greengate-street, Plaistow, by special cars.

2.15 p.m.—Discussion on the interim report of the Corrugation Committee.

3.30 p.m.—Inspection of depot and of the Exhibition of Tramway Appliances, &c.

7.30 p.m.—Corporation reception at the town hall.

September 26th.

10 a.m.—Paper: "Tramway Fares and their Basis," by Mr. W. J. McCombe, tramways manager, Hull.

12.15 p.m.—Luncheon.

1.15 p.m.—Proceed by special cars to tramway depot.

1.30 p.m.—Meeting of managers' section.

1.30 to 3 p.m.—Inspection of depot and Exhibition of Tramway Appliances.

3 to 5 p.m.—Garden party in West Ham Park.

7 for 7.30 p.m.—Association dinner at the Liverpool-street Hotel, E.C.

September 27th.

9.45 a.m.—Annual business meeting at De Keyser's Hotel.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

CLERK OF WORKS.—September 16th. Northwich Urban District Council. £3 10s. per week.—Mr. J. A. Cowley, clerk.

CLERK OF WORKS AND INSPECTORS.—September 16th.—Tredegar Urban District Council. £3 per week. Also three inspectors of works, at £2 10s. per week each.—Mr. H. J. C. Shepard, clerk, Tredegar.

Applications to be endorsed "Clerk of Works" or "Inspector."

CLERK OF WORKS.—September 18th.—Isle of Wight Rural District Council. 30s. per week.—Mr. H. E. Stratton, clerk.

MAINS FOREMAN.—September 19th.—Borough of Darwen. £2 per week.—Mr. R. W. Smith-Saville, waterworks engineer.

CLERK OF WORKS.—September 20th.—Alnwick Urban District Council. £3 3s. per week.—Mr. John Balmbra, clerk.

TOWN PLANNING ASSISTANT.—September 23rd.—Corporation of Halifax. £150 per annum.—Mr. Percy Saunders, town clerk.

ROAD FOREMAN.—September 23rd.—Rushden Urban District Council. 35s. per week.—Mr. W. B. Madin, engineer and surveyor. Applications to be endorsed "Road Foreman."

ENGINEER'S ASSISTANT.—September 25th.—Watford Urban District Council. £100 a year.—Mr. W. Hudson, clerk.

CHIEF ENGINEER AND COUNTY SURVEYOR.—October 7th.—London County Council. £2,000.—Sir Laurence Gomme, clerk.

DRAUGHTSMAN.—Survey Department of the Federated Malay States. Age between 25 and 35. £300—£400.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W. "M. 5,511" to be quoted on left-hand top corner of application.

WORKS FOREMAN.—To construct concrete reservoir, engine and boiler house, mechanical filters, and lay mains in Southern Nigeria, under the direction of Mr. H. F. Peet, waterworks engineer to Southern Nigerian Government, Lagos. £350 per annum.—Messrs. Middleton, Hunter & Duff, consulting engineers, 17 Victoria-street, Westminster.

WORKING ROAD FOREMAN.—For County Council on East Coast.—Apply Box 1,184, offices of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

DRAUGHTSMAN. Public Works Department of Sierra Leone. Age between 25 and 35. £300—£350. Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL ENGINEERING ASSISTANT.—Municipality of Delhi, India.—Apply "Municipal Engineer," THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

MUNICIPAL COMPETITIONS OPEN.

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RANGOON.—September 28th—February 1st.—The date in the conditions in Clause 28 has been altered from August 31st to September 28th and in Clause 14 from January 1st to February 1st, 1913. The latest date for posting letters to reach Rangoon by February 1st will be by the Indian mail of January 10th.

LLANELLY.—September 30th.—Competitive designs and estimates for school buildings for over 1,000 children, also domestic subjects centre, for the Education Committee.—Mr. G. E. Halliday, F.S.A., F.R.I.B.A., Castle-street, Cardiff, will act as assessor and award premium.—Mr. I. W. Watkins, clerk, Education Offices, Coleshill-terrace, Llanelly.

WANDSWORTH.—October 14th.—Competitive designs for public swimming bath at Balham.—Mr. P. Dodd, borough engineer, 215 Balham High-road, S.W.

GLASGOW.—October 29th.—Preliminary sketch designs are invited by the corporation for the extension of the municipal buildings. Honorariums of 100 guineas to five selected designs.—Mr. John J. Burnet, A.R.S.A., 239 St. Vincent-street, Glasgow, is assessor.—Applications to the clerk, Mr. J. Lindsay, town clerk.

LLANDUDNO.—October 31st.—Designs for laying out about 20 acres, for the urban district council. A premium of 50 guineas is offered.—Mr. A. Conolly, clerk.

HUDDERSFIELD.—October 31st.—Designs for laying out certain areas as a town planning scheme, for the corporation. Premiums of 100, 50, and 25 guineas.—Mr. J. Henry Field, town clerk.

ORSETT (Essex).—January 1st.—For the construction of a sewerage and sewage disposal scheme in the parish of South Ockendon, for the Orsett Rural District Council. Premiums of £50 and £25 are offered.—Mr. James Beck, clerk, 2 Orsett-road, Grays.

MUNICIPAL CONTRACTS OPEN.

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Buildings.

TOWCESTER.—September 14th.—For the erection of seventeen houses, for the rural district council.—Mr. W. K. Higham, clerk.

PORTSMOUTH.—September 16th.—For rebuilding offices and other work, for the Education Committee.—Mr. G. H. Etherton, clerk, Town Hall.

TREDEGAR.—September 17th.—For the construction of foundations for a gasholder, for the urban district council.—Mr. D. W. Davies, Tredegar.

ERPINGHAM.—September 17th.—For the construction of bridges and culverts, for the rural district council.—Messrs. A. F. Scott & Son, 24 Castle Meadow, Norwich.

HALIFAX.—September 17th.—For the erection of a tramway shelter for the corporation.—Mr. P. Saunders, town clerk.

BIRMINGHAM.—September 17th.—For the erection of a special school, for the corporation.—Mr. J. A. Palmer, secretary of the Education Committee, Council House.

DURHAM.—September 17th.—For the erection of a school, for the county council.—Mr. A. J. Dawson, clerk to the Education Committee, Shire Hall, Durham.

GRIMSBY.—September 17th.—For the erection of a council school, for the Education Committee.—Mr. Douglas Chandler, clerk.

EDINBURGH.—September 18th.—For the erection of a town hall at Portobello, for the corporation.—Mr. T. Hunter, town clerk, City Chambers, Edinburgh.

ESSEX.—September 18th—October 11th.—For the erection of a school, for the Education Committee.—Mr. F. H. Bright, clerk, 53 High-street, Maldon.

HULL.—September 19th.—For the erection of a school, for the Education Committee.—Mr. J. H. Hirst, city architect.

KENILWORTH.—September 19th.—For the erection of a lodge and chapel at cemetery, for the urban district council.—Mr. S. Douglas, architect and surveyor.

WARRINGTON.—September 19th.—For fixing stone steps and iron railings to a footbridge, for the corporation.—Borough Engineer.

LAMBETH.—September 19th.—For repairs, painting and lead roof work, for the corporation.—Mr. H. Edwards, borough engineer.

WEST RIDING.—September 20th.—For the erection of a school and repairs to existing school, for the Education Committee.—Education Architect, County Hall, Wakefield.

RHONDDA.—September 20th.—For alterations and extensions to schools, for the urban district council.—Mr. W. P. Nicholas, clerk, Pentre, Rhondda.

ENFIELD.—September 23rd.—For the erection of medical superintendent's quarters and four cottages, for the Joint Hospital Board.—Mr. R. Collins, Public Offices, Enfield.

BLACKBURN.—September 23rd.—For the erection of public halls, for the corporation.—Mr. L. Beard, town clerk.

HAMPSHIRE.—September 24th.—For the erection of a corrugated iron cookery room, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

LANARK.—September 24th.—For the construction of two bridges, for the county council.—Mr. W. E. Whyte, district clerk, District Offices, Hamilton.

SOMERSET.—September 25th.—For the erection of an infants' school, for the county council.—County Education Office, Weston-super-Mare.

SALFORD.—September 25th.—For alterations and additions to town hall and sessions court, for the

corporation.—Mr. J. B. Broadbent, 15 Cooper-street, Manchester.

HAMPSHIRE.—September 26th.—For the erection of a classroom and alterations to building, for the county council.—Mr. H. Barber, clerk, The Castle, Winchester.

NELSON.—September 28th.—For the construction of a bridge, for the corporation.—Mr. W. Shackleton, borough engineer.

NORTH RIDING.—October 2nd.—For the erection of a cookery and manual instruction room, for the Education Committee.—Mr. J. C. Wrigley, secretary, County Education Offices, Northallerton.

Iron and Steel.

MOUNTMELLICK.—September 14th.—For extending water mains, sinking wells, and erection of a pump, for the rural district council.—Mr. John J. Williams, clerk.

MALDON.—September 16th.—For laying 2,000 yds. of cast-iron water mains, for the rural district council.—Mr. A. W. Freeman, clerk.

LONDON.—September 27th.—For the supply of cast-iron segments, for the Metropolitan Water Board.—The Clerk, Savoy-court, Strand, W.C. Tenders to be endorsed "Tender for cast-iron well segments, Shortlands."

LEEDS.—September 30th—October 7th.—For the erection of steel and corrugated-iron building, and constructing surface-water drainage, for the Tramways Committee.—Chairman of the Tramways Committee.

MADRAS (India).—For the supply of about 9,500 tons of cast-iron pipes and special castings, with valves, and other works in connection with water supply distribution system, for the corporation.—Messrs. J. Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

Roads.

SPENNYMOOR.—September 14th.—For laying concrete, kerbed and flagged footpath, and scoriæ brick channel, for the urban district council.—Mr. F. Badcock, clerk.

ALVASTON.—September 14th.—For the supply of slag rejections and granite, for the urban district council.—Mr. W. J. Holbrook, clerk, Full-street, Derby.

PETWORTH.—September 16th.—For steam rolling and scarifying, for the rural district council.—Mr. Ernest H. Staffurth.

CHORLEY.—September 16th.—For the supply of road materials, for the corporation.—Mr. J. Mills, town clerk.

GREENFORD.—September 16th.—For the supply of gravel, hoggin, river flints and chalk flints, for the urban district council.—Mr. W. H. Read, surveyor, The Avenue, West Ealing.

BUSHEY.—September 17th.—For making up two roads, for the urban district council.—Mr. E. E. Ryder, surveyor. Tenders to be endorsed "Tender for street works."

ALTRINCHAM.—September 17th.—For widening, kerbing and channelling, for the urban district council.—Mr. H. E. Brown, surveyor.

ST. HELENS.—September 17th.—For the construction of two roads, for the corporation.—Mr. A. W. Bradley, borough engineer.

ACTON.—September 17th.—For making up two roads and resurfacing several carriageways with tar-macadam, for the urban district council.—Mr. W. Hodson, clerk.

SOUTHAMPTON.—September 18th.—For reconstruction of footways, for the corporation.—Mr. R. R. Linthorne, town clerk.

WATFORD.—September 18th.—For the supply of 4,480 tons of broken granite, and chippings and dust, for the urban district council.—Mr. W. Hudson, clerk.

BOURNEMOUTH.—September 18th.—For making up three streets, for the corporation.—Mr. F. W. Lacey, borough engineer and surveyor.

DEWSBURY.—September 18th.—For work of paving and flagging, for the corporation.—Borough Surveyor.

REIGATE.—September 18th.—For the execution of private street works, for the rural district council.—Mr. A. J. Head, surveyor, 48 High-street.

ROCHDALE.—September 18th.—For making up a road, for the corporation.—Borough Surveyor.

HORSHAM.—September 20th.—For the supply of tar for surface treatment, for the rural district council.—Mr. W. Dengate, surveyor.

FARNHAM.—September 20th.—For the supply of road metalling granites, for the urban district council.—The Surveyor. Tenders to be endorsed "Granite."

CAITHNESS.—September 20th.—For improvements to county road, for the road authority.—Mr. W. Kirkland, road surveyor, Wick.

BURNLEY.—September 21st.—For road improvement work, for the rural district council.—Mr. H. Pritchard, surveyor.

SMALLTHORNE.—September 23rd.—For carrying out street works, for the urban district council.—Mr. G. Phillips, clerk.

FELTHAM.—September 23rd.—For the supply of granite, for the urban district council.—Mr. G. Stevens, surveyor. Tenders to be endorsed "Tender for granite."

NANTYGLO AND BLAINA.—September 23rd.—For the supply of limestone granite, limestone chippings and granite chippings, for the urban district council.—Mr. H. J. V. Shepard, clerk.

UXBRIDGE.—September 23rd.—For work of steam rolling and scarifying, for the urban district council.—Mr. W. T. Harvey, clerk.

RUNCORN.—September 23rd.—For making-up work with tar-macadam and ordinary macadam, for the rural district council.—Mr. H. Swetenham, surveyor, 49 Northgate-street, Chester.

HANWELL.—September 23rd.—For the supply of broken Guernsey granite, Kentish pit flints and distilled tar, for the urban district council.—Mr. Percy Scott, clerk.

BROMLEY.—September 24th.—For work of making up, for the corporation.—Mr. F. H. Norman, town clerk.

TOTTENHAM.—September 24th.—For the disposal by the urban district council of a 10-ton steam roller, fitted with scarifier.—Mr. Edward Crowne, clerk.

TOTTENHAM.—September 24th.—For the supply of a 10-ton single-cylinder steam road roller, fitted with an approved road scarifier, for the urban district council.—Mr. Edward Crowne, clerk.

ST. NEOTS.—September 24th.—For the supply of broken granite, Rocmac and Ferromac, for the urban district council.—Mr. J. Edey, surveyor.

HARWICH.—September 25th.—For making up a road, for the corporation.—Mr. F. H. French, borough surveyor. Tenders to be endorsed "Making up of South Cliff-road."

WANSTEAD.—September 25th.—For work of steam rolling, for the urban district council.—Mr. Bruce Blewitt, clerk.

TANGIER.—October 3rd.—For the construction of a road 1¼ miles long, for the Committee of Public Works.—Specifications may be obtained at the Intelligence Branch of the Board of Trade, 75 Basinghall-street, E.C.

Sanitary.

BEDFORD.—September 14th.—For the construction of delivery tanks, inlet channels, detritus tanks, precipitation and storm-water tanks, the laying of about 1,600 yds. of cast-iron pipes, and water main, for the corporation.—Mr. Chas. Stimson, town clerk.

CHESTERTON.—September 14th.—For the construction of sewer, with manholes, for the rural district council.—Mr. J. F. Symonds, clerk, 9 Bene't-street, Cambridge.

HEXHAM.—September 16th.—For laying 3¾ miles of earthenware pipe sewers, manholes, and flushers, for the rural district council.—Mr. J. E. Parker, Post Office Chambers, Newcastle.

DARTFORD.—September 16th.—For emptying cesspools and closets, and removing house refuse, for the rural district council.—The Clerk.

STALYBRIDGE AND DUKINFIELD.—September 18th.—For the construction of sewage disposal works (Bradley Hurst, Contract No. 2), for the Joint Sewerage Board.—Mr. William Moss, clerk, Market-place, Ashton-under-Lyne.

RUNCORN.—September 18th.—For removing night-soil.—Mr. G. F. Ashton, clerk.

BEDWELLTY.—September 20th.—For work of sewer diversion, for the urban district council.—Mr. D. H. Price, surveyor, Aberburgoed (Mon.).

ANDOVER.—September 21st.—For the construction of screen chamber, engine house, suction tank, 9-in. rising main, circular bacteria beds, and erection of cottage, for the corporation.—Mr. T. E. Longman, town clerk.

NELSON.—September 21st.—For the laying of a pipe sewer, for the corporation.—Mr. W. Shackleton, borough engineer.

WHITEFIELD.—September 24th.—For the construction of sewerage and sewage disposal works, for the urban district council.—Mr. Chas. Bradshaw, clerk.

REDDITCH.—September 26th.—For laying pipe sewers, for the urban district council.—Mr. A. J. Dickinson, engineer and surveyor.

COCKERMOUTH.—September 27th.—For the cutting of trenches, and construction of manholes, flush tanks, ventilators, sedimentation tanks, and percolating filters, for the rural district council.—Mr. J. B. Wilson, Grecian Villa, Cockermouth.

NELSON.—September 28th.—For the construction of sewers and sewage works extensions, for the corporation.—Mr. W. Shackleton, borough engineer.

CAIRO.—September 30th.—For sanitary installations, for the Office of Public Works.—Administrative Service, Public Works Ministry, Cairo.

WATFORD.—September 30th.—For the supply of concrete tubes of 36 in., 30 in., and 21 in., for the urban district council.—Mr. W. Hudson, clerk.

BLEAN.—September 30th.—For the construction of sewage disposal works, for the rural district council.—Mr. F. A. Ward, Roseneath, Eddington, Herne Bay.

WATFORD.—September 30th.—For the construction of storm-water drainage and sewerage works, for the urban district council.—Mr. D. Waterhouse, engineer and surveyor.

BRAILA (Roumania).—October 3rd—7th.—For work of drainage and laying conduits, at the estimated cost of £16,000, for the corporation.—Primaria Orasulni Braila, Roumania.

BRADFORD.—October 9th.—For the construction of circular outfall sewer in tunnel, and two shafts, for the corporation.—Mr. Frederick Stevens, town clerk.

Miscellaneous.

HASTINGS.—September 14th.—For the supply of horses and carts, for the rural district council.—Mr. A. R. Inskipp, clerk, 11 Wellington-square, Hastings.

CORNWALL.—September 14th.—For the supply of direction posts and motor warning signs, for the county council.—Mr. Albert E. Brooks, county surveyor, Truro.

BROADSTAIRS.—September 23rd.—For water-softening house and ferro-concrete tanks, cast-iron pipes and specials, and sluice valves, for the urban district council.—Mr. L. A. Skinner, clerk.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ALFORD.—Accepted for the supply of granite, for the urban council:—
M. Jackson & Son, Louth.

CHAPEL-EN-LE-FRITH.—For the construction of new sewers, for the rural district council.—Mr. J. Goddard, sanitary surveyor:—
M. A. Boswell, Wolverhampton, £8,980.

CHAPEL-EN-LE-FRITH.—For the construction of the Dove Holes reservoir, for the rural council.—Engineers: Messrs. Brady & Partington, Town Hall, Chapel-en-le-Frith:—

Airds, Limited, London	£5,704
H. Ashley, Mansfield	4,724
Sanders & Torrance, Stoke-on-Trent	4,631
W. W. Bateman, Chesterfield	4,124
A. Hyslop, Manchester	3,993
D. Eadie & Co., Limited, Stockport*	3,972

CHELMSFORD.—For extensions to the fire station, for the corporation:—
A. E. Faircloth, £193.

CHELMSFORD.—For laying water mains, for the corporation:—
G. Porter, Hackney, £628.

DISLEY (Cheshire).—For the construction of Furness Vale sewers, for the rural council.—Engineers: Messrs. Brady & Partington, Town Hall, Chapel-en-le-Frith:—

H. Ashley, Mansfield	£1,408
W. Hirst & Sons, Sheffield	1,271
W. Bradshaw & Sons, New Mills	1,265
Airds, Limited, London	1,211
W. Morley & Sons, Manchester	1,028
Sanders & Torrance, Stoke-on-Trent	970
M. A. Boswell, Wolverhampton	922
D. Eadie & Co., Limited, Stockport*	916

HALIFAX.—For the construction of 2,125 lin. yds. of 48-in. diameter cast-iron pipe sewer in the bed of the Hebble Brook from Water-lane to the sewage disposal works at Salterhebble, for the corporation:—
Construction and laying of sewer.—Bower Brothers, £9,650.
Supply and delivery of pipes and specials.—Stanton Iron Works Company, Limited, £14,352.

HALIFAX.—The following tenders are recommended to the town council for acceptance:—
Two basket screens required at the sewage works.—Adams Hydraulics, Limited, London, £100.
Wooden fencing for Pye Nest-road.—J. Turner, North Bridge Wood Works, £300.
Six tramway car bodies with top covers.—Brush Electrical Engineering Company, Limited, Loughborough, £2,640.
Six pairs of 40-h.p. motors.—Siemens Brothers, Limited, Stafford, £1,032.

HAMILTON.—Accepted for the erection of municipal offices, for the corporation:—
Masons.—T. Anderson & Sons, £6,782.
Carpenters and joiners.—J. C. Burns & Co., £2,374.
Plumber.—L. Taylor, £656
Slater.—W. Bannatyne, £98.
Plaster and concrete.—W. Bannatyne, £717.
Tilers.—R. Brown & Son, Paisley, £320.
Glazier.—J. McLaren, £149.

HYDE.—For building public hall and police courts, for the corporation.—Mr. J. Diggle, borough surveyor:—

S. Roberts, Limited, Plymouth	£16,998
R. Carlyle, Manchester	15,997
C. H. Normanton & Son, Limited, Manchester	15,379
E. Marshall & Sons, Limited, Ashton-under-Lyne	14,925
Gerrard & Son, Swinton	14,490
J. Ridyard, Ashton-under-Lyne	14,449
S. Robinson & Sons, Hyde*	14,175
M. Warrington, Hyde	14,053

KENT.—For extensions to school building, for the education committee:—

J. H. Henry, Limited, London	£851
Laurance Seager, Sittingbourne	716
G. Bowes & Sons, Milton Regis	708
J. R. Bligh, Sheerness	685
A. W. Phillips, Sheerness*	677

LEICESTER.—For the supply and erection of steel roof trusses, lattice girders and columns for the extension of the main car depot, for the corporation.—Mr. E. G. Mawbey, borough engineer:—

Eastwood, Swingler & Co., Limited, Derby	£1,083
F. W. Cross & Co., Limited, Walsall	888
E. C. & J. Keay, Limited, Birmingham	794
Goddard, Massey & Warner, Limited, Nottingham	778
E. Cockey & Sons, Limited, Frome	769
Gimson & Co., Limited, Leicester	766
J. Mundy, Glasgow	722
Robinson & Kershaw, Manchester	689
S. Russell & Sons, Leicester*	678

MACCLESFIELD.—For the construction of the sewers at Taxal, for the rural council.—Engineers: Messrs. Brady & Partington, Town Hall, Chapel-en-le-Frith:—

W. Bradshaw & Sons, New Mills	£872
W. Hirst & Son, Sheffield	763
H. Ashley, Mansfield	729
Airds, Limited, London	724
D. Eadie & Co., Limited, Stockport	604
W. Morley & Sons, Manchester	590
Sanders & Torrance, Stoke-on-Trent	541
M. A. Boswell, Wolverhampton*	516

MARKET BOSWORTH.—For works of sewerage, for the rural council:—
H. Preston, Ratby, £162, and 2s. 9d. per yard for connection.
J. A. Jacques, Mountsorrel, £184.
R. Shipman, Ratby*, £161, and various prices for connection.
O. Dilks, Thornton, £158, and various prices for connection.
M. Sleath, Rothley, £193.

MERTHYR.—For the erection of girls' school and domestic subjects block, for the education committee:—

E. Walters & Son, Bristol	£9,182
E. P. Davies, Dowlais	8,390
Warlow & Warlow, Merthyr	8,101
W. G. Burd, Cefn Coed	7,960
Jones Brothers, Treharris	7,158
E. Williams & Sons, Dowlais	7,325
A. J. Colbourne, Swindon*	6,988

SOUTH SHIELDS.—For repaving certain streets with granite setts, for the corporation.—Mr. L. Roseveare, borough engineer and surveyor:—
T. C. Starkey & Co., Hull, £2,427.

STOCKPORT.—For reforming a carriageway with granited rock asphalt, for the corporation.—Mr. J. Atkinson, borough surveyor:—
W. H. Worthington, Limited, Manchester, £1,771.

STOCKPORT.—For making up works, for the corporation.—Mr. J. Atkinson, borough surveyor:—
Gosling & Stafford, Hazel-grove, £1,271.

SUNBURY-ON-THAMES.—For steam rolling and scarifying, for the urban district council.—Mr. H. F. Coales, surveyor:—

	Per day. £ s. d.	Per yard. d.
Kavanagh & Co., Surbiton-hill	1 10 0	1
Oxford Steam Plough, Cowley, Oxford	1 7 0	1
Eddison Steam Rolling Company, Limited, Dorchester	1 5 5	¼
Pamplin Brothers, Cherryhinton, Cambridge	1 5 0	½
A. J. Ward, Egham	1 1 0	½
H. Ward, Egham	1 2 6	½
Parry & Co., Howard's-lane, Putney*	1 1 11	¼

TINTWISTLE.—For works of sewerage, for the rural council.—Engineers: Messrs. Brady & Partington, Town Hall, Chapel-en-le-Frith:—

H. Ashley, Mansfield	£2,519
D. Eadie & Co., Limited, Stockport*	2,172
W. Bennison, Romiley	2,126

WHALEY BRIDGE.—For the construction of sewers and sewage disposal works, for the joint sewerage board. Engineers: Messrs. Brady & Partington, Town Hall, Chapel-en-le-Frith.—

Airds, Limited, London	£11,071
W. Hirst & Son, Sheffield	10,451
H. Ashley, Macclesfield	10,359
A. Hyslop, Manchester	9,885
W. Cunliffe & Sons, Birmingham	9,400
W. W. Bateman, Chesterfield	9,219
Pethick Dix & Co., London	9,182
W. Morley & Sons, Manchester	9,069
Sanders & Torrance, Stoke-on-Trent	8,983
D. Eadie & Co., Limited, Stockport	8,711
M. A. Boswell, Wolverhampton*	8,259

WINCHCOMB.—For laying and jointing 9-in. and 6-in. stoneware pipe sewers, together with manholes and lampholes; also the construction of sewage tanks, &c., laying out of land for irrigation, and other incidental works at Bishop's Cleeve, for the rural district council.—Messrs. Phillott & George, Cheltenham, engineers:—

J. Riley, Cheltenham	£4,070
R. Bowen, Cheltenham	3,380
M. Williams & Co., Cheltenham	3,227
A. Hill & Co., Kidderminster	3,068
Johnson Brothers, Gloucester*	2,937

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

SEPTEMBER.

14.—Institute of Sanitary Engineers: Visit to Kensington Destructor Works.

18-21.—Annual Congress of the Sanitary Association of Scotland, at Montrose.

21.—Institution of Water Engineers: Visit to Llwyn-on Reservoir, South Wales.

21 (or 28).—Institution of Municipal and County Engineers: Eastern District Meeting at Grays.

25-27.—Municipal Tramways Association: Annual Conference at West Ham.

28.—Institution of Municipal and County Engineers: East Midland District Meeting at Ilkeston.

OCTOBER.

1-5.—Royal Sanitary Institute: Meeting at Lewes; Mr. D. Roberts, borough surveyor, on "The New Sewerage System for Lewes, with Special Reference to the Discharge of Effluents into Tidal Streams."

26. Royal Sanitary Institute: Meeting at Alton; Discussions on "Housing Problems in County Areas" and "Municipal Work in Alton." Town Hall, 11.15 a.m.

APPOINTMENTS OPEN.

THE MUNICIPALITY OF DELHI, INDIA, require the services of an Assistant, experienced in Municipal Engineering.—For further particulars apply to "Municipal Engineer," office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

ALNWICK URBAN DISTRICT COUNCIL.
CLERK OF WORKS.

Applications are invited for the appointment of a Clerk of Works in connection with the augmentation of the Waterworks for the above district, at a salary of £3 3s. per week. The person appointed will be required to devote the whole of his time to the duties of the office and work under the instructions of the Council's Engineers, Messrs. Taylor, Wallin & Douglas, of Newcastle-on-Tyne and to commence immediately.

It is necessary that applicants should have had considerable experience in levelling, setting out of works, and of ferro-concrete constructions.

Applications, in the candidate's own handwriting, stating age, qualifications, present and past experience, together with copies of not more than three recent testimonials, and endorsed "Clerk of Works," must be addressed and delivered to me at the Council Offices on or before Friday morning 20th September instant.

Probable duration of engagement—six months. One month's notice on either side to terminate engagement.

Canvassing members of the Council, or Engineers, either directly or indirectly, will be considered a disqualification.

JOHN BALMBRA
Clerk to Urban District Council.

Council Offices,
Alnwick.
September 6, 1912.

WANTED for India, energetic Young Land Surveyor; thoroughly good and plane table Topographical worker; good draughtsman. Apply, with copies certificates to Planter's Stores and Agency Co., Ltd. 17 St Helen's-place, Bishopsgate, London, E.C.

RURAL DISTRICT COUNCIL OF MUTFORD AND LOTHINGLAND.
DISTRICT SURVEYOR.

The Council invite applications for the post of District Surveyor for this Rural District, comprising about 28,171 acres, with about 110 miles of roads. The population is 11,184.

The officer appointed will be required to take control of all roads, sewers and sewage disposal works under the jurisdiction of the Council, to see that the by-laws as to new streets and buildings are properly carried out, and to do all other work under the Public Health, Highway or other Acts which pertain to the office. He must hold the certificate of the Municipal and County Engineers' Association. The appointment will be determinable by one month's notice on either side.

The salary will be £125 per annum, and the Council will provide an office, stationery and postages. A sum of £15 per annum will be allowed to the Surveyor appointed if he provides and uses a motor cycle. He will be required to live in the district, to devote his whole time to the work, and to give security to the Council through an approved Guarantee Society to the amount of £150.

Applications, in candidate's handwriting, and endorsed "District Surveyor," must reach me not later than Saturday, the 21st instant, and must state age, qualifications and experience, and be accompanied by copies of three recent testimonials.

Canvassing of members of the Council is prohibited.

(By order of the Council)
E. S. NORTON,
Clerk.

148 London-road, Lowestoft.
September 10, 1912.

WATFORD URBAN DISTRICT COUNCIL.
ENGINEER'S ASSISTANT.

The Watford Urban District Council invite applications for the appointment of an Engineering Assistant.

The applicant must be a good draughtsman, have a practical knowledge of drainage works, waterworks and private street works, and be able to take levels and make surveys. The officer appointed will be required to devote his whole time to the service of the Council, at a commencing salary of £100 per annum, and to perform his duties under the direction of the Engineer.

Office hours from 9 a.m. to 5.30 p.m.

Application (written on foolscap, one side only), stating age, qualifications and date on which the applicant could enter on the duties, accompanied by copies of not more than three recent testimonials, to be sent to the offices of the Council, 14 High-street, Watford, on or before 9 a.m. on Wednesday, 25th September, 1912.

Canvassing, directly or indirectly, will be a disqualification.

W. HUDSON,
Clerk and Solicitor.

Council Offices,
Watford.
September 5, 1912.

BOROUGH OF DARWEN.
WATERWORKS DEPARTMENT.
APPOINTMENT OF MAINS FOREMAN.

The Darwen Corporation Waterworks Committee require a Working Foreman in the Distribution Department.

Applicants must have practical knowledge of the laying of Water Mains, Services, Detection of Waste, and the Testing and Inspection of Fittings, &c. Preference will be given to candidates having had similar experience under a Public Waterworks Authority.

Wages 32 per week. List of duties and conditions of employment must be obtained from the Waterworks Engineer by candidates previous to making application.

Applications, accompanied by not more than three testimonials (copies only), must be addressed to the undersigned and delivered on or before Thursday, the 19th inst.

R. W. SMITH-SAVILLE, ASSOC.M.INST.C.E.,
Waterworks Engineer.

Municipal Offices,
Darwen.
September 7, 1912.

The Surveyor

And Municipal and County Engineer.

Vol. XLII. SEPTEMBER 20, 1912. No. 1,079.

Minutes of Proceedings.

The Philosophy of Engineering.

As regards practical policy in the carrying out of engineering works, there are two basic or, rather, leading ideas in Prof. Barr's presidential address to the Engineering Section of the British Association at Dundee. One of these is that the more truly the engineer bases his work on the eternal verities, the less will the results tend to harm or annoy the public, or those persons who for various reasons suffer from the effects of works carried out in a manner less in harmony with the laws of Nature. The second of these ideas is that, if engineers took a wider view of their responsibilities than they usually do, they would definitely aim at carrying out their work in such a manner as to cause as little inconvenience or harm as possible. Prof. Barr fails to point out, however, that the two principles are often in conflict; a work which is in harmony with natural laws may easily jar upon the susceptibilities of persons who are out of harmony with those laws, more especially, say, with that group of them with which the engineer is chiefly concerned. We will not do Prof. Barr the injustice of assuming that in his main arguments the term "engineer" is used to denote only members of the engineering profession. As regards his broader contentions, he obviously intends the expression "the engineer" to include all persons who control engineering works, financially or otherwise; but he seems to have somewhat overlooked the most important class of all—the public, who pay for what they desire, not necessarily for what they need. There is a definite demand for moons with the bright side of the face "remote from the source of light." Another important point which must not be overlooked in this connection is that in attempting to do what it is wise to do for the community as a whole, and with our thoughts on the future, we are constantly hampered by the necessity of watching over the pressing needs of the poorer classes in the immediate present. Engineering is, after all, the most important visible expression of government, and the most honourable title of any potentate or government is "Protector of the Poor." In municipal engineering there is a constant conflict between the attempt to do what is economical as regards both present and future taken together, and, on the other hand, the effort to keep down the rates. These considerations, however, do not weaken the force of the epigram on which this address pivots: "The works of the engineer are to be used by some people; they have to be endured by all."

Prof. Barr is happy in his choice of the racing yacht as an example of the contention that "the attainment of the highest efficiency brings with it the greatest artistic merit." He is less fortunate in his references to the work of highway engineers. To say the least of it, his selection of the case of a surveyor who acts carelessly or negligently in the matter of road repair is hardly on a level with the rest of his address. Things which happen because bankrupt drapers and local ne'er-do-weels sometimes occupy posts honoured by the title of "surveyor" have nothing to do with engineering. Worse than this, we find remarks with regard to the nature of a road crust which display not only unfamiliarity with the subject from the practical point of view, but also a temporary haziness of vision with respect to the operation of natural laws. The "ideal road" may be in either of two classes. It may be the kind of road described in visions of the New Jerusalem, with which, at our present stage of evolution at any rate, we are not concerned; on the other hand, it may mean, and in a presidential address to the Engineering Section of the British Association should mean, a road which can be imagined to exist under the present system of physical laws. If this is the kind of ideal intended we must point out that it certainly would not be "one that would not wear at all." Prof. Barr actually said that "the demand that is being forced upon the engineer to eliminate this nuisance (dust) is leading to an improvement of our roads for all users," which reminds one of the proverb "Any stick to beat a dog with." We desire directly to traverse the statement that "It is no part of the function of a road surface to fritter itself down into dust under traffic of any kind." The less dust the better, of course, but broken-down material of some kind there must be if the road is to serve its purpose. Surfaces in working contact must be in one of three classes: they must be effectively lubricated, as in the case of engine bearings, or they must become highly polished, or they must wear. With lubricated surfaces we must have outside control of the direction of motion and an outside point of application of the moving force; with polished surfaces we must have similar control—that afforded, for instance, on both counts, by the groove which the skate cuts in the ice on a pond. On roads and railways the necessary means of applying force, and in the latter case of directing motion, is supplied by friction which cannot be maintained unless the surfaces wear. Since the road surface has to prevent movement sideways as well as to supply friction for the application of power, and for braking, it is probable that the amount of wear, which is the necessary accompaniment, with the materials at our disposal, of the maintenance of a suitable roughness, must be considerably greater than in the case of a railway. This is the more likely from the fact that the road is subject to a far greater range of conditions, both as regards gradients and with respect to vehicles and their wheels. To revert for a moment to the case of the railway, it

may be pointed out that, in spite of the moderate gradients, it is found necessary to use sand in slippery weather in order to make the surface of the rails sufficiently non-slippery.

These remarks are not intended to damp the enthusiasm of those who are making intelligent attempts to use new materials, but these materials will not assist anybody to evade the natural laws which govern the relations between force and matter. Prof. Barr's ideal road suggests an ideal vehicle, having wheels like those of a pedrail tractor, but each foot a sucker-foot like that of the house fly, and equally efficient. Generally, we contend that there is an essential difference between "*an* ideal road," which may presumably be imagined to be fitted with various devices and subjected to a general levelling of gradients involving the making of tunnels and aqueducts, and the purchase of large areas of land—there is an essential difference between this and "*the* ideal road," which must necessarily possess the essential features at least of *the* ordinary highway.

* * *

Sterilisation of Water by Chlorine Gas.

A paper read by Dr. D. D. Jackson, of New York, dealing with the chlorine sterilisation of water is noticed elsewhere in the present issue. Dr. Jackson brings forward facts to which we have frequently called attention during the last few years. The first is that overdosing with the sterilising agent, leading to unpleasant tastes and odours in the water, is liable to occur unless an efficient automatic dosing apparatus is used. The flow of hypochlorite must be in exact proportion to the flow of the water if overdosing is to be avoided. Again, results at Cleveland and elsewhere clearly show that if the water is sufficiently free from organic matter the dose of hypochlorite may be reduced to a minimum. This is also a fact which we have dealt with many times, and apparently its truth is at last finding acceptance. Instead of adding hypochlorite to the water before or during filtration in comparatively large quantities, we find that a dose of from 0·7 to 0·5 parts per 1,000,000 of available chlorine is giving good results at Cleveland, 0·35 parts per 1,000,000 are used at Jersey City and at Cincinnati, and 0·5 parts per 1,000,000 at New York.

As is well known, electrolytic hypochlorite is being used at many places, and there can be little doubt that it will ultimately supersede bleaching powder, for it is obvious that the great difficulty of adding this chemical to the water in exact doses in the minute proportion of, say, 0·5 parts of available chlorine per 1,000,000, is altogether against its use, without taking into account the many other advantages of electrolytic hypochlorite over the chemical. Dr. Jackson, however, brings forward and strongly advocates the use of compound chlorine liquefied under pressure. This is sold in cylinders, and is mixed with the water. There is no doubt as to the ease with which it can be applied, but the process of mixing chlorine gas with water in this manner is open to objection. Chemists will not readily agree that the admixture of chlorine gas with water will produce the same result as the admixture of hypochlorite solution. The subject is too long and complicated for full discussion at the moment. But briefly the sterilisation of water by means of chlorine gas is due to the fact that the chlorine combines with the hydrogen in the water, and forms hydrochloric acid, while the oxygen is liberated, and it is this nascent oxygen which performs the work of sterilisation. With hypochlorite, however, there is a certain amount of oxygen present, and this, with the oxygen produced by means of the chlorine present in the hypochlorite, sterilises the water. Thus with chlorine gas twice the amount of chlorine is required, and presumably twice the amount of hydrochloric acid remains in the water. Again, with hypochlorite, the gas is given off in minute bubbles, and is thus more readily dissolved in the water, but if chlorine gas is blown through in bulk it is inevitable that bubbles of gas will escape.

It appears that complete reliance is placed upon the hypochlorite sterilisation at Cleveland. The addition of from 0·5 to 0·7 parts per 1,000,000 of available chlorine to the water is considered, and has apparently been proved to be sufficient to render the water safe for use, even when the sewage-laden ice from the river and harbour has caused specific infection at the water supply intake. It is also found that with these small doses there is no unpleasant smell or taste in the water. It is to be regretted that there is as yet so little definite evidence to hand as to the results of sterilisation. It is to be anticipated that when statistics are forthcoming a considerable drop in the typhoid death-rate will be shown, and that where deaths from typhoid fever have been avoided there will also be a considerable decrease in the death-rate from other causes. Much evidence has been brought to light, showing that an improvement in the quality of drinking water has had this effect at a number of towns, but more evidence is needed before the great advantages of sterilisation will be fully grasped.

* * *

Dungarvan Council and its Surveyor.

Mr. J. A. Ryan, surveyor to the Dungarvan Urban District Council, has been constrained to resign his post on the ground, not apparently refuted by the urban council, that "it would be impossible for him to comply with the new conditions imposed by the council . . . chiefly because the expenses alone would amount to about three times the salary of 19s. 2½d. per week paid by the council to their surveyor." This, it will be generally allowed, would be an all-sufficient reason for Mr. Ryan, or any other surveyor similarly treated, to "send in his papers." It will not surprise most people, Dungarvan Urban District Council being such as it obviously is, to know that the surveyor had also to "defend himself against the very unjust charges made against him by a certain section" of the members. What ever the precise matter in dispute between Mr. Ryan and the council may have been, it was quite candidly admitted by the chairman, Mr. Thomas Power, that an attempt had been made to cast new duties upon the surveyor, for in the course of a statement he remarked that the advertisement for the vacancy "caught to be based on the conditions laid down recently for Mr. Ryan, which will show that we are not going to impose lighter duties upon a new man. This, as well as the peculiar tone of the discussion, a tone apparently based upon a feeling of regret that the council are debarred by the Local Government Board from appointing as surveyor individuals variously described as "handymen," and persons "not qualified"—would suggest that Dungarvan councillors have yet to realise their duty to the public as well as to the profession of municipal engineers. Perhaps some allowance is justly to be made for people who are still young in their career of local self-government, but, even so, all the circumstances of this case, which does not stand alone, go to prove that but for the beneficent restraints of a central government authority the standard of municipal work in Ireland, and therefore of public health, would be seriously depreciated.

* * *

The Institution of Municipal and County Engineers.

From the report which appears in another column, it will be seen that many matters of interest came up for discussion at the last meeting of the council of the Institution of Municipal and County Engineers. Not the least important of these was the Mutual Defence Fund. This is now one of the established branches of the Institution's work, and members will anxiously await the devising of a satisfactory

scheme for its operation by the Constitution Committee, to whom the matter has been referred. A report was received from the Standardisation Committee in regard to a specification for street lighting. The comparison of competing methods of illumination and the drawing of a specification which will secure an adequate and definite illuminating power have hitherto been matters of considerable difficulty, and the new specification will no doubt be appreciated as much as its predecessors dealing with other subjects. The work of the Standardisation Committee has always been received with favour by the members, the latest evidence of this being the exhaustion of the first edition of the Concrete Flag Specification. On the recommendation of the Roads Committee, the council resolved to make a contribution of 100 guineas to the International Road Congress which is to be held in London next year. The Institution will have to play a considerable part in this congress, and it will be generally felt that the donation which is to be given to the funds is not incommensurate with the dignity of the British municipal engineering profession. The last matter to which we desire to refer is the motion of which Mr. Cockrill gave notice, that a Town Planning Conference should be held in connection with the next annual meeting, and that steps should be taken with a view to obtaining the sanction of the Local Government Board to the payment of the expenses of the delegates by the authorities whom they represent. This is a matter upon which we have often expressed an opinion, and it is sufficient here to say that attendance at such a conference by the advisers of local authorities is primarily of value in securing that the most modern views on a new subject shall be at their disposal, and that consequently the expense involved in securing such information should in justice be borne by the authorities and not be made a personal charge on their officials.

The Importance of Culverts and Small Highway Bridges.

The design of small, single-span highway bridges and of road culverts is a matter which has been neglected in many countries, although it is one which merits special attention on the ground that careful culverting and the provision of solid and lasting small-span bridges is work which is always worth doing, whether the roads are, otherwise, good or bad. Good culverts not only add to the value of a good road bed and crust, but they reduce the cost of its maintenance and repair, and where the roads themselves are but ill provided with solid crusts a well-devised system of culverting adds to the present value of the road by reducing the effort of hauling at some of the worst places, and increases its potential value as a sound earthwork capable of being gradually brought into the condition of a hard highway. A wide main road in Spain, provided with fine stone bridges in the hilly parts of the route, but crossing the "rambla" in the plain by gravelly or stone-paved fords, may be less praiseworthy as an engineering work than some humble district road in India adequately provided with bridges and culverts throughout its length.

The United States is one of the countries which has suffered, and is still suffering, from a lack of attention to work of this kind, but the United States Office of Public Roads has taken up the matter in a way which promises a rapid and general improvement. In another part of the present issue we have reproduced, from Bulletin No. 43, issued by that office, a number of the most notable passages relating to methods of procedure and types of design, and such as are of general interest beyond the borders of the United States. We have altered the sequence of the passages quoted, but this is purely a matter of grouping for the convenience of our readers and in order to eliminate the portions with which we have no immediate concern.

A Loan without Sanction.

The report of the district auditor contains some plain comments on the financial device adopted by the Holborn Borough Council in connection with the contract for paving Shaftesbury-avenue with wood. It appears that instead of first getting sanction for a loan in the usual way, and then paying the contractors as the work proceeded, an arrangement was made by which the work was to be paid for by a series of fifteen equal annual instalments, such payments to include first cost, interest, repairs and renewals when necessary. The intention was to pay each instalment when it fell due out of current rate. This is certainly a very novel method of payment, and we entirely agree with the district auditor when he points out that such an arrangement is open to legal objection as being equivalent to spreading over a period of years the cost of the new work done in the first year—that is, the major part of the whole work—without first obtaining proper authority for raising a loan. This is entirely opposed to one of the main principles of municipal finance under which loans are raised—namely, that every proposed loan should be submitted to the judgment of a central authority whose sanction must be obtained before the money is borrowed. According to the auditor's report, too, the circumstances under which the expenditure was incurred in the Holborn case were such as to make the scheme of payment even more objectionable than it would otherwise have been. The estimates for the year did not include the work in question, and it appears that the council availed itself of the contractors' offer to accept deferred payments after pressure had been brought to bear upon it by persons desirous of having wood substituted for the stone setts with which the road had previously been paved. The objections to raising loans without sanction are so manifest that we are glad that the district auditor has spoken so plainly in regard to the novel system of payment proposed in this case.

Bath Council and the City Surveyor.

Recent proceedings at the Bath City Council in regard to the Orange-grove improvement provide an excellent illustration of the mischief which arises when members of local authorities imagine themselves possessed of expert knowledge in regard to matters which are in reality outside their legitimate sphere. Certain retaining walls had to be constructed, and plans were prepared by Mr. Fortune, the city surveyor. These plans did not meet with the approval of one of the councillors, who was of opinion that the design was unnecessarily expensive; and after some discussion the council resolved to take the rather extraordinary course of submitting the plans to an outside engineer "for revision." Such a proceeding certainly has the appearance of a veiled vote of want of confidence, and the flimsy nature of the whole agitation in consequence of which this very serious step was taken may be gauged from the fact that Mr. Fortune's design met with the unqualified approval of the selected judge, who reported that "any alterations for reducing the proposed thickness of the various sections would be extremely unwise and unjustifiable."

We congratulate Mr. Fortune on this not unexpected outcome of a very unpleasant business. It would save a great deal of unnecessary trouble if members of local authorities would remember that their engineers have been retained as professional advisers, and that if the works which they are called upon to carry out should fail owing to interference from other quarters in matters of design, the blame would fall upon their shoulders for having acquiesced in a course which they, as experts, ought to have known was unsafe. Why employ an expert adviser, if his advice is not to be followed?

D[illegible]

Experiments on the Weathering of Portland Stone.

By Dr. J. S. OWENS, F.G.S., ASSOC.M.INST.C.E.

This investigation was undertaken at the suggestion of Dr. Des Voeux, and has been carried out on behalf of the Coal Smoke Abatement Society. The importance of a careful consideration of the process known as "weathering" can hardly be exaggerated. Many of our national buildings are suffering serious, if not irremediable, defacement by the gradual fretting away, not only of ornamental traceries on their surfaces, but also of the faces of main walls and buttresses.

The Abbey of Westminster is a notable example of the decay of stone. The authorities of the Abbey regard this matter as very serious, and in 1901 they called for a report upon it from Sir A. H. Church and Mr. Herbert Jackson. Details of their report will be referred to later, but it is mentioned at this point to show the practical importance of the subject.

It is well known that certain impurities common in the atmosphere of manufacturing towns greatly accelerate the deterioration or weathering of building stone. This action is particularly apparent in stones in which the carbonates of calcium or magnesium are found in large proportion. As magnesium forms a soluble sulphate, stones rich in this suffer more from city air than where the calcium carbonate predominates. Such stones may be roughly divided into two groups—*viz.*:—

(*a*) Those in which silicious or other mineral particles are cemented together by one or other of the carbonates named.

(*b*) Those in which the granular parts are themselves carbonates, while the matrix or "ground" is also carbonate or of a more durable substance.

In either case the atmospheric impurities attack and disintegrate the carbonate, whether cementitious or granular. Somewhat similar processes of degeneration take place in other stones when weathering, but it is more rapid and more easily observed in the sandstones and limestones in which calcium or magnesium carbonate is present. The destruction of limestones in cities is usually due to sulphur acids which convert the carbonate into a sulphate with consequent loss of cohesion. These effects are supplemented by the purely physical agencies of wind, rain and frost, each of which plays its part in preparing the surfaces for and accelerating the more serious chemical decay which is especially evident in our large cities.

Physical disintegration is common to all climates and seasons, but is in no way due to chemical pollution of the atmosphere, which is the prime cause of disintegration in cities. In 1909, with the permission of the Dean and Chapter, the author carefully inspected the stonework of Westminster Abbey, and prepared a report upon it for the Smoke Abatement Society. At some points the original stone had decayed to a depth of about 9 in. from its surface. There are other parts where the stone has been destroyed to a depth of about 2 in. in twenty years. Renewals are so frequent that almost the entire outer skin of the building, as originally erected, has been replaced in comparatively recent years.

The report of Sir A. H. Church and Mr. Jackson in 1901 contains chemical analyses of the abbey stone. It was found that some stones, originally free from calcium sulphate, contained on analysis from 14 to 30 per cent. The amount of sulphate decreased as the depth from the exposed surface increased. For example, from the south-east buttress of the clerestory (1702) the sample contained 24·2 per cent on the surface, and at a depth of 2 in. there was only 1·54 per cent.

When reporting to the Smoke Abatement Society in 1909 I wrote: "I do not think that all is yet known as to the causes of decay; for example, with apparently similar stones forming the surface of a wall one expects to find a uniform decay of the whole surface."

The condition of the abbey clearly indicates a selective action by which certain individual stones suffer far more than others in their immediate vicinity. "This peculiar selective action was noticeable in very nearly every part of the abbey, and did not appear to be due to incorrect bedding of the stone." The experiments I have been making, if continued to a satisfactory conclusion, may throw some light upon this apparent selective action; but up to the present no such happy issue has been attained.

The immediate purpose of the experiments was to measure the rate of loss of strength of stones from weathering under varied conditions. For this purpose Portland stone was selected as most suitable and most commonly used in London. All the specimens of which tests are recorded were of this material, quarried at Wakeham, Portland. It was proposed to make strength alone the test of durability, rather than loss of substance, porosity of surfaces, or chemical changes in the composition of the stone. In order to apply this test it was necessary first to select a fair standard of comparison, and, secondly, to devise some method by which the process of weathering might, if possible, be accelerated.

With respect to a standard of strength, it was at first thought that the strength of stones which had received no exposure would form an adequate standard, and in Series 1 and 2 referred to later the weathered stones are compared with stones broken after cutting and without exposure. For subsequent tests this basis of comparison was abandoned. It was found that stones normally show a considerable increase of strength for some time after quarrying; drying out of the so-called "quarry sap" has been suggested as a reason for this.

The only other standard suitable for comparison is the strength of the stones broken on the same dates as those subjected to exposure, but themselves kept indoors and under cover after cutting, such as, for example, Group 9, Table 1.

The specimens were treated as follows: The stone was selected at the quarry and forwarded to London, where it was cut to shape. The specimens for tensile tests were shaped similarly to the ordinary cement briquette for tensile testing, and had a minimum section of about 1 sq. in. Specimens intended for compression tests were cut to cubes of 1-in. side. The dates of quarrying and cutting were recorded. The specimens were distributed for exposure in three places. A number were retained on the premises of the Gas Light and Coke Company, Westminster, where the tensile tests were conducted under the direction of Mr. J. G. Clarke. Others were exposed by Dr. Des Voeux in London at Buckingham-gate, and the remainder at Cheam, Surrey, by myself. At each of these places certain stones were exposed out of doors to normal conditions of weather. Others were exposed indoors, and a third group were embedded in soot and exposed out of doors.

The effect of soot is considerable, and it cannot be doubted that, although soot, as such, might be regarded as a harmless colouring material, yet, in reality, it serves as a vehicle for conveying the harmful acids emitted from burning coal to the stone on which it is deposited. It is known that soot particles act as absorbents for the acids produced from the sulphur in burning coal. Samples of London soot have been shown to contain from 4 to 5 per cent of SO_3 (sulphuric anhydride). The amount of soot deposited in our cities is enormous. In Glasgow, on the suggestion of Sir J. Ure Primrose, the rate was measured by exposing boxes on the roofs, and it was calculated that over 22 cwt. of soot per acre fell during one year.

According to Sir W. Thistleton Dyer's experiments at Kew, nearly 2 tons of soot per acre are deposited in London. More recent measurements, made under the control of the *Lancet* for the Coal Smoke Abatement Society, show that during the year ended June 13, 1911, a deposit of about 650 tons per square mile was received in the City area of London, and this deposit contained about 3·2 per cent of sulphate (SO_4). In the south-west district the average was 460 tons per square mile, while, on the same calculation, the fall immediately outside the metropolitan area was 196 tons per square mile. The method of measurement and analyses of the deposits were published in the *Lancet* for January 6, 1912.

In the experiments the stones which were embedded in soot were covered by a loose layer of about ½ in. thick, and it is possible that they were to a certain extent protected from damp air and rain. In further experiments it might be advisable to soak the stones

in water with which a known weight of soot had been mixed.

It is noteworthy that in Manchester, Leeds, Glasgow and other large provincial towns the rain water is acid. Analysis has shown that London rain is not acid unless contaminated by soot. This is probably a question of the amount and quality of the coal consumed per unit area of each city. In Series 3 are recorded tests, especially designed to show the effect on the strength of moisture held in the pores of the stone, also the effect of a dilute solution of ammonium sulphate. The solution used contained ·054 grams per litre—that is, about the quantity in London rain.

The tensile tests were made in an Adey machine. The specimens were measured, immediately before breaking, by means of callipers, and the minimum dimensions recorded. The compression tests were carried out at the East London College under the direction of Prof. Smith. An ordinary 50-ton Wicksteed machine was used. The specimens were protected by packing pieces of cardboard placed between each compression plate and the stone. The results of the tests are embodied in the tables; those numbered 1, 2, 3 refer to Series 1, 2 and 3, all of which are tension tests. Table 4 refers to Series 4, and records tests in compression. Table 5 records compression tests on stones containing varying amounts of moisture. Table 6 refers to cylinders broken in compression; the stones were turned to about 1-in. diameter, and were cut to a length of about two diameters.

SERIES 1.

These were briquettes broken in tension under a steadily increasing load, the rate of loading being the same for all the tests. The stones were cut without reference to their bedding planes or other special precautions. The percentage of moisture present was not recorded. Thirty-nine specimens were broken and the group averages are given in Table 1.

With respect to these averages. The stones broken without exposure formed the basis of comparison for the other groups. In this group the maximum tensile strength was 495 lb. per square inch, and the minimum was 358 lb. per square inch. This shows a variation of about 15 per cent above and 17 per cent below the mean.

TABLE I.

1	2	3	4	5
No.	No. of stones.	Conditions of exposure. 114 days—Feb. 16 to June 10, '10. 245 days—Feb. 16 to Oct. 19, '10.	Breaking load, lb. per sq. in. tension.	Remarks.
1	1 to 14	Broken after cutting and without exposure	430·7	
2	15 to 17	Outside at Westminster for 245 days	559·0	
3	18 to 20	Inside at Westminster 114 days	585·0	
4	21 to 23	Inside at Westminster, and embedded in soot 114 days	506·0	
5	24 to 26	Ditto for 245 days	615·3	
6	27 to 29	Outside at Westminster 114 days embedded in soot	434·3	
7	30 to 33	Outside at Cheam (Surrey) 114 days	467·0	
8	34 to 36	Ditto for 245 days	539·5	
9	37 to 39	Inside at Cheam (Surrey) for 245 days	633·0	

It will be noticed that stones broken after cutting had an average strength of 430·7 lb. per square inch, whereas stones kept indoors at Cheam for 245 days had an average strength of 633 lb., which indicates a normal increase in that period of about 47 per cent, so that, although all the stones subjected to exposure show some increase of strength, the effect of exposure under certain conditions was to reduce the rate of growth in strength. It must be borne in mind that in Series 1 the amount of moisture present was not measured; hence the results do not bring out the effect of the different conditions of exposure satisfactorily.

SERIES 2.

These were briquettes treated similarly to Series 1, but the percentage of moisture in the specimens was observed and is recorded in Table 2. Here, again, the dry stones broken after cutting must be taken as the standard, but comparison may also be made with Group No. 8.

The individual variations are considerable, the maximum strength exceeding and the minimum being less than the mean by 14 per cent and 9 per cent respectively. In Series 2, if the stones containing moisture be neglected, then those exposed in London show a greater loss of strength than those exposed in the country. The reduction of strength is about 16 per cent for stones embedded in soot and exposed at Westminster. It is noteworthy that Group No. 7 shows an apparently great loss of strength, but the high percentage of water present probably accounts for this.

TABLE II.

1	2	3	4	5	
No.	No. of stones.	Conditions of exposure.	Breaking load in lb. per sq. in. tension.	Remarks. Treatment.	Remarks. Per cent moisture.
1	1 to 8	Broken after cutting and without exposure	432·7	Dry	—
2	9 to 11	Outside at Westminster for 105 days	282·2	—	0·768
3	12 to 14	Outside at Westminster, but embedded in soot for 105 days	364·2	—	0·020
4	15 to 17	Outside at Westminster, but embedded in soot for 687 days	417·0	Dried	—
5	18 to 20	Inside at Westminster for 105 days	387·0	Dry	—
6	21 to 23	Inside at Westminster for 105 days; embedded in soot	390·7	Dry	—
7	24 to 26	Outside at Cheam (Surrey) for 105 days	298·8	—	1·344
8	27 to 29	Inside at Cheam (Surrey) for 105 days	402·8	—	—

SERIES 3.

These were briquettes tested to determine the effect of water in the pores of a stone upon its strength. At about 4·6 per cent moisture the stones were saturated, and in this condition their strength dropped about 40 per cent from the normal dry state. As the stones were broken in tension this loss of strength cannot be due to any form of bursting pressure by water in the pores, such as might occur with a saturated stone under a compressive load.

TABLE III.

1	2	3	4	5
No.	No. of stones.	Conditions.	Breaking load in lb. per sq. in. tension (average).	Per cent of H_2O at time of test.
1	1 to 4	In normal dry state	580·7	0·13
2	5 to 9	Saturated with H_2O and allowed to partly dry	449·9	0·32
3	10 to 14	Saturated with H_2O and broken wet	345·5	4·59
4	15 to 18	Immersed in 0·054 gram. per litre solution of $(NH_4)_2 SO_4$ for 15 hrs. and allowed to dry	558·0	0·043

The results show that in calculations as to the strength of structures built of stone, and probably of cement or brick, the amount of water present should be taken into account.

SERIES 4.

These were Portland stone cubes of 1 in. side, tested for compressive strength. The cubes were cut carefully from selected stone quarried in 1910. The tests were made in May, 1912, the stones having been exposed for a period of 373 days.

TABLE IV.

1	2	3	4	5
No.	No. of stones.	Conditions of exposure. All 378 days, May 11, 1911, to May 23, 1912.	Breaking load in lb. per sq. in. in compression.	Remarks.
1	1 to 3	Outside at Westminster	7,260	
2	4 to 7	Ditto, embedded in soot	5,890	
3	8 to 10	Inside at Westminster	6,700	
4	11 to 13	Ditto, embedded in soot	5,220	
5	14 to 16	Outside at Cheam (Surrey)	7,430	
6	17 to 20	Ditto, but embedded in soot	6,810	
7	21 to 22	Inside at Cheam (Surrey)	7,410	
8	23 to 25	Ditto, but embedded in soot	6,390	One cube omitted, ends not parallel.

There is a marked depreciation in strength of all

cubes exposed in soot. The basis of comparison for this series is the strength of stones kept within doors at Cheam, Surrey. Those kept outside at Cheam show a greater strength, but those kept at Westminster, and the stones embedded in soot show considerable loss of strength. All stones were dried before breaking.

SERIES 5.

In Table 5 are recorded tests of a series of 1-in. cubes of Portland stone broken in compression for the purpose of ascertaining to what extent various percentages of moisture reduce the strength. The series consists of four groups of six stones representing different degrees of saturation.

Group 1 are dry stones and Group 4 stones completely saturated, and containing about 4½ per cent water. Groups 2 and 3 represent incomplete saturation to

TABLE V.

1 Group.	2 Reference No. of stone.	3 Area sq. in.	4 Breaking load. Lb.	5 Breaking stress. Lb. per sq. in.	6 Per cent moisture.	7 Per cent moisture average of group.	8 Breaking stress average of group.	9 Remarks.
1	1	1·040	9,000	8,650	Dry	Dry	7,250	—
	2	1·056	7,020	7,320				Not parallel sides
	3	1·026	7,120	6,940				Not parallel sides
	4	1·042	7,640	7,340				—
	5	1·055	7,560	7,080				—
	6	1·062	6,550	6,160				—
2	7	1·015	7,120	7,039	1·78	1·67	[illegible]	Not parallel sides
	8	1·022	8,160	8,000	1·58			—
	9	1·039	6,675	6,430	1·60			Not parallel sides
	10	1·000	6,790	6,490	1·55			Not parallel sides
	11	1·037	6,050	5,840	1·66			—
	12	1·078	4,820	4,470	1·81			Not parallel sides
3	13	1·060	6,050	5,710	3·59	3·25	6,900	—
	14	1·050	8,000	7,610	2·91			Not parallel sides
	15	1·032	7,850	7,610	3·35			Not parallel sides
	16	1·035	6,050	5,850	3·14			—
	17	1·047	8,400	8,030	3·27			—
	18	1·045	6,900	6,600	3·34			Not parallel sides
4	19	1·038	6,850	6,600	4·54	[illegible]	5,692	Stones were fully saturated
	20	1·038	6,200	5,970	3·87			
	21	1·040	5,960	5,730	4·71			
	22	1·030	4,420	4,280	4·71			
	23	1·023	6,000	5,860	4·52			Not parallel side
	24	1·050	6,000	5,710	4·41			—

the extent of 1½ per cent and 3 per cent respectively. For complete saturation the compressive strength is reduced about 21½ per cent from normal dry strength. For incomplete saturation the loss of strength is less, but owing to considerable variation in Groups 2 and 3 no direct relation between the percentage of moisture and loss of strength could be established.

Comparing these figures with those in Table 3 the reduction of strength in the stones broken in tension appears to be nearly twice that in compression for complete saturation, but further experiments are required before assuming this to be generally true.

SERIES 6.

These were cylinders tested in compression, and consisted of three groups.

In Group 1 were eleven stones broken dry and without exposure, having been kept for twelve months under cover. The average strength at fracture was 11,000 lb. per square inch. Group 2 were stones exposed to normal atmospheric conditions at Buckingham-gate for 153 days. These show an average strength of 10,400 lb. per square inch, while those in Group 3, which were exposed embedded in soot, show an average of nearly 10,700 lb. per square inch. It is possible that these were drier than the stones in Group 2. Groups 2 and 3 exposed outside in London both show a falling off of strength compared with Group 1, which was kept under cover in a box.

[illegible] deductions. The large variation in the strength of [illegible]

[illegible] miles distant from the city, the effect of a purer atmosphere is shown by less rapid weathering. As it [illegible] a greater distance from London this difference in the rate of weathering would have been still more marked.

Further information as to the effect of water would be of value; also the increase of strength of stone after quarrying [illegible]tion. How much is due to simple drying, and how much to actual chemical or physical change in the stone?

It would be valuable in future experiments to determine the constants of elasticity in order to see if these are changed by weathering. Should this be found to occur, it might be possible to make a series of tests upon a single specimen to investigate the

TABLE VI.

Portland Stone Cylinders, diam. 1 in., length 1·96 in.

1 Group No.	2 Stone No.	3 Breaking load lb.	4 Breaking stress lb. per sq. in.	5 Breaking stress average of group lb. per sq. in.	6 Remarks.
1	1	6,450	8,200	11,000	All stones broken when dry after having been kept under cover for 12 months after cutting.
	2	7,600	9,670		
	3	7,450	9,470		
	4	10,300	13,100		
	5	8,400	10,700		
	6	9,300	11,800		
	7	7,640	9,730		
	8	8,450	10,750		
	9	10,300	13,100		
	10	10,500	13,350		
	11	8,520	10,850		
2	1	8,630	10,980	10,420	All stones kept outside at Buckingham-gate for 153 days
	2	10,700	13,630*		These were not sooted.
	3	8,460	10,780		* Omitted in taking the average.
	4	7,800	9,950		
	5	7,220	9,200		
3	1	8,520	10,850	10,680	All stones kept outside at Buckingham-gate for 153 days
	2	8,740	11,100		These were all embedded in soot.
	3	10,850	13,800*		* Omitted in taking the average.
	4	8,320	10,550		
	5	8,000	10,200		
	6	11,600	14,750*		

growth of strength with age, and thus escape the difficulties inherent in the variable qualities of the material experimented upon.

The practical bearings of these experiments need hardly be pointed out.

The defacement of national buildings and monuments has already been discussed. The experiments on the loss of strength of saturated stones are important in relation to foundations in a pervious subsoil, pier bases and monolithic structures under water. The action of subsoil water in producing land slides may be in part attributed to direct weakening of the saturated material. Then, again, water allowed to lie on road surfaces must reduce the crushing strength of the stones to a considerable extent, and these experiments emphasise the need of efficient surface and under drainage.

The erosion of our sea coast is doubtless accelerated by the weakening of the rock subject to frequent immersion under the rising tide, and to wetting by the wind-swept spray in stormy weather.

The author desires to thank the following gentlemen for their assistance in connection with the experiments: Mr. J. G. Clarke, for his help in planning and carrying out the experiments; Prof. C. A. Smith, who kindly undertook the responsibility of the compression tests; Messrs. Freak and Meadows, senior students, who performed the actual tests in the East London College Laboratory; and the author's assistant, Mr. L. A. Sellek, who also helped in making the tensile tests.

Private Tramcars. Along the streets of the [illegible] [illegible] tram lines are laid. The residents own small cars, [illegible] beside it until they are wanted again! All municipal work, such as street cleaning and the like, is done by means of large box cars drawn by oxen, and in the busier streets a special line for this slow traffic is laid on one side of the double track on which the passenger traffic is conducted. "Traffic on these lines," says the *Light Railway and Tramway Journal*, "would seem to offer many entertaining possibilities."

THE MODERN ROAD.

ADDRESS BY SIR JOHN H. A. MACDONALD.

The road problem was dealt with in a lecture given by Sir John H. A. Macdonald, one of the members of the Road Board, before the Engineering Section of the Bristol Association meeting at Dundee recently.

Sir John said he thought that was the first year in history that the great scientific societies of the land had thought the subject of the road worthy of being put forward as being connected with science at all. There was nothing that the Road Board were more anxious about than that interest should be taken by scientific men and the general public in road improvement. Enormous losses were caused to the country by the inefficient character of the road. That loss, he did not hesitate to say, amounted to millions of pounds. There was vast loss in the wearing out of traction, animals and vehicles, on the rough, uneven surface of the highway, injury to man and horses by dust, and great loss by dust which penetrated into the cases containing goods in transit, and into houses and injured furniture. The dust nuisance, he held, was being gradually diminished. There was loss from the condition of the surface of the road which permitted insanitary matter to lodge there and caused injury to health and even loss of life.

In an interesting summary of the evolution of the road the lecturer spoke of the work of the Romans and General Wade. The Roman roads were a rebuke to the roads we had been making since. The former were laid with a good bottom—well drained and covered with a good base for the actual roadway, and the roadway itself was impervious to water, which was the real enemy to the road. With the work of Macadam and Telford science came in for the first time in the making of roads. They produced a good road, but most unfortunately, when the railway began to take possession of the traffic of the country their roads came to be terribly neglected. Now the road had once more become of paramount importance. The traffic was increasingly great and would increase more and more.

MECHANICAL TRACTION.

One would have been afraid to say a few years ago, but the mechanical vehicle had conquered the road for all time, and it was absolutely necessary that they should address themselves to the consideration of what the road should be for the future. The old idea was that the traffic was to be ruled by the road. Now it was practically certain that the true way to look at the question was that the road must be ruled by the traffic.

Macadam's principle was that no water should be allowed to enter through the surface of the road under any circumstances, and that nothing should be used for binding that would absorb water. That had been completely set aside since the road maker took to using the heavy roller. The result was they had a macadam road that had no resemblance to a macadam road at all. Water was used to make the mixture that was brushed into the interstices. The road was muddy in wet weather and stones came out in dry weather, and left holes in which water lodged and caused destruction to the surface. Another evil of the present road was that there was too much camber.

The problem which had been before the Road Board and had been taken up by many first-class road surveyors was to have a surface which would not break, that would be easier for the passenger and transit of goods, and that would not form puddle holes or excite matter to clog the vehicles and form thick dust. He showed a piece of road taken from the Thames Embankment that had been down for a long time, and claimed that it showed that the desired surface had been obtained to a very practical extent. They would observe that the top was different from the rest. It was a solid mass, and when it was broken up, so cohesive was the material in which the stones were placed that the stones did not come out when it was broken they broke across with the mass.

THE CARPETING PRINCIPLE.

Macadam's idea was to have a crust made by small stones, and that crust was now made by a combination of pitch and stone. They had a new proposition that was to have a carpet for their roads. The carpet on a stair deadened the sound by limiting the vibration caused by the footfall. They wanted to do the same with the surface of the road, to protect the material below from receiving the full violence of the blow which tended to disintegration. He thought they were gradually getting to that.

ROAD BOARD EXPERIMENTS.

Sir John explained the experiments which are at present being carried out by the Road Board. He said the difficult question was the class of material to use. It was a popular idea in this country that they had only got to order a few barrels of tar from somebody, rake up the road, and pour the tar on it. It was absolutely necessary that they should get the right tar and apply it in the right way. Pitch was very good for the thick part of the road below. When they got to the top they used a very fine bitumen, and with the aid of that they made up a cover. They were hopeful that such a road, provided that the right top was put on, would never require to be touched again.

These were the steps of progress the Road Board were making, and they were hopeful, but they would not hope much unless they could be assured of the help of the public. A certain percentage of the cost of every article sold in this country was due to their bad roads, and every day they increased the quality of the roads every day they would be adding to the potential wealth of the nation. What would the nation have been without Macadam and Telford and the railways? Now they were going to have, and they must have, sound, solid, good roads. There was a great outcry as to the enormous cost, but from his point of view it was very cheap. No doubt the immediate outlay was considerably larger than to lay down a mud-bound road, but the original outlay would be more than recouped for the whole community in the course of time. The Road Board were adopting a policy of encouraging local boards to take loans at very low interest—or in special circumstances without any interest—repayable in a certain number of years. Under that policy the act al strain on the local resources would not be greater than now, and the advantages would be enormous to the whole community.

TOWN PLANNING.

THE NECESSITY OF PRELIMINARY SURVEYS.

In a paper which he read before the British Association at Dundee lately, Prof. Geddes, University College, Dundee, referred to the necessity of a survey being made before the preparations of any town-planning scheme could be satisfactorily undertaken. It was to be feared that schemes were in incubation which, whatever their particular merits, were not based upon any sufficient surveys of the past development and present condition of the towns, or upon adequate knowledge of good and bad town planning elsewhere. In such cases the natural order, that of town survey before town planning, was being reversed, and in this way individuals and public bodies were in danger of committing themselves to plans which would have been widely different with fuller knowledge, yet which, once they were produced, it would be too late to replace and even difficult to modify. Therefore, before proceeding to the preparation of a town-planning scheme, it was desirable to institute a preliminary local survey which should take into account the situation, historic development, communication, industry, and commerce, population, and town conditions and requirements.

Surveyor and "Jerry" Building.—At a recent meeting of the St. Mellons (Mon.) Rural District Council, Mr. Gomer S. Morgan, the surveyor, directed the local authority's attention to the serious consequences of approving of plans merely as a matter of form. The plans of some houses at Rumney were really valueless, and their submission was only a pretence at compliance with the requirements of the council's by-laws. "Jerry" building in its worst form had been rampant at Rumney. New streets had been formed with little or no regard for the comfort of the people who lived in the houses, and in other cases the frontage lines were so near the public roads as to render them far less commodious than they would be if proper regard were paid to the ultimate requirements of the neighbourhood. In several cases the roads had been nearly ruined, and improvements could only be effected by the expenditure of considerable sums of money. It was stated that the matter had been dealt with by the Plans Committee. A letter was read from the Local Government Board pointing out that the council's by-laws as to buildings and new streets should be brought up to date. The clerk said he would report on the subject.

The Engineer and the Community.

PROF. BARR AT THE BRITISH ASSOCIATION.

The presidential address to the Engineering Section of the British Association meeting at Dundee was delivered by Prof. Archibald Barr.

Tredgold's oft-quoted definition of engineering as "the art of directing the great sources of power in Nature for the use and convenience of man" may well be taken, and often has been taken (said Prof. Barr), as a text upon which to hang a discourse on the importance of the profession to which many of us belong, the leading part it has played in the process of civilisation, and the dependence of the world to-day on its activities. But the words suggest failures as well as achievements, and responsibilities no less than privileges. The definition suggests that the engineer not only fails in his vocation if he does not accomplish something for the use and convenience of man, but, further, that he acts contrary to the spirit of his profession if he directs the sources of power in Nature to the unuse or inconvenience of man; and surely we must understand by "man" not the engineer's immediate client, but mankind in general. The works of the engineer are to be used by some people; they have to be endured by all.

Taking the highest view of our calling—and surely we do not hold that ours is in any sense a sordid or selfish vocation—the engineer fails in the fulfilment of his duty in so far as his works are detrimental to the health or destructive to the property of the community, or in so far as they are unnecessarily offensive to any of the senses of those who are compelled to live with them. There has been too great a neglect of such considerations. The medical practitioner is held to be negligent of his duty if he acts solely in the immediate interests of his patient, and does not take due precaution to guard against the spread of disease or the offence of the community by the exhibition of unsightly forms. We should take as high a view of our responsibilities.

In his presidential address to the association last year Sir Wm. Ramsay said that the question for the engineer has come to be not "Can it be done?" but "Will it pay to do it?" The answer to this question in respect to any particular proposal depends on the width of view we take in answering two preliminary questions: Whose interests are we to consider? and what do we mean by paying? Of course, there are limits that must be set in answering each of these; my present contention is that these limits are usually much too narrowly drawn. A road surveyor may save a few pence or shillings to his county council by leaving a piece of newly metalled road unrolled—because the clock strikes the hour for retiring—and may thereby cause expense amounting to pounds, it may be to hundreds of pounds, through damage to motor cars or the laming of horses—not to speak of loss of life or limb—to the users of the road, who are, after all, the *clientèle* he is there to serve. Does it pay? The authorities of a city will spend large sums on the adornment of the streets with stately and ornate buildings and on the purchase of works of art—and rightly so, though comparatively few of the citizens can appreciate or even give themselves the chance of appreciating them, while they will tolerate, or even be directly responsible for, the running on these same streets of quite unnecessarily ugly and noisy tramcars, and congratulate themselves on the drawing of a paltry income from the display of hideous advertisements that are constantly before the eyes of the whole community. Does it pay thus to separate æsthetic from utilitarian demands and interests?

It is too much to assume that engineers could meet all the reasonable demands of their immediate clients without producing, at least temporarily, secondary effects that may be of inconvenience to some members of the community.

When we examine into the immediate causes of the injuries and inconveniences that result from our activities we find that they are due in all, or almost all, cases to failures rather than to successes. The more completely the engineer achieves the primary end of his work the less is the damage or injury that can be laid to his charge. If it can be shown that this is a very general law, as I think it can be, we may look forward to the elimination, as a direct result of progress in the mechanical arts, of the nuisances and inconveniences for which, in some measure at least, we must accept responsibility. And not only so, but the converse will be equally true—the more we keep in view the removal or avoidance of anything that can cause offence, the more rapidly we shall advance in the attainment of the primary ends at which we aim. Consider, by way of example, the nuisance of which we hear so much—the raising of dust by motor cars. I shall not discuss the debated question as to how far the motor car produces dust, or only distributes it, nor shall I deal in detail with the possible remedies. We hope to have a paper on the subject at this meeting from one of our leading authorities. For my present purpose it suffices to point out that it is no part of the function of a road surface to fritter itself down into dust under traffic of any kind. The ideal road would be one that would not wear at all, and the nearer we approach this ideal of a permanent road surface the less will be the inconvenience caused, not only to those responsible for the upkeep of the road, but to the general public. And, conversely, the more attention we give to the devising of a dustless road the more rapid will be our advance towards the provision of one best suited for all the purposes which a road is intended to serve. We had dusty roads before the motor car came into being, but the demand that is being forced upon the engineer to eliminate this nuisance is leading to an improvement of our roads for all users. The inventors of the automobile will yet merit the thanks even of those who, bemoaning the blatant intrusion of science into our lives, may discard the railway train and the motor car and take to the stage-coach of their grandfathers with a view to the recovery of some of the lost repose.

Again, the combustion of fuel does little harm to anyone; it is the imperfection of the combustion that is the main cause, almost the sole cause, of injury to health, to property, and to the amenity of populous centres. Of course, one knows that smokeless combustion is not necessarily, nor always, the most economical, but that is only because we have not yet learned how to use fuel in anything like a perfect manner. But all the tendencies at the present time are towards improvement, and the more attention we pay to the elimination of the smoke nuisance the more rapid will be our progress in the economical use of one of the most valuable of our inheritances. It is therefore clearly the duty of every engineer who has to do with power or heat production—for the credit of his profession and even in the interests of his immediate clients—to consider the use and convenience of all who can be affected by the work for which he is responsible. The time is not far distant when the direct burning of bituminous coal in open grates will be looked upon as not only a source of serious harm, but as a culpably wasteful practice. Great progress has been made in processes for the partial distillation of coal by which a free burning and quite smokeless fuel is prepared and valuable by-products (so-called) are conserved. If all engineers concerned with the design and application of plants in which coal is used had a due sense of their responsibilities to the community, progress would have been, and would to-day be, much more rapid; and economies would be effected that would, in themselves, amply justify the application of more scientific methods of utilising the constituents of a very complex material, which we are too apt to look upon as merely a convenient source of heat—plentiful enough and cheap enough, as yet, to be used in a most wasteful manner. It will not be to the credit of our profession if it should require restrictive legislation not only to prevent a gross interference with the health and comfort of the community and the amenities of our centres of industry or of population, but to effect economies in the utilisation of the chief of the sources of power which it is our function to direct to the best advantage of all concerned.

After expressing the opinion that in the near future the power and heat required for domestic purposes will be distributed in a perfectly inoffensive manner from large central stations, and pointing out that the appeal to selfish interests, which would be one means of attaining this end, is not inconsistent with Nature's method of securing progress, Prof. Barr proceeded:—

"It is just a hundred years since passengers were first carried on the Clyde in a mechanically propelled ship, and to-day—when they are not too completely obscured by smoke—we can see the successors of the 'Comet' plying on that river with power plants of

greatly superior overall efficiency, but showing little advance in regard to the combustion of the fuel. Had the emission of smoke from river craft been prohibited years ago, there is little doubt that engineers would have let few days pass without arriving at some solution of the problem of inoffensive power production, and the demand for economy would have looked after itself. How much better it would be were engineers to take the wider view of their duties and responsibilities to which I have referred, and realise that they are acting contrary to the true spirit of their profession when they produce appliances that pollute the atmosphere for miles around to the hurt and inconvenience of those whose 'use' they are intended to serve! But this year a ship has left the Clyde that we hope may be the forerunner of a new race which will attain a higher efficiency than any of the direct descendants of the 'Comet,' and that will ply their trade without inconvenience to man or beast, who can claim some right to be permitted to enjoy an unpolluted atmosphere and the measure of sunshine which Nature — sparingly enough in those regions—intended to provide."

After dealing with the subject of offences against good taste and the sense of the beautiful, especially as exemplified by the lavish embellishment of some early steam engines, Prof. Barr said:—

"There are, and must always be, wide differences of opinion regarding what is good or bad in matters of taste, but we may go so far in generalisation as to say that we can admire the association of elements we know to be incongruous only in compositions that are intended to be humorous. . . .

"There are lengths to which even artists will not go in the arrangement of elements in a composition. But an artist will secure a colour scheme at which he aims by the introduction into his landscape of a rainbow in an impossible position, or of an impossible form or dimensions, or with colours arranged according to his own fancy, though in this there is a much more essential unreasonableness. A polar bear might be transported to the desert and an Arab might conceivably find his way to the regions of snow and ice, but a rainbow cannot wander from the place assigned to it by Nature, nor can it have other than the ordained form or dimensions or sequence of colours. No artist would paint a figure holding a candle and make the light fall on the side of the face remote from the source, but he will, and usually does, paint the moon illuminated on the side remote from the sun. Why? Simply because he has not before his mind the essential absurdity of the scheme, if indeed he knows why the moon shines. Artists, who deal with Nature in any of its aspects may be commended to 'mark, learn, and inwardly digest' Whistler's definition of their calling: 'Nature contains the elements in colour and form of all pictures . . . but the artist is born to pick and choose, and group with science these elements that the result may be beautiful.' Whether or not we are to understand that Whistler intended to include an accurate knowledge of physical facts and phenomena in what he calls science, he cannot have meant anything less than sense. . . .

"The only valid excuse for such departures from the fit and rational in painting or in structural design as those I have instanced is ignorance on the part of the designer of the nature of the elements he employs, or a lack of skill to devise a possible or reasonable arrangement of details that will secure the general effect he desires. . . .

"Our works—like the highest creations in Nature—should be beautiful and not beautified. . . . The practice of resorting to extraneous adornments to minimise crudities of structural scheme had its rise—if I mistake not—in the comparatively recent times when culture and taste were at their lowest. It is specially characteristic not only of earlier times, but of the earlier stages of the design of any particular product. It has already disappeared in some cases, and will continue to disappear from the practice of the arts of construction as skill and taste develop. . . .

"I have already alluded to the abandonment of ornament in the design of machines, and I think there can be no one with any sense of the fit and pleasing who does not approve this change in practice. The stage coach and horses of former times were lavishly decorated—the carriage of to-day is more graceful and pleasing in virtue of the simple elegance of its lines. In the best domestic architecture of to-day we see the same tendency to trust for effect more and more to an artistic grouping of the lines and masses of essential parts and the gradual abandonment of purely decorative features without and within. There was a time when the hulls and riggings and sails of ships were lavishly ornamented; now even the figurehead—the last remnant of barbaric taste—has disappeared; and do we not find in a full-rigged ship of to-day—or yesterday, perhaps, one should say—a grace and dignity that no extraneous embellishments would enhance? From the racing yacht the designer has been forced, by the demand for efficiency, to cast off every weight and the adornments that so beset the craft of earlier times, with the result that there is left only a beautifully modelled hull, plain masts, and broad sweeps of canvas, and we can hardly imagine any more graceful or beautiful product of the constructive arts. These examples will serve to illustrate the contention that the attainment of the highest efficiency brings with it the greatest artistic merit. . . .

"It is a matter of constant remark, and with justice, that steel bridges, as a class, are much less pleasing to the eye than those of stone. The building of stone bridges is an ancient art, and survival of the fittest and selection—even with little creative skill on the part of the designers—would have led to the development of types having, of necessity, at least the elegance of fitness. But, further, this art has come down through the times to which I have referred, when artistic and utilitarian aims had not yet been divorced in the practice of the crafts; and, further still, the practice of building in stone has been in the hands of architects, as well as of engineers, and architects are expected to be artists, and are trained as such. On the other hand, construction in steel is a very modern art, and it has been in the hands of engineers who usually neglect, if they do not despise, the study of the fine arts. But why have architects, with their artistic training, not succeeded in producing artistic structures in steel as admirably as those they design in stone? Partly, no doubt, because they are hampered by tradition. They have not yet fully realised the difference in spirit that must characterise fit designs in the newer and the older materials. No one can be an artist in any material the possibilities and limitations of which he has not fully mastered. Again, if a common engineer may venture the criticism, the architect, as a rule, has not sufficiently mastered the science of construction, and has been too much addicted to taking the easy course of adopting a decorated treatment instead of striving to secure elegance of structural scheme as such; and decoration, at least on anything like traditional lines, is wholly incompatible with the best possibilities of steel as a structural material. Progress is being made in the art of designing efficient and graceful structures in metal, but the best results can only be attained by a designer who has a thorough scientific and technical knowledge of the properties of steel and the process of its manipulation, on the one hand, and cultured artistic sense and capacity on the other. These should not be considered as appropriate equipments for separate professions."

Water Filtration at Tynemouth.—At the next meeting of the Tynemouth Town Council a recommendation in favour of installing mechanical filtration for the purpose of removing the stain from the water supplied to the public will be submitted.

Birmingham Tramway Car Experiment.—An experiment will shortly be made on one of the routes of the Birmingham Corporation tramways with a single-deck car so constructed as to afford standing room for seven passengers on the platform at each end.

Bridge Building.—Students, young engineers, and surveyors will find much useful information in "Preliminary Studies in Bridge Building," by Reginald Ryves, ASSOC.M.INST.C.E. (London: St. Bride's Press, Limited, 24 Bride-lane, E.C. Price 2s. nett.) The book is described as the "first of a series of small volumes, each complete in itself, dealing with the design of ordinary highway bridges of moderate span." Though highway bridges alone are referred to, the matter contained in this volume is largely applicable to railway bridges, aqueducts, and similar engineering undertakings. The five primary types of bridges are described, and the conditions determining the best site for each of the three types of streams are discussed in detail; while, in connection with wandering streams various modes of designing abutments or approach spans are dealt with. Improvements of fords and the effect of eccentric loading of vehicles on the girder loads are among the numerous other items touched on. *Scotsman.*

Highway Bridges and Culverts.

[Extracts from Bulletin No 43, a revision of Bulletin No. 39, United States Department of Agriculture, issued by the United States Office of Public Roads, by C. H. Hoyt, formerly superintendent in charge of bridge engineering, and W. H. Burr, consulting engineer, Office of Public Roads.]

Comparatively little attention has heretofore been given to the design of highway bridges, and the result has been disastrous in many instances.

The relation of culverts and bridges to the general movement for the improvement of our public highways is intimate. The desirability and economy of building these structures of durable and permanent material, or according to intelligent or economic design, has not thus far been actually recognised in practice throughout the United States. The expensive and unsatisfactory method of repairing the old and inadequate structures of the past or of fording the streams is still continued.

Modern traffic now demands that the construction of bridges and culverts shall keep pace with industrial development. The administration of these matters in the United States is placed largely in the hands of local officials, who are scattered as individual units throughout the country. In many of these localities the amount of this class of work under the jurisdiction of one local official has apparently not been sufficient to warrant securing the services of a capable engineer in connection with this work.

The work of the Office of Public Roads, Department of Agriculture, is for the purpose of securing the improvement of all public highways throughout this country, and in connection therewith highway bridges and culverts should be given their full share of attention. In consequence, the office will send an engineer whenever practicable to confer with local officials, upon their request, concerning this class of work; to make inspections, recommend such types of construction as are adapted to given locations, and give such other information and assistance as may be practical in the individual case.

In addition to this it is intended to issue other bulletins giving designs, specifications and general information for small culverts and bridges.

The plan to be observed should consist of steps such as the following:—

(1) The services of a capable bridge engineer should be secured.

(2) The foundation should be tested to determine its suitability, bearing power, and economy.

(3) The location should be determined within a close approximation, and a profile of the center line made showing also the results obtained by testing the foundation.

(4) The loads which the bridge may be called upon to carry safely, anticipating reasonably the demands and growth of the future, should be decided upon. All highway bridges, at least those on main roads, should be designed to carry concentrated loads, such as road rollers or traction engines weighing from 10 to 15 tons each, with a reasonable factor of safety. Unfortunately for the traffic of to-day, many of the present highway bridges were designed to carry only moderate uniform loads, and this accounts for their light appearance and their inadequacy to meet present demands.

(5) After these facts have been determined, the engineer will be able to prepare plans for the foundations, abutments, piers, and the bridge itself, all of which may be designed to meet economically the conditions of the location selected. An estimate of the cost may be made, and this should in all cases be used as the basis for an appropriation for the bridge.

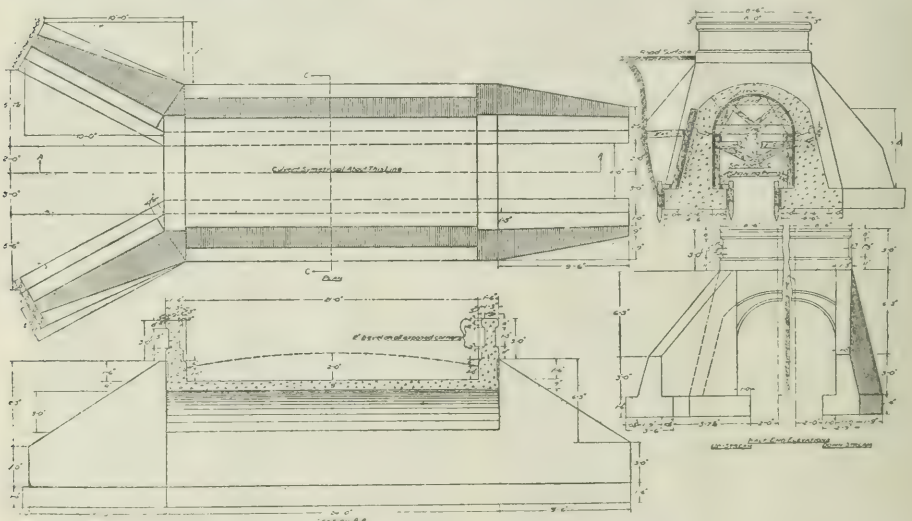


FIG. 1.—A PLAIN CONCRETE ARCH CULVERT, 6 FT. SPAN.

Quantities.

Concrete:	Arch and parapets ..	1—2 – 4	12·9 cubic yards.	Required:	Portland cement	10·2 barrels.
	Side, end, and wing walls	1–2½–5	39·8 „ „		Sand	33 cubic yards.
	Footings	1–3 –6	20·1 „ „		Stone or gravel	66 „ „

FOUNDATIONS.

The question is much involved, and it is difficult to treat it satisfactorily in the limited space which can be given it here. . . . For many of the smaller box culverts of spans varying from 2 ft. to 8 ft., and carrying only ordinary loads, the ordinary earth foundation [bed] is sufficient in most cases, with proper protection against undermining by currents of water. Where the streams are sluggish, however, or where the culverts are located in swamps, and the foundations [underlying soil or strata] are soft and wet, a few logs from 10 to 12 in. in diameter, which are placed below in trenches, and upon which the footings rest, add much to the stability of the foundation. . . . The suitability of foundation [soil or strata] for the more important structures can be safely determined only by tests. This can be done best by digging test pits wherever conditions will permit. . . . Where conditions do not permit test pits, an iron rod may be driven to depths of from 10 to 20 ft., unless rock is encountered before that depth is reached. This method, however, gives very little idea of the material through which the rod is driven. A somewhat better way is to drive down 1-in. extra heavy iron pipe, which may be cut into 4-ft. lengths and coupled together as driven. A driving cap should be provided, and the

driving should be done with wooden mauls. Pipe has been driven in this manner in the winter months to depths of about 30 ft., or possibly more. The pipe, after being driven, may be pulled out with a small chain and lever, so that a sample of the material through which the pipe was driven may be brought up inside it. This material can then be examined as the pipes are uncoupled and cleared out.

Arch bridges or culverts especially require an unyielding foundation, and are more than likely to fail unless such is provided. Consequently, they should not be built except where a good rock or gravel foundation is to be had, or possibly where a satisfactory foundation can be made by driving piles. Attention should be called to the fact that piles may be driven in an inclined position, and thus be able to resist the arch action directly.

MASONRY ARCH BRIDGES AND CULVERTS.

[The arch] is a type of structure which should not be undertaken by inexperienced builders, or with haphazard methods. The services of a capable engineer should be secured, and, with proper materials, thorough construction, and favourable local conditions, the arch is an economical and desirable type of bridge construction. The illustration (Fig. 1) is made from a working plan prepared in the Office of Public Roads for a plain concrete arch culvert with a 6-ft. span, which may be of service more often than those of larger spans.

The reinforced concrete arch has an advantage over the plain concrete arch in the fact that the curve of the reinforced structure may be made more nearly flat than the plain concrete arch, and thereby save in the total height of the structure. This permits it to be used where it otherwise could not be. Under favourable conditions there may be an additional advantage in point of economy, although this cannot be stated generally as true in all cases.

The steel reinforcement in the arch serves the same purpose as in the concrete slab—that is, to increase the strength of the arch rib where the concrete has excessive tensile stresses. In some cases, however, the concrete is also reinforced against compression. It is also possible, when steel reinforcement is used, to reduce the quantity of concrete in the arch rib from the amount that would be required for a plain concrete arch.

STEEL TRUSSES.

There are still a few types of trusses used to which are given the names of their original inventors or proposers, such as the Pratt truss, the Howe truss, or the Warren truss, as well as some others.

Formerly the Howe truss with upper and lower chords and compression web members of timber, but with wrought-iron tension web members, was extensively built. It has now gone out of use, except in some remote districts where economy of first cost is absolutely essential. In these bridges cast-iron joint blocks were used at the joints where the web members intersected the chords.

The Pratt type of truss, more or less modified frequently in consequence of the varying depth of truss, is much used, and makes an excellent style of bridge. It is adapted to almost any length of span from 100 ft. up.

The Warren truss with riveted joints, formerly much known as "a lattice girder," is an excellent bridge for highway purposes for lengths of span from 60 or 70 up to 100 ft. or more in locations where the plate girder would be too expensive. In fact, except for locations where the operation of riveting in the field is too troublesome or expensive, this type of bridge has great excellence for almost any length of span up to as much as 200 ft.

I-BEAM AND CONCRETE SPANS.

One of the best types of culverts for spans from 10 to 30 ft. long is the steel I-beam incased in concrete, upon which rests a relatively thin concrete slab which forms the cover for the culvert. The slab is designed to carry the load for a span equal to the distance from centre to centre of the steel I-beams, while the beams are designed to carry the load over the clear span from one side wall or abutment to the other.

Among the best features of this type of construction are its safety and ability to withstand severe and unfavourable conditions, such as the unequal settlement of abutments, which may cause cracks in the concrete that would cause other types to fail. In this type, however, the load is carried principally by the steel I-beams, whose strength is not destroyed by the settlement of the abutments.

Many structures of this type have been built without incasing the I-beams in concrete, but by merely painting the beams instead, to protect them from rust. The painting, however, must be repeated every few years, at some considerable expense. There is, of course, a great possibility that this painting may never be done, and the better way is decidedly to incase the beams in concrete during the construction, and thus protect them permanently.

This type also admits of arch construction between the beams for the floor system. By this means space may be saved in the depth of the floor system that may be of value in locations where the area of the waterway or the "head-room" is a controlling factor.

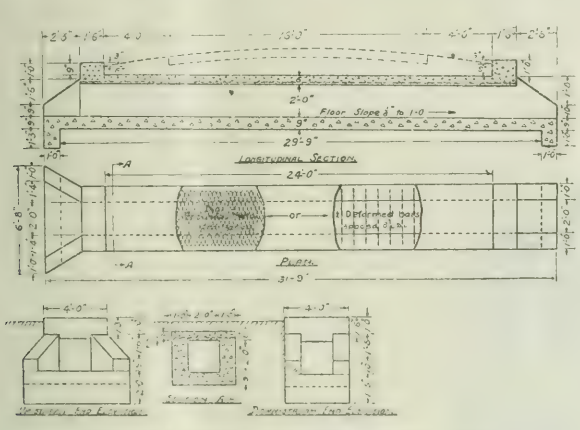


FIG. 2.—A CONCRETE BOX CULVERT, 2 FT. SPAN.

Quantities.

Concrete:	Top and parapets	1–2–4	2·4 cubic yards.
	Side and wing walls	1–2½–5	4·6 ,, ,,
	Footings	1–3–6	4·0 ,, ,,
Materials required:	Portland cement		16 barrels.
	Sand		5 cubic yards.
	Stone		10 ,, ,,
	Expanded metal, No. 10, extra heavy		96 square feet.

Alternatively, 41 ½-in. def. bars, ¾ sq. in. nett area, 3 ft. 6 in. long = 122 lb.

The length of the spans over which reinforced concrete slabs may be built within the limits of practicability and safety depends much upon the loads to be carried. The depth and amount of fill over the culvert, which may distribute the effect of the concentrated load is also an important factor.

On main roads, where concentrated loads, such as road rollers or traction engines, are to be provided for, and the depth of fill over the culvert is sufficient only to provide a cushion of earth from 1 to 2 ft. in depth, the concrete slab is practical for spans up to about 10 or 12 ft., while for greater spans than this, under these conditions, other types better adapted to the longer spans should be used.

Under conditions of less severe loading the spans for the slab may be increased up to 16 or possibly 20 ft., but it does not seem advisable to use them for these greater spans in view of the possibilities of a nominal future growth of traffic requirements.

BOX CULVERTS.

The box culvert gets its name from its similarity to a box with open ends. It has a floor, which may be of plain concrete or may be paved with stone. The two sides and wing walls at the two ends may be of plain concrete or reinforced with steel, but the cover and parapets should always be of reinforced concrete.

The sketch shown (Fig. 2) is made from a working plan prepared in the Office of Public Roads for a con-

crete box culvert, which has an opening 2 ft. wide by 2 ft. high, and forms one of the set of standard plans.

This type of construction is practical under the majority of conditions for spans up to about 8 ft., which, as a matter of fact, forms a large percentage of all the culverts needed. Conditions may occur where it will be practicable to apply the box type, with some modifications, to greater spans than those mentioned, such as where the foundation is soft or liable to much erosion from swift currents. The floor may then be reinforced with steel, so that it will have greater strength to act as a beam to distribute the load over a greater area. It may also be extended back of the side walls to act as a footing. With suitable "cut-off" walls to prevent currents of water from running beneath this floor, the foundation will be well protected from erosion.

ARTISTIC TREATMENT OF FERRO-CONCRETE.

THE NEW COUNTY BUILDINGS, SHREWSBURY.

A recent example of artistic work in ferro-concrete is furnished by the new County Buildings at Shrewsbury, erected by Mr. T. Pace, of Shrewsbury, from the designs prepared in the office of the county surveyor, Mr. A. T. Davis, M.Inst.C.E., by Mr. A. E. Williams. This handsome range of buildings is constructed with ferro-concrete floors throughout, in accordance with the Hennebique system, and the designer has made a very happy use of the characteristic features of the floor construction in the decorative treatment of ceilings. Instead of attempting to hide the main and secondary beams, as is too frequently done, these details (says *Ferro-Concrete*) have wisely been allowed to remain in full prominence, thereby expressing the structural idea of the design, giving evidence of the strength it embodies, and at the same time avoiding those wide expanses of flat ceiling which are so difficult to treat satisfactorily.

Shrewsbury County Buildings.

In the more important apartments the main and secondary beams are richly ornamented by moulded cornices and panels in relief on the under side, while the rectangular panels into which each ceiling is divided are similarly decorated by more or less elaborate scroll work. In rooms where decorative effect is not a prominent desideratum, the ceiling treatment is more simple, but equally satisfactory.

The floors were tested after completion by loads of 2 cwt. per square foot of area, being 50 per cent in excess of the calculated load. The deflection registered was only half of 1 millimetre, which was considered to be highly satisfactory. Working details for the ferro-concrete construction were prepared by Messrs. L. G. Mouchel & Partners, of Westminster, and the work was carried out under the supervision of Mr. A. E. Williams, Shrewsbury, by the Liverpool Ferro-Concrete Contracting Company, Limited, of Bixteth-street, Liverpool, who have carried out numerous large contracts on the Hennebique system.

The Law as to Temporary Buildings.—Twickenham Urban District Council succeeded last week in procuring a conviction against a defendant for erecting a temporary building at Eel Pie Island. The building had actually been moved on two occasions, and the surveyor to the council, Mr. F. W. Pearce, admitted that if the structure were used as a bowlhouse or a dog kennel proceedings would not have been taken. Mr. Firth, defending, said it was intended to put the structure on wheels, and it would be in the same position as a coffee stall or a watchman's box.

STATISTICAL PITFALLS.

THE EFFECT OF "MAINING" UPON AVERAGE COSTS OF ROAD MAINTENANCE.

While figures by themselves cannot lie, they lend themselves very readily to the *suggestio falsi* which arises from a *suppressio veri*. Some of the prettiest examples of this are furnished by the numerous cases in which the mean of means is not the mean of the lot, and the following purely imaginary case may be taken as an example of the extent to which we may be led away by conclusions as to a mean rate if we fail to note what are the quantities to which the rates refer.

In the county of Loamshire there were in the financial year 1902-3 500 miles of main roads and 1,000 miles of district roads. Half of the latter might be classed as "secondary" and the other half as "tertiary." The costs of these roads per mile per annum were: Main roads, £80; secondary, £40; and tertiary, £20.

The county surveyor reported that efforts were being made to reduce the cost, and the secretary of the district Surveyors Association said the same with regard to district roads. The editor of the *Loamshire Gazette* wrote: "The roads of Loamshire have cost £46 13s. 4d. per mile in the year 1902-3."

During the next three years a policy of "maining" was carried out, and by April, 1906, 500 miles of the district roads, those of the "secondary" class, had been mained. At the end of the financial year 1906-7 the following passage appeared in the report of the county surveyors: "The cost of maintenance of the main roads maintained by the county has been reduced from £80 per mile in 1902-3 to £70 per mile in 1906-7." The secretary to the District Surveyors' Association reported: "The cost of maintenance of district roads has been reduced from £30 per mile in 1902-3 to £25 per mile in 1906-7."

The editor of the *Loamshire Gazette* wrote: "The cost of maintenance of roads in Loamshire has risen from £46 13s. 4d. per mile in 1902-3 to £55 per mile in 1906-7." Thus a decrease of £10 per mile in the cost of main roads and a decrease of £5 per mile in that of district roads was accompanied by an increase of £8 6s. 8d. in the cost of maintenance of all the roads of the county taken together, this being due to the fact that during the three intervening years 500 miles of road had been transferred from the district councils to the county council. If the average cost of all the roads had remained unchanged, the £80 per mile might have been reduced to £60, and the £30 a mile for district roads to £20 per mile. This can best be shown in tabular form as follows:

Cost of the roads of Loamshire in 1902-3.

Main roads, 500 miles at £80	... ...	£40,000
District roads { 500 miles at £40	... ...	20,000
District roads { 500 miles at £20	... ...	10,000
All roads, 1,500 miles at £46⅔	... ...	£70,000

Cost of the roads of Loamshire in 1906-7.

Main roads, 1,000 miles at £70	... ...	£70,000
District roads, 500 miles at £25	... ...	12,500
All roads, 1,500 miles at £55	... ...	£82,500

Same total cost as 1902-3, *but with lower costs for both classes.*

Main roads { 500 at £80 / 500 at £40 } 1,000 at £60	...	£60,000
District roads, 500 at £20	... ...	10,000
All roads, 1,500 at £46⅔	... ...	£70,000

The main roads reduced by 25 per cent, and the district roads reduced by 33⅓ per cent, the average cost per mile remaining the same.

In case the above examples may be regarded as beyond the region of ordinary experience, let us take a similar case, but one in which only 100 miles of district roads are "mained":

Actually.		*Before "maining."*	*After "maining."*
500 miles at £80	£40,000	500 miles at £80	600 miles at £73⅓
100 miles at £40	4,000	1,000 miles at £22	
900 miles at £20	18,000		900 miles at £20
1,500 miles at £41⅓	£62,000	1,500 miles at £41⅓	1,500 miles at £41⅓

Thus, the transfer of 100 miles of district roads to the county results in a reduction of £2 per mile in the cost of maintenance of district roads, and a reduction of £6 13s. 4d. per mile in the cost of county roads, without any physical change whatever, every mile of road in the county costing exactly what it did before.

IS THE ROAD BOARD A FAILURE?

An article in the *Westminster Gazette* of the 17th inst. upon "the policy of the Road Board" alleges that "the second report of that body shows conclusively that not only has the Board not proceeded to carry out the work assigned it by the Chancellor and sanctioned by Parliament, but that it does not intend to." The indictment then proceeds to assert that:—

(1) The Road Board only concerns itself with town-planning schemes and colossal projects, for which over £1,000,000 has been earmarked.

(2) It has made no effort in the direction of deviating roads, "clipping hedges," removing the dangers of sharp corners, or widening or straightening roads.

(3) That all they have done is "to splash tar about" and "polish the surfaces" of main roads, thus attracting the traffic to them and increasing the speed and danger.

(4) That secondary roads have been neglected.

(5) That tarring the roads has ruined the panels of hundreds of motor cars!

(6) That "the dangers and more [*sic*] of old roads still exist, while over £2,000,000 is misspent in the Road Board coffers."

(7) That "Colonel Crompton, as consulting engineer to the Road Board, seems to have been deeply influenced by the Roads Improvement Association, which is concerned mainly with revolutionary projects involving from £500,000,000 to £100,000,000."

The remedy for this terrible state of things is to be either the formation of a "Road League" or a National Road Council, but how the constitution of either, or both, of these bodies is to make all things bright and beautiful is not very clear.

The writer also does not like the Road Board's practice of advancing money on loan; he says that these methods are "undignified," and that instead of this the money should be given conditionally, and that prizes should be offered for the most economical schemes of road improvement.

This suggestion is apparently on the same principle as the prizes given to station masters for the best gardens at railway stations!

Finally it is stated, "What the Road Board really requires are the services of a thoroughly practical and enterprising travelling inspector, whose business it should be to eradicate the mid-Victorian ideas of unprogressive local surveyors and educate them in road reforms," and the name of Mr. Maybury is suggested as the right man for such a post.

The article concludes with the following tirade:—

"In a word, the Road Board has failed, and the most deplorable thing of all is that, while millions of pounds are being hoarded up, the appalling list of casualties to innocent [*sic*] pedestrians, and especially to children, which the Chancellor referred to in 1909, has increased tremendously."

Looking at the work of the Road Board dispassionately can we agree with the writer of this article and say the Road Board has failed? The answer will most assuredly be in the negative. When it is considered that the board cannot deal in an autocratic manner with the roads in the manner suggested by the article, but have to approach the road authorities with tact and judgment, it is really surprising to find what an immense amount of work has been accomplished. The improvement in our roads during the last two years has been phenomenal. The policy of the board has been to improve the surfaces of the roads so as to meet the exigencies of the case, and they have succeeded in doing so. It is all very well to fling out exaggerated statements and to make assertions which cannot be proved, and the article bristles with these.

For instance, is it a fact that

(1) The board only concerns itself with town planning schemes? We have yet to learn that the board has concerned itself in one single scheme of the kind.

(2) A considerable number of "deviations" and by-pass roads have been done under the auspices of the Road Board and with regard to "clipping hedges" the writer of the article must know that the board have no legal power to do this work or to report upon its being done by the local authority. A large number of sharp corners have been improved, and other road improvements carried out. The statements under this head are absolutely contrary to the fact.

(3) As to "splashing" tar, this is a feeble witticism, no more worthy of argument than the general allegation that "hundreds" of motor cars have been ruined by tar.

With regard to the remaining indictments, they require no comment, and we can safely leave them to our readers to judge for themselves.

We hold no brief for the Road Board, and they no doubt are well able to take care of themselves, but we draw attention to the article with a view to encouraging correspondence on the subject, and possibly a useful discussion as to whether the article summarised contains an atom of convincing proof that the Road Board is a failure.

CHLORINATION OF WATER AT CLEVELAND, OHIO.

Dr. D. D. Jackson, of New York, in a paper read before the American Waterworks Association, gives some very interesting particulars concerning the results of the application of hypochlorite to water for sterilisation.

It appears that when the water of Cleveland was first treated with chlorine, in September, 1911, unpleasant tastes and odours were noticed at times. Investigations proved that these were due to the use of an unnecessarily large amount of chlorine, and the quantity applied was therefore reduced without loss of efficiency in the removal of disease germs. This efficiency appears to have been well proved, not only by laboratory tests, but by the fact that "while ice movements in April caused specific infection of the water supply at the intake during those days, yet there was no accompanying rise of typhoid in the city." The sewage-laden ice from the river and harbour has infected the water supply on several occasions, so that, although the supply is now generally pure, it is essential to sterilise the water at times when pollution is inevitable.

Dr. Jackson recommends, in order to insure the use of standard amounts of chlorine when a sudden increase or decrease in pumping takes place, that an automatic device should be installed which will regulate the flow of hypochlorite solution directly in proportion to the flow of water, and that chlorine gas made from the electrolysis of common salt should be used experimentally in place of the chemical solution hitherto applied. He estimates the cost of the installation for Cleveland at £417, and the cost of treatment at from 1s. 8d. per 1,000,000 gallons to 1s. 0½d., according to the scale upon which the liquid chlorine is made.

The daily supply is about 70,000,000 gallons, and from 11 lb. to 18 lb. of hypochlorite is used corresponding to an amount of chlorine from 0·5 to 0·7 parts per 1,000,000. This amount has been found to be quite sufficient. At Jersey City 0·35 parts per 1,000,000 are found to be sufficient; the same amount is used at Cincinnati. At New York 0·5 parts are used for the Croton supply, and 0·6 parts in the Bronx supply.

It is now proposed to use compound chlorine, liquefied under pressure, which is sold in 100-lb. cylinders, at about 4d. per lb. This is about double the price of hypochlorite of lime, as far as available chlorine is concerned, but it is so much more easily applied, and is stated to possess so many advantages over the chemical that the extra cost is outlimited. The gas passes direct into the flowing water, and is there absorbed. There are no tanks and no lime sludge, and practically no labour.

It is interesting to note that in the year following the installation of the new intake at Cleveland the typhoid death-rate fell from 48 per 100,000 to 15, and that since then it has averaged 16 for seven years. This once again shows the value of pure water, but the authorities at Cleveland, finding that sewage pollution was taking place occasionally for short periods, wisely determined to eliminate the risk, and therefore adopted sterilisation.

"The Three-point Problem in Surveying."—Mr. W. N. Thomas writes: "In the article on "The Three-point Problem in Surveying," which appeared in your last issue, I regret that my brief description of a station pointer is rather misleading. Two only of the three arms are fitted with clamps, tangent screws and verniers, as shown in Fig. 1. The third arm is fixed so that its fiducial edge coincides with the zero of the circular scale, which is graduated in both directions from this point to 180°.

CORRESPONDENCE.

"Be calm in arguing; for fierceness makes
Error a fault and truth discourtesie"
— Geo. Herbert, *"The Temple."*

SEWER VENTILATION.

To the Editor of The Surveyor.

Sir, In your reference to my work on "Sewer Ventilation" on page 361 of your last issue, you describe sewer ventilation as a vexed problem. My experience has been that the reason of this is because the principles of so many branches of science are involved.

To deal with the subject in its complex nature, the whole experience of the engineer, chemist, bacteriologist and meteorologist are needed to enable the ventilating engineer satisfactorily to complete his work.

The difficulty has been in the past that most reports, statements and investigations have dealt with the matter singly, and not conjointly. For instance, a bacteriologist's paper or report would deal with it purely on the rules of bacteriology, taking no account of the pneumatic action in the sewer, which comes within the practice of the civil engineer. Not one in 10,000 has sufficient knowledge of bacteriology to judge the correctness or otherwise of the report, so this statement would be taken as correct. Singly it probably would be; but collectively it leaves the question as bad as before as far as the public health is concerned.

Take the following illustration. Some ten years ago a well-known engineer laid down the theory that sewers of a good gradient, with shafts of a moderate height, would prevent the sewer gas evil. Had the scheme been thrashed out by our chemists and bacteriologists, as well as by our engineers, its weakness would have at once been seen, and the expense of erecting shafts which have since been scrapped would have been avoided.

Another engineer, in one of the most recently published books on sewer ventilation, works out the cost at so much per mile of sewer, not taking into account the volume of the gases which have to be dealt with. Had he been co-operating with a chemist he would have found that in a mile of one of our large London sewers there is as much work to be done as in 132 miles of ordinary 12-in. pipe-sewer. So that the number of ventilators required for any given length of sewer must of necessity depend upon the work to be done in the sewer.

From a chemical point of view, I am of opinion that the paper read by the president of the British Association at Dundee will not only be of considerable help in forwarding the work of sewer ventilation, but will be an immense service to sanitation in general. The compounds which the professor stated are so essential to prolong or give life are those which happen to be destroyed to some extent by coming into contact with gases discharged from sewage. So that, if we allow those compounds to be destroyed in any way, we deprive the public of some of the means necessary for the prolongation of life.

But the main question as regards the public is efficiency and expense. Persons reading your reference to the cost of the apparatus at Kensington may form the opinion that the system is a costly one. The £19 quoted for this work more than covered the cost, and included the price of the ventilator, special manhole cover and dust box, excavating, laying on water supply, and making good the road. The annual outlay of £3 10s. for maintenance includes the cost of the pinhole of water for motive power, chemicals, and the monthly inspection of the apparatus by one of my men.

The consumption of water for the motive power for a district of apparatuses has been found to be less than that previously used for watering the streets for laying the dust. Thus, the expense of working an isolated ventilator in one of the worst places cannot be taken as a proportional cost of treating a whole district of sewer emanations.

Competent engineers have stated that, taking the benefits derived from good sewer ventilation as compared with the outlay, it is the cheapest thing they have ever had. This, I think, proves that sewer emanations can be got rid of by good sewer ventilation, at very little cost to the public.—Yours, &c.,

R. H. Reeves.

Walton Mill,
Walton-on-the-Naze,
Essex.
September 16, 1912.

INTERCEPTING TRAPS.

To the Editor of The Surveyor.

Sir,—I was glad to see in your last issue a letter signed "M.Inst.C.E." His views coincide with my own. If the trap is useless, nay, more, is an evil, then it should be relegated to the scrap heap. But before arriving at such a drastic conclusion I trust that the municipal surveyors throughout the country will further investigate the matter, as personally I should not like to occupy a house that had not been efficiently trapped and separated from the sewer. Many years ago I purchased in a provincial town a house that had a bad reputation as being insanitary. I ascertained that the drainage was good, but that there was no trap, and that the sewer with which the drain communicated was an old one of poor construction. I forthwith proceeded to relay the drain and inserted a "Buchan" trap, with a good cascade action, and provided a fresh-air inlet. I lived there for seven years with a young family, and none of them suffered from any zymotic disease, and since then, some twenty years ago, the house having changed hands, another young family has been reared with the same result. I should add that during the seven years, and, I believe, up to now, the drain has never choked or caused the slightest trouble of any kind. This may be only negative evidence, but it shows, I think, that where a house drain was formerly untrapped evil arose, whereas after trapping the house was rendered perfectly safe, although the sewer was an excessively bad one.

I cannot help thinking that the slur now thrown upon the trap must be due to improperly shaped traps, or, which is more frequent, careless fixing. We ought to be extremely grateful to the Departmental Committee of the Local Government Board for their labours and report, but we should, I think, be on our guard before coming to a too hasty conclusion. The condemnation of the intercepting trap is one of the most drastic alterations in our sanitary dogmas of belief that have occurred during the last few years.—Yours, &c.,

Pater Familias.

September 16, 1912.

FACILITIES FOR PROFESSIONAL EDUCATION.

To the Editor of The Surveyor.

Sir,—Your correspondent appears to have omitted the Northampton Institute, Clerkenwell, from his list of places in London where engineering classes are held.

This institute has excellent classes for A.M.I.C.E. and B.Sc. work, and a special feature is made of the practical testing work.—Yours, &c.,

J. Stuart King

Council Offices,
The Priory,
Friern Barnet, N.
September 13, 1913.

[The list referred to by the writer of the above appeared in last week's issue (p. 357).—Ed. The Surveyor.]

The name of the Garden Cities and Town Planning Association was, we find, inadvertently omitted from the letter of Mr. Ewart G. Culpin, the secretary of that body, which appeared in our issue of last week (p. 357).

Workmen's Insurance Contributions.—It is reported that the Local Government Board have intimated to the Malden and Coombe (Surrey) Urban District Council that the payment by the council of their workmen's weekly insurance contributions will not be allowed.

Power-saving Pulley Coverings.—We understand that the Power Saving Company are now pushing their business under new management, with marked success. We have recently had submitted to us an ingenious model of their non-slipping covering of compressed fibre, which covers the driving face of power pulleys, and which, where the driving power is sufficient and the belt capable of carrying the load demanded of it, restores the power lost by the slip, producing more work and less wear and tear. The material for this fibre covering is tenacious in wear, and has been used on fast, slow, heavy and light drives with equal success. It is easily fixed without the removal of the pulley from the shaft. There should be a wide field for an invention calculated to effect such conveniences and economies.

Law Notes.

Edited by J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, one side only) should be addressed to "The Law Editor," at the office of The Surveyor, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

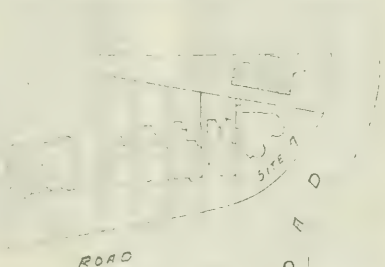
QUERIES AND REPLIES.

In order to avoid confusion queriists are requested to use distinctive words as noms de plume. *The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.*

Private Street Works: Encroachments on Highway: Laying Out a New Street.—"San-Remo" writes: Will you kindly help me by giving replies to the following, as my council have adopted the Private Street Works Act, 1892: (1) To what scale should the plans be drawn to be acceptable by the Local Government Board? (2) Ditto cross-sections? (3) Is it necessary to show each house (where they exist) on lands in full—*i.e.*, will a portion do, showing the width of the houses in front? My reasons for asking are that to measure up the flanks and back premises and plot them would be a big order in my case, as I have several streets in hand. (4) Page 20 (*c*) "Statutory Exemptions," J. B. Reignier Conder's work, appears to infer that all public places of worship are exempt from payment for making up the streets under the 1882 Act; if this is so, how are the lands or premises apportioned for payment? And would a public library or institute or school be included in this exemption; (5) I find, by taking rough measurements in some of the streets which I am about to make up, that the fences in some places have encroached on the road as much as 12 in. and 15 in. These have been laid out many years, and no deposited plans are available. Can I call upon these frontagers to set back (at their own cost) to give the width of 36 ft.? (6) "Specification Provisional Apportionment," &c., J. B. Reignier Conder: The explanation of the specification appears to me quite clear. (7) I understand I must prepare a bill of priced quantities to get at my total cost of the street, and apportion this equally to each frontager. The quantities, together with specification, may be inspected, &c., but am I right in assuming it is not necessary to show my prices to those of the frontagers who wish to inspect these plans, &c., or must my prices appear in the bill? (8) A person has a small field, and has notified his intention of shaping out a roadway through its centre from the county road to the extent of his land, and submits his plans showing the position of his land, with the roadway marked thereon, and adjoining owners' names, all properly drawn to scale, and in accordance with the by-laws (which are the Model Series of the Local Government Board), which require the total width to be 36 ft. The local authorities have returned his plan refusing their sanction on the grounds that he had not submitted levels, sections, &c., and marked his proposed building plots, &c., thereon. Now I contend he is not laying out a new street within the meaning of the by-laws, as he has no intention of building for the moment, and as to building plots, he is prepared to sell anything from 20-ft. frontage up to the whole length of the road in one piece or plot if a purchaser comes along; in other words, he is simply marking out the ground—*i.e.*, a 36-ft. roadway—on his own private property. I therefore contend he is not liable to submit plans with detailed sections, &c., until he commences to build (*vide* Sir George Jessel, late Master of the Rolls, Lord Selborne, and others).

(1), (2) and (3) The Local Government Board supply special forms on which plans and estimates are required in the case of street improvements, and these will no doubt contain all needful information and instructions on these points. (4) Under the Act of 1892 churches and chapels exempt from poor rate are not chargeable with private street works expenses, and their proportion is payable by the urban authority (see sec. 16 of the Act). This exemption does not extend to a public library, institute or school. If, however, any such building is devoted by law to a public purpose in such a way that it can never be let at a rack rent, it would be exempt on the *extra commercium* principle (see pp. 23-27 of the work referred to). Exempted premises abutting on the street must be included in the provisional apportionment. *Herne Bay Urban District Council* v. *Payne*, 1903, 2 K.B., 199). (5) If these are really encroachments—that is to say, if these owners have set forward their fences on land dedicated as part of the highway—they can be called upon to set the fences back at their own cost to the boundary of their land. (6) These particulars are taken from the Schedule to the Act. (7) The estimate must show "particulars of the probable cost," and this would appear to involve a statement of prices. (8) I agree. The planning out of the estate on paper does not amount to laying out the street. It will be sufficient if plans are submitted before the erection of the first house (see the remarks of Lord Esher in *Robinson* v. *Barton Eccles Local Board*, 21 Ch.D, at p. 750).

By-laws: Air Space.—"Q. E. D." writes: I should be glad to know whether the accompanying plan conforms with the by-laws relating to sites abutting on



two streets, a copy of which I forward. The site marked "A" is the one referred to.

[Copy of by-laws referred to.]

"Where two sides at least of the site of such building immediately adjoin streets he shall provide on one side other than the front of such building an open space which shall be free from any erection thereon above the level of the ground, except any portico, porch, step or other like projection from such building, or any gate, fence or wall not exceeding 7 ft. in height, and which shall extend laterally throughout the entire width or depth of such building, and across which the distance from every part of such building to the nearest boundary of any lands or premises immediately opposite, or to the opposite side of the street immediately adjoining such site, shall be not less, in any case, than 36 ft. He shall provide on another side, not being the front of such building, an open space which shall exclusively belong to such building which shall be free from any erection thereon above the level of the ground except a water-closet, earth-closet or privy, and an ashpit, which shall extend laterally throughout at least 10 ft. of the entire width or depth of such building, and across which the distance from every part of such building to the nearest boundary of any lands or premises immediately opposite, or to the nearest boundary of any street immediately adjoining such site, shall not be less, in any case, than 10 ft. at the least. A person who shall make any alteration in or addition to such building shall not by such alteration or addition diminish the aggregate extent of open space provided in pursuance of this by-law in connection with such building, or in any other respect fail to comply with any provision of this by-law. Where any open space may have been provided in pursuance of any by-law in that behalf in the rear of a domestic building, a person shall not by the erection of any building upon such open space or by any other means diminish the aggregate area of open space so provided."

In my opinion the by-laws are not applicable. Site A is triangular, and although the side adjoining the road is curved, it is one side only.

Lighting of Private Streets in Rural Districts.—"E. P. E." writes: The council of a rural district have recently made up and taken over the streets of an estate in one of their parishes under the Private Street Works Act, 1892 (powers being obtained from the Local Government Board). Other parts of the same parish are lighted by the parish council by special rates under the Lighting and Watching Acts, but, owing to the residents of the estate not being in a two-thirds majority in favour of lighting, the lamps fixed when the streets were made up, and the cost of which was included in the street charge, are not lighted. Some of the residents in one of the streets, however, wish to light several of the lamps, and to defray the expense by making a voluntary rate among themselves. Before doing so they would be glad to be enlightened on the following points: (1) Does the taking over of the streets by the rural district council include the lamps? (2) If not, in whom are the lamps

vested? (3) Whose permission is it necessary to obtain to enable some of the residents to light certain of the lamps themselves? (4) In the event of such residents obtaining permission, will they be liable for any possible damages for depreciation of property not lighted in the same or adjoining streets?

(1) If sec. 161 of the Public Health Act, 1875, has been declared to be in force in the district, by Order of the Local Government Board, the lamps would presumably vest in the rural district council under that section. (2) I gather that the Lighting and Watching Act, 1833, has not been adopted for the part of the parish in which these streets are situate. If such is the case, then, unless the lamps are vested in the district council, they would apparently be vested in the owners or owners of the soil of the street, subject to the rights of the public. (3) Assuming that the Act of 1833 has not been adopted, I think the consent of the council would be sufficient. (4) The residents are under no liability to light the streets, and I do not see how they can be liable for depreciation of property not lighted.

PAVING OF YARDS.—Mr. Samuel Rawson, CERT.SAN.I., inspector of nuisances, &c., of the borough of Hemel Hempsted, writes: In the issue of THE SURVEYOR of July 12th last I noticed a reply to a query of "A. M. O. K." respecting the paving of common yards, &c., stating that, in the absence of by-laws, a local authority have not power to compel owners to do the work. In my district there are very few unpaved yards, the work having been done in every case by the owners, under sec. 25 of the Public Health Acts Amendment Act, 1907, which, if adopted by a local authority, gives them power to do the work in default and recover the cost. This no doubt was overlooked when considering the above case. I enclose form of notice used in this district, which no doubt would be useful to your querist.

[FORM REFERRED TO.]

PUBLIC HEALTH ACTS AMENDMENT ACT, 1907.
(7 Edw. VII., c. 63.)

Notice to Drain Subsoil of Dwelling-house or Surface of Yard.

To _____

the owner of the dwelling-house situate at ....

Whereas the * yard in connection with, and exclusively belonging to the dwelling-house situate as above is not so formed, flagged, asphalted or paved provided with such works on, above, or below the surface of the yard, as to allow of the effectual drainage of the subsoil or surface of the yard by safe and suitable means to a proper outfall, WE, the ....

being the Local Authority under the Public Health Acts Amendment Act, 1907, for the district in which such dwelling-house is situated, do, in pursuance of section 25 of the said Act, by this notice require you, the owner of the said dwelling-house, within twenty-one days after the service hereof to execute and complete all the following works, namely:—

_____

_____

_____

as necessary for the effectual drainage of the subsoil or surface of the yard to a proper outfall.

Dated this _____ day of _____ 19

(Signed) _____

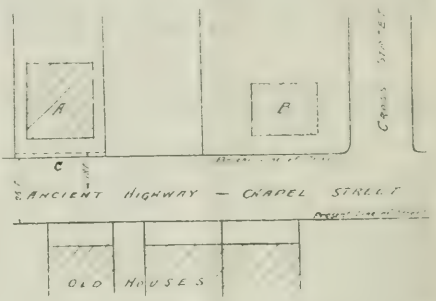
_____ of the said Local Authority.

(Address) _____

NOTE.—If within the said period of twenty one days the owner has failed to complete the execution of the works specified in the notice, the local authority may execute the work, and may recover from the owner in a summary manner as a civil debt the expenses incurred by the local authority in the execution of the works.

I must plead guilty to having overlooked the Act of 1907 in connection with this question. It is true that its provisions are only in force in those districts where they are applied by the Local Government Board, but where so it has been applied it undoubtedly gives the authority power to secure that the yards of dwelling-houses shall be "so formed, flagged, asphalted, or paved," or "provided with such works on, above, or below the surface" as to allow of effectual drainage. I am much obliged to Mr. Rawson for calling attention to this. The form of notice he kindly sends will no doubt be useful to "A. M. O. K." if the section is now, or becomes in the future, in force in his district.

LAYING OUT A NEW STREET.—[illegible] Surveyor of [illegible] Parish Council have prepared [illegible] approval, marked A on the accompanying sketch. The width of the highway at C is 28 ft. wide. Old houses are built along the opposite side, and one at [illegible] on the same line marked B, plans for which [illegible] passed by the council [illegible] years ago. The house B is the only one built on that side of the highway and [illegible] 300 yds. long. The council's by-laws made under sec. 157 of the Public Health Act, 1875, and dated May, 1883, state that—"Every person who shall lay out a new street which shall be intended for use as a carriageway shall so lay out such street that the width of the road shall be 36 ft. at the least." In *Pound* v. *Plumstead Board of Works*, and *Dryden* v. *Putney*, &c., it was decided that—"An ancient highway may become a new street within the meaning



of this section (see Lumley, Public Health Act, note (*b*). Am I right in contending—(*a*) That a new street is being laid out, and the street line at C be set back 18 ft. from the centre of the highway; (*b*) has the council any liability to pay for the land thus thrown into the highway; (c) will the street line set out when B was built govern in this instance?

(*a*) The cases referred to merely decide that an old highway *may* become a new street, but the mere building of a house on land adjoining a highway does not constitute the laying out of a new street within the meaning of by-laws. See *Rushcliffe* v. *Creer* (64 J. P. 200); *Devonport Corporation* v. *Tozer* (1903, 1 Ch. 759). In the absence of special circumstances, I do not think it would be held that a new street is being laid out in the present case. (*b*) Unless a new street is being laid out, the council would have to purchase any land required for widening the highway, under sec. 154 of the Public Health Act, 1875. (*c*) Under the Public Health (Buildings in Streets) Act, 1888, house A must be set back in a line with house B.

RURAL HOUSING.

THE PROBLEM IN ESSEX.

The demand which exists for a supply of better cottages for the accommodation of the working classes in Essex is referred to in the last issued annual report of the county medical officer of health, Dr. J. C. Thresh.

In the majority of parishes in the rural parts of the county systematic inspection has revealed the fact that many unsatisfactory cottages are occupied by families who are able and willing to pay more rent if they were able to obtain larger and more commodious dwellings, and that many cottages are occupied although barely fit for habitation, and are in such a condition that the owners would prefer to close rather than improve them to any extent. It appears that many of the existing and tenantable cottages are lacking in all conveniences, such as sinks, coppers, and sometimes even ovens.

In some cases, the report states, owners threaten to close cottages and eject the tenants if any undue pressure is put upon them to spend a considerable amount of money in making the places really habitable.

The difficulty of obtaining at a reasonable price land in a convenient position is commented on by Dr. Thresh. "The landowners," he says, "exhibit no anxiety to provide the land. If the authority selects a piece and approaches the owner it is unfortunate that the piece selected is so often the most valuable one in the whole parish. . . .There may be no actual opposition, but the apathy may be so absolute and the price so great as to be practically insuperable." It is added that if the land is obtained there is still the great difficulty of providing cottages which will let at anything like a remunerative rent. If sanitary authorities provide cottages, "they are expected to build and maintain them on a higher plane than any builder or private individual, and at the same time to get them at a lower rent than that charged by private owners for inferior cottages."

Workmen's Cottages. A correspondent is desirous of knowing the names of any medium size towns (say of between 15,000 and 20,000 inhabitants) where cottages for the working classes have been erected by the local authorities.

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
A Loan without a Sanction	379, 403
Appointments Vacant	406
Artistic Treatment of Ferro-Concrete	388
Assistants' and Students' Section	394
Association of Managers of Sewage Disposal Works	406
Bath Council and the City Surveyor	379
Correspondence	390
Development of York	401
Dungarvan Council and its Surveyor	378
Experiments on the Weathering of Portland Stone	380
Facilities for Professional Education	390
Highway Bridges and Culverts	379, 386
Instalment Payments for Road Construction	379, 403
Institution of Municipal and County Engineers	378, 404
Institution of Municipal Engineers	405
Institution of Water Engineers	405
Intercepting Traps	390, 397
Is the Road Board a Failure?	389
Law Notes	391
Local Government Board Inquiries	386
London and Brighton Road	402
London County Council School of Building	385
Municipal Competitions Open	406
Municipal Contracts Open	407
Municipal Tramways Association	405
Municipal Work in Progress and Projected	398
Personal	400
Philosophy of Engineering	377, 384
Proposed Western Approach Road to London	397
Recent Publications	402
Royal Sanitary Institute at York	
Engineering and Architecture Section	401
Notices	406
Rural Housing	392
Sanitary Administration at Chichester	395
Sewer Ventilation	390
Statistical Pitfalls	388
Sterilisation of Water by Chlorine Gas	378, 380
Tenders for Municipal Works or Supplies	408
The Engineer and the Community	377, 384
The Modern Road	383
Town Planning	383
Water Supply in Essex	393

WATER SUPPLY IN ESSEX.

DECREASING YIELD FROM DEEP WELLS.

In a report on the water supply of the county Dr. J. C. Thresh, medical officer of Essex, states that the water level in the chalk and Thanet sands is falling, indicating that more water is being abstracted than is entering from the rainfall. He adds that as the number of deep wells is annually increasing and most of these are being drawn upon to the utmost, the water level and the yield of water from individual wells will continue to decrease. Dr. Thresh points out that if, as he surmises, sea water is entering, there is not only the danger of failure of supply, but also of the water ultimately becoming so saline as to be useless for drinking purposes.

Except from deep wells water is only obtainable in the county from superficial gravel beds, and, in Dr. Thresh's opinion, these sources should be protected as far as possible so that the springs from them may continue to be utilised.

At the present time many small communities are supplied from such springs. Clacton is entirely supplied with water from gravel beds, Colchester is partly supplied from springs at Lexden, Chelmsford also depends for more than half its supply upon gravel springs. The latter borough is seeking to increase its supply by sinking another deep well, and upon the site chosen is likely to obtain an additional 100,000 gallons of water per day. "Possibly," remarks Dr. Thresh, "much more than this could have been obtained on lower ground where the sands are not compressed by a thickness of London clay and of superficial deposits."

The report continues: "A successful bore has been made at Bocking for supplying one side of Braintree. A previous bore made on elevated ground was a failure, the water being very limited in amount. The second bore near the river yields far more water than is required. At Broomfield, near Chelmsford, a bore has been successfully completed, and a complete scheme for supplying the parish has been submitted to the Local Government Board. At Maldon an attempt has been made to increase the supply from one of the bored wells by boring further into the chalk. This was a failure. At Tolleshury the boring made for the supply of the town yield a water containing 80 grains of salt per gallon. When the chalk was pierced in the hope of getting a less saline water, the water level fell about 18 ft. This and the Maldon experience indicates that, in central and South-East Essex, it is worse than useless to continue borings into the chalk."

THE USE OF SALINE WATER.

As to the wholesomeness of the waters used for public supplies at Southend, Colchester, Witham, Chelmsford, and other places, Dr. Thresh says there appears to be no doubt, but near the coast in certain parts of Essex the only deep-well water obtainable contains 70 grains and upwards of common salt per gallon. So far these waters have only been used for supplying farms or a few cottages, and when such a water has been obtained in boring to obtain a public supply, it has been unhesitatingly condemned as being unsuitable for the purpose. "Fifty grains of salt to a gallon of water," observes the writer of the report, "imparts a saline taste perceptible to many people, and when the amount is increased to 70 grains everyone can detect it. The comparatively few people I have been able to interrogate acknowledge that at first they would not have used the water for drinking purposes if they could have obtained any other, but that they soon became accustomed to it and liked it, and have never experienced any ill-effect which could be attributed to its use."

Proceeding, Dr. Thresh says: "The subject has recently assumed greater importance since it is now proposed to utilise such a saline water as a supply for a population of several thousands. I have suggested mixing it with an equal volume of spring water or subsoil water, but unfortunately a sufficient quantity of a sufficiently good water does not appear to be available for the purpose. The water in question contains about 85 grains of salt per gallon, so that, assuming each person drinks 3 pints per diem, each would imbibe 31 grains of salt. Many wild and random statements are made about the injurious effects of salt, but no proof seems to be adduced that its continued use in moderate quantities has produced illness of any kind. In Essex thousands of people are entirely dependent upon supplies containing 55 grains of salt per gallon, and these localities are about the healthiest in the county. Will the additional 30 grains per gallon be deleterious? Or, in other words, if water containing 21 grains of salt in the 3 pints drunk daily is perfectly wholesome, is it likely that a water containing 31 grains will be unwholesome? My opinion is that the water is quite wholesome, and that after the inhabitants have become accustomed to its use no objection will be found to it."

In his concluding remarks on the subject, Dr. Thresh says it will be interesting in years to come to note whether these deep-well waters alter in character. "The present utility of the analyses lies in the fact that by consulting them an idea of the probable character of the water to be obtained from any deep boring in any part of the county can be ascertained, and very often this information determines the site at which a well should be sunk to obtain the best type of water available. I have hundreds of similar analyses of water from private wells, which have been recorded for the benefit of any authority or person in the county who may wish to know the character of the subterranean waters in any locality. The Government Geological Survey is preparing a report on the water supplies in Essex, and, as my assistance has been asked, no doubt the whole of these analyses will be included and form a valuable record for study and for reference."

"The Civic Engineer's Who's Who." The first issue of "The Civic Engineer's Who's Who" (London: St. Bride's Press, Limited, 24 Bride-lane, E.C., 2s. 6d. nett) gives wonderfully complete lists of the engineering officials of England and Wales. For a first issue it is very creditable.—*Glasgow Herald.*

New School at West Hartlepool.—A new municipal high school for girls was opened at West Hartlepool last week. The school, which is a handsome building in the Renaissance style, is situated in Eldon-grove. Accommodation is provided for 300 scholars, but further classrooms can conveniently be added at any time to bring the accommodation up to 400. The school includes a chemical and physical laboratory, cookery-room and art-room. The site occupied is 1½ acres, one-third of this being devoted to a playground. There are also a covered playground and a tennis court. The cost of the school, including the building, furnishing, &c., has been £11,826.

Assistants' and Students' Section.

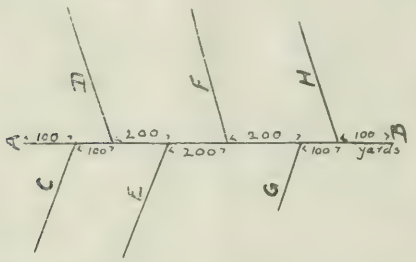
CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

272. Surface-Water Drainage.—State, showing the method of working out, the sizes of pipes necessary to take the surface water from streets as per sketch.



Streets are 36 ft. wide, and tar paved; all the houses are drained on the combined system, so that no surface water from the forecourts, &c., need be reckoned. Rainfall ½ in. per hour.

Street.	Length.	Fall.
A–B	1,000 yds.	1 in 40
C	200 ,,	1 in 20
D	300 ,,	1 in 10
E	200 ,,	1 in 20
F	500 ,,	1 in 30
G	100 ,,	1 in 15
H	150 ,,	1 in 50

(F. H. S., *Sheringham.*)

273. Cast-Iron Stanchion.—Calculate the size of a cast-iron stanchion 12 ft. in height alongside an external or party wall to carry a load of 54 tons. (T. R.)

274. Administration.—What is the best arrangement of the columns in a surveyor's cash-book (also wages-book), to show, in addition to the usual items, separate columns for the workmen's and the council's contributions under the National Insurance Act? ("R. D. C.")

275. Cantilever.—A cantilever of uniform cross-section and length L carries a concentrated load W at the free end. A prop is placed at a point $\frac{L}{4}$ from the free end, bringing this point to the same level as the fixed end. Find an expression for the reaction at the prop, and the deflection of the free end of the cantilever. Neglect the weight of the cantilever. (B.Sc.Eng. Final.) (H. F. W., *Tottenham.*)

276. Roof Design.—It is found necessary in designing the steel trusses for a roof to adopt some system of wind bracing. Explain in detail how the cross-sectional area of the wind ties is determined. (H. F. W., *Tottenham.*)

REPLIES TO QUESTIONS.

267. Road Making.—Will some reader kindly give the heads of a specification for the conversion of a macadamised into a wood paved road? ("Inquirer.")

[In response to our suggestion last week that a further discussion of this subject would be interesting, we have received the following communication, which we gladly publish.—ED.]

Before proceeding to tabulate the heads asked for by "Inquirer" it may not be out of place to point out that the specificaton should be written in some convenient order so as to facilitate future reference to any particular item. For instance, when specifying actual work the heads should follow the same order in which the contract will be carried out. Working by this method, it will be seen that the heads can be arranged in various groups, when writing the draft, thus tending to obviate the omission of any item. The following heads may be taken as suitable for an ordinary wood-paving contract. In the grouping, when writing the draft, 1–9 would be classed as general clauses; 10–15 materials; 16–30 actual work.

HEADS

(With brief notes where considered desirable).

1. *General.*—Brief summary of work included in the contract.
2. *Protection of Work.*—Frost, &c.; make good damage.
3. *Traffic Arrangements.*—Foot traffic; hand-carts, &c.
4. *Payments.*
5. *Time of Completion.*
6. *Work Satisfactory to Surveyor.*
7. *Extras.*—How measured; pricing.
8. *Maintenance.*
9. *Provisional Sum.*
10. *Cement.*
11. *Sand.*
12. *Ballast.*—If the old macadam is to be re-used (see clause 17), particulars should be given under this head as to the amount of granite allowable in the concrete—*i.e.*, whether the whole of the aggregate be sifted macadam or a combination of macadam and ballast. Then the required proportions of sand and stone in all aggregate should be specified. The contractor is to provide sand to mix with the granite, and also a sufficient quantity of ballast to make up for any deficiency in the sifted macadam. State the estimated thickness of macadam on the roadway.
13. *Water.*
14. *Shingle.*
15. *Testing Materials.*—Samples.
16. *Setting out Work.*—Gradients to channels; camber of road; intersections.
17. *Breaking up Macadam.*—If macadam is required as aggregate for concrete, specify sifting, stating size of sieve mesh. Cart fine stuff.
18. *Removing existing Pavings.*—Those in channels, crossings, around manholes, &c. It is important to state how the materials are to be disposed of, giving full particulars relating to cartage of all materials found on the site and not required for re-use.
19. *Excavations.* Ground under macadam, and foundations to pavings. Surplus carted.
20. *Soft Ground.*—Old trenches, &c.; extra thickness of concrete. Surplus carted.
21. *Gulleys.*—Existing altered; new gulleys; accurate levels.
22. *Damage by Accumulated Water.* Soft ground treatment. (See 20.)
23. *Concrete Foundation.*—Composition of concrete; mixing; used fresh; thickness; consolidate.
24. *Floated Coat and Method of Laying.*—Composition; mixing; used fresh; thickness; laid to screeds—distance apart; after screeds removed make good.
25. *Wood Blocks.*—Description and quality of wood. If soft wood, state quantity of creosote per cubic foot. Size; uniformity; arrangements for selection of timber.
26. *Laying Blocks.*—Straight courses; break point; channels; joint; cutting to intersections, &c.; experienced men required.
27. *Expansion Joints.*—Width; cleaning out; material required for filling.
28. *Grouting.*—Composition; worked into joints; paving to be approved previously.
29. *Surface Grout.* Cement and sand; proportions; applied evenly.
30. *Dressing.* Shingle; gauge; periodical dressings.
31. *Road Open to Traffic.*—Open after —— clear days from date of completion.

(F. E. Y., *Richmond.*)

271. Bending Moments.—If a straight prismatic baulk of timber floats in a horizontal position with a weight of 4 cwt. hung to each end, what will be the bending moment at the centre of its length?

When a body floats in a liquid the resultant pressure of the surrounding liquid on the surface of the

body is equal to the weight of the displaced liquid, and acts vertically upwards in a line passing through its centre of gravity. It follows, therefore, that the weight of the displaced liquid must be equal to the weight of the body, and the centres of gravity of both must be on the same vertical line. It is also important to note that the pressure of a liquid at rest is the same at all points of the same horizontal plane.

The baulk of timber in question will therefore be supported by a total pressure acting vertically upwards, equal to the sum of the weight of the baulk itself and the loads at the ends. This pressure must act uniformly along the whole length of the baulk, because it lies horizontally in the liquid. (See Fig. 1.)

It is probable that the weights which hang at the ends of the baulk will have a greater density than the

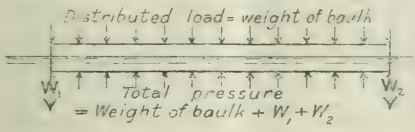


FIG. 1.

liquid in which they are immersed, in which case their effective weights will be less than their actual weights by the weight of their own volume of the liquid in which they hang.

Now, as the baulk is supported throughout its length by the liquid, there will be no bending moment due to its own weight, but only that due to the weights hung at its ends. The baulk may then be considered as a beam under an evenly distributed load of a total amount equal to the sum

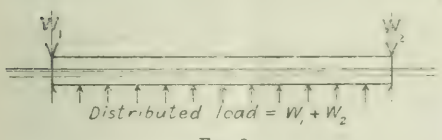


FIG. 2.

of the effective weights of the loads at the ends. (See Fig. 2.)

The formula for the bending moment at the centre of a beam with a distributed load and supported at the ends is—

$$BM = \frac{Wl}{8}$$

Where

BM = maximum bending moment,
W = total distributed load,
l = length of beam between supports.

In the absence of precise information as to the length of the baulk of timber, the density of the liquid, and the volume of the weights, it is not possible to give a specific value for the bending moment. (I. W. S., *Clapham Junction.*)

This is a simple case of a beam with an evenly distributed load, the upward pressure of the water on the baulk (*i.e.*, the force which keeps it afloat) being the distributed load, giving reactions of 4 cwt. each.

If we have a beam resting on supports at its ends, and with an evenly distributed load which makes the reactions at the supports 4 cwt. each, and imagine the whole turned upside down, then this is exactly similar conditions to the given floating baulk of timber.

Let L = length of baulk in feet.

We know that the bending moment at any section is the algebraic sum of the moments of all the forces acting on either side of that section.

Since the reactions are 4 cwt., or 448 lb. each, we know that the whole distributed load must be 896 lb., and the load on $\frac{1}{2}$L is 448 lb.

Now, taking moments about the centre of the baulk, we have—448 × $\frac{1}{2}$L = 224L ft.-lb. tending to turn the body in one direction, and half distributed load (448 lb.) acting at $\frac{1}{4}$L from the centre, or 448 lb. × $\frac{1}{4}$L = 112L ft.-lb. tending to turn body in opposite direction.

Then, subtracting the latter from the former, we get 224L − 112L = 112L ft.-lb., which is the bending moment at the centre of length of baulk. (P. H. W., *Harwich.*)

[The reply sent in by "P. H. W." deals with the question in the usual way, but it should be observed that "I. W. S." is quite correct in stating that, for absolute accuracy, the weights given should be reduced by the buoyancy of the liquid acting on them.—Ed.]

LONDON COUNTY COUNCIL SCHOOL OF BUILDING.

NEW DEVELOPMENTS IN BUILDING EDUCATION.

Four years ago a day technical school for boys was established at the London County Council School of Building, Brixton, having for its object the provision of a sound scientific and technical training for those preparing to enter the building trades and allied vocations, admission to the school being restricted to boys between thirteen and fifteen years of age. So great a success has been this department that the policy is to be extended in the forthcoming session, beginning on Monday next by the establishment of a senior day technical school to provide instruction for students whose age and previous education are above the age and standard of education required for admission to the day technical school for boys. This senior school will prepare students for professional work, and the instruction is arranged in the following sections: (1) General building; (2) architecture; (3) surveying; (4) structural engineering. The curriculum will include instruction in building construction, architectural drawing, architectural history, freehand and perspective, geometry, land surveying, reinforced concrete and structural engineering, mathematics, mechanics of building, chemistry and physics of building materials, and practical training in brickwork, masonry, carpentry and joinery, plumbing and sanitary engineering, painting and decorating. The course has been arranged to meet the requirements of three grades of students: (1) Those able to take the complete course (fee 3 guineas per term); (2) those able to take part-time instruction only (fee 1½ guineas per term); (3) those desiring to take up work in individual subjects (fee ½ guinea per term). The part-time course provides instruction on five half days per week from 3 to 5 p.m. in the following subjects: Quantity surveying, land surveying, mathematics, reinforced concrete and structural engineering, mechanics of building. The full course will extend over two years.

In the evening classes at the school several improvements will also be effected. The work of the school has been divided into five sections—namely: (1) Trade subjects; (2) building construction and allied subjects; (3) surveying; (4) structural engineering; (5) architecture and drawing. The third and fourth sections are newly created this year.

SANITARY ADMINISTRATION AT CHICHESTER.

LOCAL GOVERNMENT BOARD CRITICISM.

At a meeting of the Chichester Town Council last week a letter was received from the Local Government Board stating that the board had under consideration the report of their medical inspector, Dr. Hutchinson, after his recent visit to Chichester for the purpose of investigating the housing conditions of the city. The board regretted to find that the sanitary administration of the city could only be described as very unsatisfactory. Not only had the amount of inspection which had been undertaken under sec. 17 of the Housing and Town Planning Act, 1909, been very inadequate, but it would seem that the steps which had been taken by the town council to remedy the sanitary and other defects to which their attention had been drawn by their officers had in many cases been inadequate and indecisive. This position would in any case be extremely unsatisfactory, but it became more so when attention was drawn to the fact that not a few of the defects to which attention had been drawn and which remained unremedied or were partially remedied were in property belonging to a member of the town council. The board were fully alive to the fact that the above was a most serious reflection on the administration of the town council, but it was clear to them that strong measures would be necessary to alter the position unless the town council themselves made up their minds without delay to adopt entirely different methods of dealing with sanitary defects, and to support and encourage their officers in any attempts they might make to improve the sanitary conditions of property in the city.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Balderton P.C. (September 12th. Mr. T. C. Ekin).—£650 for the purpose of public street lighting for the village.—Mr. Holmes, the clerk, said the parish council had no loans, and the annual expenditure averaged 3d. in the £ from the rates. The parish council proposed to enter into an agreement with Messrs. Simpson & Co. to supply electric light for public street lighting at 1d. per unit. There was opposition from residents who thought gas lighting would be better than electric lighting.

Bentley (Yorks) U.D.C. (August 27th. Mr. A. G. Drury).—£12,225 for works of sewerage and sewage disposal at the new colliery village of Bentley.—Mr. Balfour, of Messrs. D. Balfour & Co., of Newcastle-on-Tyne, who explained the scheme, said it was proposed to provide additional main sewers and sewage disposal works for a large number of houses proposed to be built in the neighbourhood of the Toll Bar estate. About 200 houses were being built, and it was expected that a large number would be built in the near future. The works to be built would provide for a population of 2,000 in that immediate district alone. Mr. R. G. Whitley, surveyor to the council, also gave evidence.

Brynmawr U.D.C. (September 4th. Mr. M. K. North).—£1,100 for the purchase and alteration of Trafalgar House, Brynmawr, for the purposes of a parish room and public offices.—It was stated that Brynmawr was the largest urban district in Breconshire, but the only public offices in the town consisted of a room 16 ft. by 16 ft., which was used as the clerk's office and also for council meetings.

Coventry T.C. (September 13th. Mr. H. R. Hooper).—£2,292 for street improvements, and also for the purchase of land for the extension of St. Paul's cemetery.—The town clerk, Mr. George Sutton, said it was proposed to widen Swan-lane from 25 ft. to 45 ft., at a cost of £354. The sum required for the extension of the cemetery was £1,700.—It was estimated that the present cemetery would meet the requirements for four years. This, said the town clerk, was a very short period, because the population of Coventry had increased more rapidly than any other place in England during the last ten years. This increase was still going on, and there was in contemplation a further extension of the boundary. He asked for the longest period possible to be allowed for the repayment of the loans.

Guildford T.C. (September 3rd. Mr. Courtenay Clifton).—£3,440 for the purchase of 134 High-street, for the purposes of street improvement, and £750 for works of surface water drainage in Woking-road and Woodlands-road.—With respect to the application for surface-water drainage, it was stated that the Guildford Garden City Syndicate were developing an estate in the district. The borough surveyor, Mr. C. G. Mason, gave details of the proposed works.

Newark T.C. (September 10th. Mr. W. O. E. Meade-King).—£2,355 for the purchase of the Sconce Hills as a pleasure ground.—There was some opposition to the proposal, it being urged that the land was unsuitable for a pleasure ground and also that it was outside the borough boundary.

Newport (Mon.) T.C. (September 10th. Mr. A. G. Drury).—£3,900 for works in connection with the water supply in Beechwood Park, £2,685 for alterations and additions to Friars-street depot, £3,184 for public conveniences in Cardiff-road, Austin Friars, Pillgwenlly, and the provision market, and £325 for the improvement of a public convenience at the top of Dock-street.—The necessary particulars were supplied by Mr. H. Tremellen, borough engineer, and Mr. Tr barne Morgan, deputy town clerk.

Nottingham T.C. (September 10th. Mr. W. O. E. Meade-King).—£6,750 for the scheme to preserve the south bank of the Trent by constructing an embankment similar to the Victoria Embankment on the other side, £2,200 for the purchase of two motor fire engines, and £1,650 for improvement at Hockley.—It was explained that the bank and foreshore of the river Trent between Trent Bridge and the boundary of the parish of Wilford had been seriously damaged by floods during the past few years, and the council proposed to construct works of concrete piling, with six concrete steps, similar in character to the steps on the other side. Part of the bank was protected some time ago by works out of revenue, and it was proposed to increase the benefit of these works so as to have a uniform height of six steps. The total length to be dealt with was 440 lin. yds. The city engineer, Mr. A. Brown, described the plans. With respect to the Hockley improvement, the town clerk emphasised the importance of the thoroughfare, which led to the populous Sneinton and Carlton-road districts. The width at the present time, including causeways, was 28 ft., and the proposal was to make the street 60 ft. in width. The governors of the Nottingham High School had agreed to sell the land, which comprised 470 sq. yds., the purchase price being £2,820. As to the loan for motor fire engines, it was explained that the present plant consisted of one motor engine, five horse steam engines, and two manuals. Two of the horse-drawn engines were supplied in 1894 and 1895 respectively, and were worn out.

Strabane No. 2 R.D.C. (August 23rd. Mr. J. C. Hannigan).—£4,928 for the erection of twenty-eight cottages for labourers.—It was stated that the council had already built 350 cottages for labourers, and the total amount of the loans granted for this purpose was £64,200, of which £3,200 was unexpended, which amount would be sufficient to build seventeen or eighteen cottages. It was estimated that the total expenditure in connection with each cottage, including the cost of land and legal expenses, would be £176. There was only one unoccupied cottage in the entire district, and the council did not intend to build any houses in the vicinity of that building. The nett annual responsibility of the council in connection with the cottages amounted to £1,277. The rents paid by the labourers weekly amounted to 1s. 3d. and 1s. 8d. for ½ acre and 1 acre plots respectively, and the total receipts were £1,331.

Stretford U.D.C. (September 12th. Mr. F. H. Tulloch).—£12,120 for the purposes of Edge-lane widening improvement (£6,000), street repairing (£6,120), and Longford Park and path (£2,980).—The clerk, Mr. George H. Abrahams, explained that, so far as Edge-lane was concerned, it was intended to widen the road 18 yds. from the city boundary to Lime-grove, but to proceed with different lengths only as opportunity arose. A portion of the land to be acquired included a belt of trees, and means had been devised to retain those trees by what was termed a "cage walk." That walk would be elevated owing to the level of the park land being higher than the adjacent road, and it would form one of the attractive features of the scheme. A sum of £2,980 was proposed to be expended upon the purchase of seats and the erection of public conveniences in the park, and the completion of the Seymour-grove footpath.

Tiverton R.D.C. (September 4th. Mr. R. G. Hetherington).—£1,000 for augmenting the water supply of Silverton.—It was stated that two schemes were prepared by Mr. Montague Luke (Messrs. Montague Luke & Partners, civil engineers, Plymouth), who was engaged by the council. One had to be dropped on account of difficulties connected with water rights, and the council had to fall back upon the present scheme, and a resolution was passed to borrow £700. But as a result of the drought of last year, when nearly every spring was affected, the engineer had to revise his plans and estimate. The revision provided for an increased supply of 30,800 gallons, and for sustaining the supply in times of drought. The cost of the actual work would be about £720, but the sum required would probably be between £950 and £1,000. It was proposed to spread repayment over thirty years. A penny rate would produce £37.

APPLICATIONS FOR LOANS.

Bexhill T.C. £360 for a sub-station at Little Common.

Cannock U.D.C. £10,442 for sewerage and sewage disposal works.

Carnarvon T.C. £2,000 for the purposes of a cemetery.

Desborough R.D.C. £2,150 for a sewage disposal scheme.

Newport (Mon.) T.C.—£5,400 for tramway offices and stores, and £830 for a car paint shop.

Scarborough T.C.—£1,040 for a bathing shelter.

Shoreditch B.C.—£2,546 for street improvement purposes.

South Stoneham R.D.C. £5,180 for sewering the Bitterne Manor estate.

Whitehaven T.C.—£3,337 for a workmen's dwellings scheme.

Yarmouth T.C.—£7,507 for the electricity undertaking.

LOANS SANCTIONED.

Bexhill T.C.—£607 for works of paving.

Carlisle T.C.—£3,500 for road improvement works.

Cheam R.D.C.—£650 for making up a road.

Cheltenham T.C.—£3,900 for paving works.

Coleraine R.D.C.—£680 for labourers' cottages.

Epsom R.D.C.—£1,432 for the purchase of land at the Cheam outfall works, and £1,300 for road widening.

Esher and the Dittons U.D.C.—£600, repayable within five years, towards the cost of repairing Imber Park-road. The money will be borrowed from a local lodge of Oddfellows at 3½ per cent. interest.

Godalming T.C.—£5,000 for repaving and sewerage works.

Hackney B.C.—£1,415 for a new road.

Harrington U.D.C.—£7,900 for the purpose of the Harrington Gas Order, 1912.

Heywood T.C.—£2,594 for carbonising plant for the gasworks, £1,500 for meters, and £600 for mains.

Newton Abbot R.D.C.—£600 for water supply purposes.

Radcliffe U.D.C.—£1,340 for road widening purposes.

Richmond T.C.—£6,300, Kew-road wood-paving (foundations), twenty years for repayment; £7 100, Kew-road wood-paving (wood blocks), ten years for repayment.

Scarborough T.C.—£551 for foundations and tarmacadam works, and £120 for a new sewer.

Sherborne U.D.C.—£1,085 for workmen's dwellings.

Tralee U.D.C.—£2 000 for a technical school.

Walsall T.C.—£9,000 for the electricity undertaking.

FORTHCOMING INQUIRIES.

SEPTEMBER.

		£
23.—	**Easthampstead.** For the provision of new tanks and pumps (Mr. R. H. Bicknell)	600
24.	**Exeter.** For works of sewerage and drainage (Mr. F. O. Stanford)	896
24.	**Hornsey.** For sewage pumping purposes (Mr. R. H. Bicknell)	2,500
24.—	**Nuneaton.** For water and electricity purposes (Mr. T. C. Ekin)	13,770
24.	**Sheffield.** For the construction of a sewer (Major C. E. Norton)	800
24.—	**South Molton.** For the provision of workmen's dwellings (Mr. Courtenay Clifton)	1 800
25.	**Bridgend.** For the purposes of the electricity undertaking (Mr. H. R. Hooper) ...	5,329
25.—	**Hadleigh.** For the provision of workmen's dwellings (Mr. Edward Leonard)	1,600
25.—	**Maldens and Coombe.** For the provision of pumping machinery (Mr. R. H. Bicknell)	1,627
25.	**Pontefract.** For works of water supply (Major J. Stewart)	900
25.—	**St. Thomas.** For the provision of workmen's dwellings (Mr. Courtenay Clifton)	600
25.—	**Sherborne.** For sewage disposal works (Mr. F. O. Stanford)	12,000
25.	**Tipton.** For sewage disposal purposes (Mr. T. C. Ekin)	629
26.—	**Devonport.** For street and public baths purposes (Mr. Courtenay Clifton)... ...	1,313
26.—	**Kingston-upon-Hull.** For depot, street, sewerage and recreation ground purposes (Major J. Stewart.	32,147
26.	**Neath.** For sewage disposal works (Mr. H. R. Hooper)	11,229
26.	**Wharfedale.** For sewerage works (Major C. E. Norton)	5,100
26	**Wincanton.** For water supply purposes (Mr. F. O. Stanford)	1,050
27	**Horwich.** For sewage disposal and street works (Major C. E. Norton)	1,644
27	**Stamford.** For the extension of the sewage disposal works (Major J. Stewart)	3,500
27	**Swansea.** For street works and footbridge construction (Mr. H. R. Hooper)	2,300
27.—	**Wincanton.** For water supply works (Mr. F. O. Stanford)	1,885
30.—	**Friern Barnet.** For the provision of workmen's dwellings (Mr. Courtenay Clifton)	3,510

OCTOBER.

1.—	**Maldon.** For the erection of workmen's dwellings (Mr. Courtenay Clifton) ...	5,680
2.—	**Paddington.** For a housing scheme (Mr. Edward Leonard)	—
4.—	**Reigate.** With respect to a town planning scheme (Mr. Thomas Adams)	

THE INTERCEPTING TRAP.

GRIMSBY BOROUGH ENGINEER'S RECOMMENDATION.

Following upon the report of the Departmental Committee of the Local Government Board on the subject of the intercepting trap in house drains, the subjoined report has been presented to the Sanitary Committee of the Grimsby Corporation by Mr. H. Gilbert Whyatt, ASSOC.M.INST.C.E., M.R.SAN.I., the borough engineer of that town:—

"The use of the intercepting trap on house drainage commenced about the year 1877, and from that time its use has been compulsory in the districts which have adopted the Model By-laws of the Local Government Board. A minority of municipal engineers and medical officers, however, have been opposed to its use, and in certain districts, although compulsory under the by-laws, its use has not been enforced.

"In October, 1908, the Local Government Board instituted an inquiry into its use, which included the carrying out of a lengthy series of experiments, both from an engineering and bacteriological point of view, and the examination of fifty-two witnesses, including medical officers of health, municipal engineers and surveyors, and architects and engineers in private practice.

"The result of this inquiry has just been published, and for the future the Local Government Board will not refuse to approve of by-laws where the use of the intercepting trap is not made compulsory.

"Personally, I have always been in favour of the intercepting trap, and finding it required by the by-laws now in force in this town, I have insisted upon the by-law being carried out; but in view of the report of the Local Government Board, while not deviating from my opinion, I recommend that, in the case of owners and builders who have any real objection to it, its use should not be insisted upon in the future.

"I shall be glad to have the instruction of the committee on the matter."

The matter, we understand, has been referred to a sub-committee to consider and report.

THE PROPOSED WESTERN APPROACH ROAD TO LONDON.

According to the preliminary plans and estimates prepared by the engineers (Sir Maurice Fitzmaurice, C.M.G., M.INST.C.E., for the London County Council portion of the road, and Mr. H. T. Wakelam, M.INST.C.E., for the Middlesex County Council), the cost of the works proposed to be carried out by and under the supervision of the respective County Councils of London and Middlesex will amount to about £1,750,000, of which sum the Road Board have promised one-half. The expenditures in the county of London are estimated at about £1,000,000, and in the county of Middlesex at about £750,000.

The route of the proposed new road commences at Kensington, and passes through Hammersmith, Chiswick, Brentford, Isleworth, Heston and Hounslow, terminating at the west of the last-named town by a junction with the main Bath road. A connection with the main Staines and Windsor road at a future date is also contemplated.

A Well-earned Holiday.—Mr. Albert Toft, road surveyor to the Bakewell Rural District Council, who is sixty years of age, has just been granted a month's holiday—the first he has had, he says, in his life. Mr. Toft asked for a holiday because his health was failing.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Bishop Auckland, Blackpool £11,000, Blyth £10,000, Hamilton £13,000, Paddington, St. Helens; housing and town planning—Evesham £10,000, Greenock; roads and materials—Newhaven, North Tipperary; water, gas and electricity—Batley £20,000. Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

BUILDINGS.

Ayr T.C.—The question of building a diphtheria block at the hospital, at an estimated cost of £2,700, is under consideration.

Belfast T.C.—The tender of Messrs. J. & W. Stewart, at £1,097, has been accepted for extensions to the offices of the waterworks department.

Bishop Auckland U.D.C.—The surveyor, Mr. T. Collins, has received instructions to prepare plans for a public swimming bath, with an annexe for Russian and Turkish baths.

Blackpool T.C.—The public swimming baths are shortly to be enlarged, at an estimated cost of £11,000.

Blyth U.D.C.—A scheme is in progress for the erection of a town hall. The estimated cost is £10,000.

Bolsover U.D.C.—The surveyor, Mr. W. Browne, in a statement to the council, shows that the cost of the new offices was £1,285.

Bristol T.C.—The tender of Messrs. J. Perkins & Sons, Limited, at £267, has been accepted for the erection of an engineers' messroom at Avonbank electricity station.

Dumbarton T.C.—Alterations at the public slaughter-house are to be carried out at an estimated cost of £1,300.

Hamilton T.C.—New municipal offices are to be erected in Cadzow-street at an estimated cost of £13,000. The new building will contain all the town's offices under one roof, with the exception of the police office. The site adjoins the present Public Library, and is, in fact, a continuation of the same scheme.

Hereford C.C.—A secondary school for boys, a description of which will be given in a future issue, was opened recently.

Kirkcaldy T.C.—The generating station is to be enlarged, at an estimated cost of £2,196, and Messrs. Smith & Son, of Kirkcaldy, have obtained the contract for the masonry work at £1,432.

Maldens and Coombe U.D.C.—From eight tenders for the extension of the mortuary, that of the Strand Building Company has been accepted at £94. The estimate of the surveyor, Mr. R. H. Jeffes, was £90.

Mallow R.D.C.—An improvement (buildings) scheme, estimated to cost £42,250, is being promoted by the council, who have referred the plans to the Local Government Board.

Paddington B.C.—The council are to consider a proposal by the Baths Committee that public baths should be erected on a site adjoining the Harrow-road.

St. Helens T.C.—The question of the provision of additional public baths has been referred to the Baths Sub-Committee.

Sheffield T.C.—The Markets Committee have approved a scheme for the rearrangement of the Sheaf Market and provision of extra stalls consequent on the site of the Pheasant Inn and other buildings being thrown into the market, the carrying out of which involves a supplementary grant of £910 (the total estimated cost of the work being £1,280). It is estimated that after the alterations have been carried out this market will yield an additional income of £1,053.

Thornaby-on-Tees T.C.—The borough engineer, Mr. C. T. Johnson, has been authorised to lay out the Pottery site for depot purposes.

Torquay T.C.—The architect has been instructed to prepare a report, with plan and estimate of the cost of providing and furnishing a reading-room at the pavilion.

Wellington T.C.—The advisability of purchasing the Assembly Rooms for public purposes has been the subject of investigation, and the matter has been adjourned for further consideration.

Wood Green U.D.C.—It has been decided to purchase for £3,000 a fifth of an acre (including some slum property) as a site for a fire station.

HOUSING AND TOWN PLANNING.

Blaydon-on-Tyne U.D.C.—It has been decided to erect twenty workmen's dwellings at Chopwell.

Evesham U.D.C.—Recently the council decided to build sixty cottages at Broadway under the Housing of the Working Classes Act, and the Local Government Board sanctioned the borrowing of £10,000. The Public Works Loan Board subsequently wrote declining to advance the loan until it was shown the scheme would be self-supporting. The clerk forwarded a copy of the balance-sheet of the scheme to the board, and asked them to reconsider the matter. At a meeting of the Evesham Council on Monday it was announced that the Public Works Loan Board now consented to advance the loan at 3½ per cent.

Greenock T.C.—It has been agreed to erect 200 workmen's houses under the Town Planning Act. The first tenement will be proceeded with at once in the east end of the town, and the remaining tenements will probably be built in the middle area.

Halstead (Essex) R.D.C.—A committee has been appointed to consider the question of providing working-class dwellings.

Holywell R.D.C.—The Housing Committee have instructed the inspector to report as to the need for new houses in the district, and as to dilapidated houses which might be purchased by the council and repaired, so as to be fit for habitation.

Hungerford R.D.C.—The tender of Mr. G. Elms, of Stockcross, at £880, has been accepted for the erection of six workmen's dwellings.

Morpeth T.C.—The tender of Mr. G. Douglas, of Newcastle-upon-Tyne, at £5,855, has been accepted for the erection of thirty-three workmen's dwellings.

Skibbereen U.D.C.—The sanction of the Local Government Board has been received to a scheme for the provision of seventeen labourers' dwellings.

Whitehaven T.C.—It has been agreed to purchase a plot of land for building sites. The cost is £1,525, or £251 per acre.

PARKS AND OPEN SPACES.

Brixham U.D.C.—A sum of £300 is to be spent on laying out a recreation ground.

Edinburgh T.C.—Works to cost in the aggregate £2 165 are to be carried out at Calton Hill and its approaches.

Irlam U.D.C.—It is proposed to provide a public recreation ground at an estimated cost of £4,147.

Oswaldtwistle U.D.C.—The question of providing a bowling green at an estimated cost of £400 is being considered.

Southport T.C.—New municipal golf links, which have been laid out at a cost of £1,250, were opened last week.

REFUSE COLLECTION AND DISPOSAL.

Colwyn Bay U.D.C.—With reference to the destructor which, as reported in last week's issue, is about to be erected for this town, the cost of burning, as estimated by the surveyor, Mr. Wm. Jones, ASSOC.M.INST.C.E., is 7·8d., and not ¾d. per ton, as stated. Mr. Jones thinks this may be considered a very favourable figure, although he is hopeful that in the actual working of the destructor he will be able to reduce the cost to about 6d. per ton by means of the revenue which he expects to make in the use of some quantity of the hard clinker for mortar, and road and footpath foundations, and from the sale of old tins and so forth.

Margate T.C.—The report of the inspector shows that out of 1,315 premises inspected, 195 were still without proper receptacles for the removal of house refuse. The necesary notices have been served on the owners.

Swansea T.C.—The Health Committee have opened an exhaustive investigation into a system of street

cleaning and scavenging, and the general administration of the stables department.

ROADS AND MATERIALS.

Bagshot U.D.C.—The surveyor, Mr. O. G. Stanley, has prepared plans for the widening of part of Guildford-road.

Broadstairs U.D.C.—The tender of Messrs. H. W. Cooper, Limited, of Mark-lane, London, at £264, has been accepted for the execution of road works.

Cheltenham T.C.—The Acme Wood Flooring Company have secured the contract for paving the Promenade from Clarence-street to Imperial-square, at a cost of £3,900.

Chester-le-Street R.D.C.—The tender of Messrs. Thompson & Son, at £4,597, has been accepted for making up the roads to the new bridge to span the Wear.

Chichester T.C.—It has been agreed to make up the portion of the Brighton to Portsmouth road in the city with the council's staff.

Dorking U.D.C.—The tender of Mr. H. M. Baker, at £675, has been accepted for the improvement of London-road.

Isle of Wight R.D.C.—A tender for the carting of about 2,050 tons of quartzite has been accepted at 11d. per ton. A committee of the council rejected this price on the ground that the work could not be carried out at the price, and accepted a tender for 1s. 9d. per ton. This, however, the council refused to adopt, and, as has been stated, reinstated the tender for 11d.

Lowestoft T.C.—The council have approved the estimate of the borough surveyor, Mr. G. H. Hamby, for making up and sewering Waveney-drive, at £1,272, £301 of which is payable by the freeholder.

Luton R.D.C.—Improvements are to be carried out in Cumberland-road at a cost of £230.

Maesteg U.D.C.—A tender of £629 has been accepted for the construction of a new road.

Maldens and Coombe U.D.C.—The council have approved the plans of the surveyor, Mr. R. H. Jeffes, for improvements at Coombe-lane, to cost £190.

Newhaven R.D.C.—This council, together with the Eastbourne Rural District Council, is submitting a joint scheme for the improvement of the Newhaven to Eastbourne road to the Roads and Bridges Committee of the East Sussex County Council.

North Tipperary C.C.—The council have adopted the suggestion of the county surveyor that stone-crushing plant should be purchased at a cost of £2,000. In the judgment of the county surveyor this machinery will effect a saving of £7,000 a year in the rates.

Paisley T.C.—The improvement of the south entrance to the Gilmour-street Station is contemplated by opening up the archway under the railway incline and forming a thoroughfare to Moss-street, or, alternatively, by alterations in the station, with the consent of the railway company.

Poole R.D.C.—The dangerous part of the roadway leading down from Corfe Mullen into Broadstone is to be widened at a cost of £81, including £25 for land. Complaint was made by councillors that the widening would not be sufficient, but it was officially intimated that no more land could be obtained.

Walsall T.C.—The borough surveyor, Mr. John Taylor, has prepared a report on the desirability of constructing a new approach to the town from the Birmingham-road.

Weymouth T.C.—The borough surveyor, Mr. K. J. S. Harris, has prepared plans for wood paving and concreting works estimated to cost £5,640, which have received approval.

Worsborough U.D.C.—The tender of Messrs. Porter & Sons, at £1,443, has been accepted for works of road widening.

SEWERAGE AND SEWAGE DISPOSAL.

Aspatria U.D.C.—The tenders of Messrs. Middleton & Hopper, at £5,107, and Messrs. Arundel at £2,543, have been accepted for sewerage and outfall works.

Itchen U.D.C.—The scheme for the drainage of Sholing has been submitted to the Local Government Board by the engineer, Mr. H. J. Weston, and has been duly approved.

WATER, GAS, AND ELECTRICITY.

Batley T.C.—A proposal is being discussed for the extension of the electricity works, at a cost of about £20,000.

Cosford R.D.C.—Water supply works are to be carried out at a cost of £353.

Edinburgh T.C.—The surplus on the year's working of the electricity undertaking was £2,179.

Ilkeston T.C.—The tender of Messrs. Thomas Bayle & Sons, Limited, of Stourport, has been accepted for the erection of a new gasholder.

Middleton T.C.—An additional steam dynamo is to be installed at the electricity works, subject to the consent of the Local Government Board to a loan to meet the cost.

Mossley T.C.—The question of erecting a new gasometer at an estimated cost of £3,000 is under consideration.

Sedgley (Staffs) U.D.C.—A nett profit of £1,599 was realised on the gas undertaking last year. A scheme is in preparation for extending the gasworks.

Spalding R.D.C.—With respect to the water purchase question, the Local Government Board have provisionally agreed to the purchase of the bore at Pinchbeck West by the council, and for 6 miles of piping, but not for the 2 miles of piping in Whaplode. The purchase price is £2,500 for the bore and the whole of the piping up to the Holbeach boundary. The matter has been left in the hands of the clerk.

Wombwell U.D.C.—The gasworks are to be extended at an estimated cost of £7,000.

MISCELLANEOUS.

Carnarvon T.C.—For cemetery purposes an offer has been made to the council of upwards of 4 acres of land for the sum of £800, and it has been decided to complete the purchase and spend in addition £1,200 upon the drainage and laying out of the ground, subject to the consent of the Local Government Board.

Farnham U.D.C.—At a recent meeting it was decided to invite tenders for granite, coal, and forage, and Mr. Aldridge raised the question as to British or foreign granite. The chairman suggested that the tenders should be limited to the owners of British quarries. Mr. Kempson said he would second such a motion. Mr. Mitchell: Won't the county surveyor have something to say about it? Mr. Aldridge: He agreed to British granite last year. Mr. Mardon objected to such a proposition being sprung upon the council without notice. After discussion, the chairman withdrew his motion, but hoped that the committee might afterwards see their way to give due weight to the tenders submitted on behalf of British quarries. Mr. Mardon: I shall always vote for the best article.

Hove T.C.—It was stated at the council meeting last week that the estimated cost to the town of the proceedings in Parliament for promoting and opposing Bills for railless traction would be nearly £6,000.

Paisley T.C.—A new motor fire engine, by the Halley Industrial Motors, Limited, has been added to the fire brigade equipment, at a cost of £1,030.

Sheffield T.C.—Tramway track reconstruction and doubling is to be expedited by continuing the work during the winter, under precautions which will safeguard its efficiency. The work will involve an outlay of £10,000, and a similar amount is to be spent on doubling a considerable section of the Fulwood route.

York T.C.—The Board of Trade have confirmed the order made by the Light Railway Commissioners authorising the extension of the tramways.

New County Buildings at Dumfries.—At Dumfries on Wednesday the foundation-stone of the new county buildings was laid by the Marquess of Tullibardine, M.P.

Blackpool Promenade Scheme.—Blackpool Town Council on Wednesday considered a further scheme for extending the promenade at South Shore to the junction of the St. Annes District at Squire's-gate, a distance of over 2,000 yds. A feature of the project is the provision of a grass plot, 30 ft. wide the whole distance for pedestrians on one side, and a tramway track and carriageway on the other. The borough surveyor, Mr. J. S. Brodie, estimated the total cost at £48,000.

PERSONAL.

Mr. D. Munro, burgh surveyor of Nairn, has resigned.

Mr. J. Robinson, surveyor to the Darlington Rural District Council, has had his salary increased by £50 a year.

Mr. O. G. Stanley, surveyor to the Bagshot Urban District Council, has had his salary increased by £30 per annum.

Mr. O. Frewin, surveyor to the Crowmarsh Rural District Council, has been appointed surveyor to the Newbury Rural District Council.

Mr. G. R. Percy, assistant in the borough surveyor's office, Windsor, has been appointed assistant surveyor to the Ilkley Urban District Council.

Mr. R. Williams, surveyor to the Soke of Peterborough County Council, has sent in his resignation, to take effect at the end of the year.

Mr. J. Skelton Smith, surveyor for the Kintyre District of Argyll County Council, has had his salary increased from £200 to £250 per annum.

Mr. W. Butler, surveyor to the Fareham Urban District Council, has been voted £20 for his services in connection with the extension of the town's water mains.

Mr. R. H. Blake, formerly assistant surveyor to the Esher and the Dittons Urban District Council under the present surveyor, Mr. H. C. Fread, has been appointed to the post of assistant surveyor to the Brazilian Government, at a salary of £1,200 a year.

Mr. P. J. Kelly, assistant surveyor for the Londonderry No. 2 District, has been appointed county surveyor for the Southern Division of Donegal County, in the place of Mr. J. Steadman, who has been transferred to the Northern Division, at a salary of £550, with £50 a year for office and clerk.

Mr. E. F. Spurrell, borough surveyor of Holborn, Worshipful Master of the Randagh Lodge, No. 834, is interested in the cases of the boys of Brothers Oaker and Katzupes, and informs us that he will be very grateful if any of the brethren in his profession can send him proxies for the election in October. Any votes that brothers have for girls can be made available by exchange.

The late Mr. T. Longdin, borough surveyor of Warrington, whose sudden death was recorded in The Surveyor of September 6th, was buried on the 7th inst. at Hill Cliffe. Civic honours were paid to deceased by the presence of the Mayor of Warrington, many members of the corporation, a full muster of the members of the borough surveyor's staff, and representatives of public bodies. Mr. Longdin, the *Warrington Guardian* writes, "commanded the high respect of all associated with the public life of the town, not alone for his brilliant accomplishments, but for his strict integrity, and secured the affections of his workpeople by his kindly manner and consideration."

FOR OTHER ADVERTISEMENTS

See End of Paper.

CITY OF MANCHESTER.

The Rivers Committee require the Services of a competent Clerk of Works immediately on the Main Drainage Works; salary £3 3s. per week. Applicants must be prepared to work night duty if required. Applications, stating full particulars as to experience, &c., accompanied by copies of three recent testimonials, to be addressed to the Chairman of the Rivers Committee not later than 10 a.m. on Saturday, the 28th inst.

Canvassing, directly or indirectly, will disqualify

THOMAS HUDSON,
Town Clerk.

Town Hall, Manchester.

ASSISTANT (22), three years Articles and Assistant in large Rural District, desires appointment as Assistant to Municipal Engineer; surveyor, leveller, neat draughtsman; sewage disposal, water supply, private street, buildings, roads, good municipal experience, &c.; highest references. "Decclaratum," office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

URBAN DISTRICT COUNCIL OF KIRKBY-IN-ASHFIELD, NOTTS.

The above-named Council invite Tenders from responsible Contractors for Sewerage and Extensions to the Sewage Disposal Works.

The works comprise about 4,378 yds. of 15-in., 12-in., and 9-in. diameter Iron and Stoneware Outfall Sewers, &c., together with Manholes and other appurtenant Works, and taking up and relaying certain Sewers, also alterations and extensions at the Outfall Works, including Bacterial Filters, Circular Tanks, and sundry alterations to existing Works, also erection of small Engine-house and 554 yds. of 4-in. Pumping Main, &c.

Plans and Specifications can be seen at the Offices of the Engineers, Messrs. Elliott & Brown, A.MM.INST.C.E., Burton Buildings, Parliament-street, Nottingham, and copies of the Bills of Quantities and Form of Tender may be obtained after September 24th on deposit of Three Guineas (by cheque), which will be returned on receipt of a *bonâ-fide* Tender, not afterwards withdrawn, and the return of all documents lent to the Contractor for the purpose of making up his Tender within fourteen days of the notice informing him a Tender has been accepted.

Sealed Tenders, endorsed "Tender for Kirkby Sewerage Works," to be delivered to the undersigned not later than the first post on Tuesday, the 15th day of October, 1912.

The lowest or any Tender will not necessarily be accepted.

The Engineers will notify applicants of a date when the Plans may be inspected at Kirkby and the site of Works pointed out.

(By order)
E. BERTRAM HIBBERT,
Solicitor and Clerk to the Council.

Public Offices,
Kirkby-in-Ashfield.
September, 1912.

TO ROAD CONTRACTORS AND TAR-PAVIORS.

HIGH-STREET, TWICKENHAM-ROAD AND MANOR-ROAD IMPROVEMENTS.

The Urban District Council of Teddington are desirous of receiving Tenders for the following Works in connection with the Making Up and Improvement of the above—*viz.*:—

134 super. yds. Roadway Formation.
364 lin. yds. 12-in. by 8-in. Norwegian Granite Kerb.
58 lin. yds. Granite Channel and Laying.
580 super. yds. 2½-in. Artificial Stone Paving.
134 super. yds. Tar Paving and Laying.

Plans and Specifications may be seen, Bills of Quantities and Forms of Tender obtained (on payment of £2 2s., which will be returned on receipt of a *bonâ-fide* Tender), on application to Mr. M. Hainsworth, Surveyor, Council Offices, Teddington.

Sealed Tenders, endorsed "Road Works," must be delivered to me, the undersigned, at the Council Offices, Teddington, not later than noon on Saturday, the 5th day of October, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
G. H. SALMONS,
Clerk.

Council Offices,
Teddington.
September 16, 1912.

METROPOLITAN BOROUGH OF SHOREDITCH.

APPOINTMENT OF DRAUGHTSMAN.

The Shoreditch Borough Council invite applications for the appointment of a Draughtsman in the Borough Surveyor's Department, at a commencing salary of £100 per annum, rising by annual increments of £10 to a maximum of £140 per annum. Age between 21 and 30 years.

Applications, on Forms to be supplied, accompanied by copies of not more than two recent testimonials, must reach the undersigned on or before noon on Wednesday, 2nd October, 1912, endorsed "Draughtsman."

Personal canvassing will be a disqualification.

J. A. D. MILNE,
Town Clerk.

Shoreditch Town Hall,
Old-street, E.C.

Royal Sanitary Institute Congress at York.

ENGINEERING AND ARCHITECTURE SECTION.

(Conclusion.)

Among the papers submitted for consideration in the Engineering and Architecture Section of the recent congress of the Royal Sanitary Institute at York was one by Dr. Tempest Anderson dealing with the development of that city.

THE DEVELOPMENT OF YORK.

At the time of the enclosure of York said the reader of the paper, the city's great opportunity in the matter of town planning was lost. In his opinion it would have been quite easy to have retained a "town belt" round the walls, as has been done in most towns in New Zealand. It was even proposed to keep a broad road outside the walls over the site of the present station from outside Micklegate Bar to Marygate, where a bridge was to have been built. This would have allowed the stage coaches from London to the North to have gained the North road in Bootham without entering the city, and would have obviated the necessity of pulling down the beautiful old Ouse Bridge. The proposal never had a fair chance, but was defeated by the opposition of the innkeepers inside the town. About the beginning of the last century the necessity of providing for the through traffic from North to South through the city began to be apparent, and, after prolonged wrangling, an Act of Parliament was obtained for a broad street, extending from Fishergate on the South, through the centre of the city to Bootham Bar on the North road. Parts of this were actually made—viz., Parliament-street and St. Leonard's-place—but before the rest of the street was made the party representing Coney-street interests got into power, and all the works were stopped. Parliament-street became merely a market place, and St. Leonard's-place an ordinary street, so that all the money was wasted, and no through street obtained.

"An attempt," continued Dr. Anderson, "was made a few years ago to complete part of the scheme south of Parliament-street, though not on the original scale, and the most expensive part of the work, a bridge over the Foss, has been executed, but the connecting link to Fishergate yet hangs fire, and will be very expensive, though in the first instance it could have been comparatively cheaply done when the land was worthless swamp. Even when this is completed the link from Parliament-street to St. Leonard's is still wanting, while more money has been spent uselessly in widening Davygate piecemeal than would have made the straight street originally, while untold sums have been spent in widening corners in Coney-street, Nessgate, and making Clifford-street, all of which might have been saved if the original Parliament-street scheme had been carried through.

"This policy of piecemeal widening has been going on all my life. Whenever I have asked any corporation, 'When are you going to take the suburbs in hand?' the answer has always been, 'We have to spend more than we can afford to improve the old city. The suburbs must be left to private enterprise.' The result has been that all the suburbs have grown up as slums without any plan, only short streets of the narrowest width allowed by the by-laws have been built, and houses with every dimension the smallest allowed have been run up. A few years ago new by-laws were obtained, which were, I believe, on the Board of Trade models. I do not believe they even stipulate for any minimum cubic space in the rooms of houses, but they prescribe a minimum width for streets, and that for proposed long streets is greater than that for short. The result has been what might have been expected: no long streets have been built, but only a network of short ones. The new suburbs of Leeman-road and South Bank are in many respects worse than the older ones, such as the Grove."

In the course of further remarks, Dr. Anderson said he had given much thought to the best plan for the development of the York suburbs. During his student's life in London he became familiar with the Bloomsbury squares, which are built on the rectangular plan; and on his first tour abroad in 1869 he was much struck with the construction of Carlsruhe, which is built with streets radiating like the spokes of a wheel, with others connecting them in a circular direction. Both areas had evidently been built brand new on a predetermined plan, but either plan in its entirety was obviously impracticable to be applied to an old straggling city like York. At present there are a great number of roads radiating from York, some of which no doubt required improving, or even supplementing, but the great necessity was for improved communications in a circular direction. A vehicle at Acomb, for instance, requiring to go to Dringhouses must come round by York, a distance of 2 or 3 miles, though less than ½ mile of new road would enable a direct course to be taken at a considerable saving of distance, and almost the same applied to the want of a new road from Heworth, and the Malton-road, say, near Elmfield, to the North-road at Clifton, connecting with the roads to Huntington, Haxby, Wigginton and Rawclift on the way. Any new scheme of town planning for York must therefore include, at any rate, one circular road at the outskirts of the area at present built upon, and keep in view the probabilities of another, further out, in view of further developments.

Concluding, Dr. Anderson said: "The present Corporation of York includes among its members and officials several level-headed and capable men who are fully alive to the necessity of making provision for the future, but it has been explained to me that they cannot go in advance of public opinion, as they are expected to carry out the wishes of their constituents, and are exposed to much criticism, as well as powerful influences, and that anything that can be done outside in the way of educating public opinion will be helpful to them. It is in hopes of this assisting them, and not in any hostile or hypercritical spirit, that I have ventured to bring forward this paper with a view to enlist your sympathy and co-operation. In a matter of this importance, affecting as it does the prosperity of the city, not merely now, but for generations to come, it is essential that the very best plan should be obtained, and for the reasons stated above it is almost impossible that it can be evolved by local councillors or officials; besides which, we ought to have the benefit of the experience of those who have already planned other places abroad, and perhaps at home. If, therefore, the corporation decide to invite competition for plans, and raise a fund for prizes, I am quite ready to subscribe £100 to give it a start. I can only hope that this may lead to the fulfilment of the prophecy by some old Yorkshire witch, whose name I forget (perhaps Mother Shipton): 'Lincoln was, London is, and York shall be: the finest city of the three.'"

DISCUSSION OF DR. ANDERSON'S PAPER.

Mr. F. W. Spurr, city engineer of York, said in regard to town planning in York, some progress was being made in a serious attempt to develop the outskirts of the city on town planning lines. As they would realise, the process it was necessary to be gone through in order to satisfy the Local Government Board was not all that could be desired so far as speed was concerned. But at the same time a very large area in the outskirts of the city was being dealt with, and was now almost complete. With regard to the new street, it would not stop immediately over the Foss Bridge. The whole of the property was being acquired, so that it would link up with Piccadilly, and at the last meeting of the city council the street was called Merchantgate. It was a fact that the greatest inconvenience they had was to get across from one suburb to another, and any scheme taken up in York must have regard for this important necessity. What York was short of was a direct communication between the Fulford-road and the Dringhouses-road, but until they could undertake the planning of the city actually it was very difficult to say what would be the best thing to be done.

Miss G. A. Lowe (Warrington) asked, with reference to the erection of small houses at Hepworth, if they were not going to build them there, where were the people who inhabited those houses to be put? Was it not wiser to arrange some scheme by which the artisan class could have a sort of a model village? She knew it was the general view for most towns to cater for the better classes, but it seemed to her such

a pity that they did not at the same time cater for the lower classes.

Dr. Tempest Anderson, replying, said that question had not been overlooked in York. Mr. Rowntree, of Rowntree's Trust, of which he himself was a trustee, had spent £20,000 in providing for that in arranging the model village. The Holgate Land Company bought a large piece of ground, which they laid out, as they thought, on reasonable lines for the very purpose of providing a small commodious house and broad streets, with good access to them. The first difficulty was the question of sewage; that absorbed a large portion of their capital. Then they were told that they were building the streets a good deal too wide, and a councillor of the corporation who was on the committee, said: "Who is going to pay for those trees and grass margins? Do you propose to endow them, because it will require another man to do this?" They said they thought that if they could buy the land and make roads that might be sufficient. So that instead of encouragement from certain people they got nothing; they were considered visionaries. The result was, they had to borrow money from the insurance company. The dwelling sites did not go off so well as was anticipated, because 1,000 workers were taken from the railway works and sent to Darlington about that time. The interest on their loans increased so much that the insurance company foreclosed their mortgage, and the whole concern was therefore taken over by them. Finally, he was left with one or two small plots, and, sure enough, he had a notice from the Chancellor of the Exchequer intimating an extra tax for undeveloped land. Their experience, therefore, in providing better accommodation without cost to the ratepayers had certainly not been a success. This subject of the planning of York was so important that he would be glad if the corporation offered a prize, or a series of prizes, for the best plan, which should include that ring he had spoken of and the other matters, and he would be happy to contribute £100 towards such a desirable end.

Dr. Armstrong (Newcastle-on-Tyne) said he thought slum property should be dealt with on the lines adopted by the Liverpool Corporation and provide for the very worst of slum dwellers.

Mr. J. S. Brodie (borough engineer of Blackpool) said that in his town they had dealt with the street question in a different way. They saw the owners of the land, and said that if the owners bore the cost of the street up to the width required by the by-laws the corporation would pay the cost of making it the extra width. They recently widened a street and put in sewers, and by the sale of the surplus land were able to recoup themselves for the whole cost.

THE LONDON AND BRIGHTON ROAD.

PROPOSED RELIEF THOROUGHFARE AT CROYDON.

The Roads Improvement Association are making special efforts to secure the adoption, by the Corporation of Croydon, of a scheme for the construction of a new road between Thornton Heath and Purley, in order to relieve High-street, Croydon, of the through traffic which at present so seriously obstructs and congests that thoroughfare.

As a result of the activities of the association and its East Surrey centre, the Corporation Roads Committee and the borough surveyor have been authorised to prepare a comprehensive and detailed scheme and open up negotiations with the bodies and persons concerned. This has been done, and a detailed scheme is to be submitted to the corporation on Monday next.

Briefly, the scheme will entail an expenditure of £67,763. The Road Board have promised a grant of £30,000, and grant promised from other sources account to £5,700, the net cost to the corporation will, therefore, be £32,063. It is estimated that the annual charge for the sinking fund and interest to meet this sum will be approximately £1,600 and the annual cost of the maintenance of the road and footpaths about £1,100.

"THE SURVEYOR" BOOK DEPARTMENT.

In response to suggestions from numerous readers, resident in remote districts at home and abroad, who find it difficult to procure the books they require, we have decided to establish a department for the supply of technical and scientific books, a selected classified list of which will shortly be published in our advertisement pages.

SOME RECENT PUBLICATIONS.*

Modern Road Construction. By Francis Wood, M.Inst.C.E., F.G.S., Borough Surveyor of Fulham, with twenty-five illustrations and a coloured map. Price 4s. 6d. nett. London: Charles Griffin & Co.

Even if we include the sub-title, "A Practical Treatise for the Use of Engineers, Students, Members of Local Authorities, &c.," neither the aim nor the scope of this useful volume is disclosed by the title, and it is therefore desirable that the ground which it covers should be indicated at the outset of a review. It is primarily a study of road crusts from the point of view of the municipal engineer, attention being paid more especially to the part played by tar and bituminous materials in road and street work, but the relative costs of different kinds of paving are carefully considered. The part dealing with the nature and properties of bituminous materials will be of value to road engineers generally, and this section of the book, taken together with the references to water-bound crusts, constitutes a study of considerable importance. Appendix I. contains specifications for the making of streets, and Appendix II. consists of Road Board Specifications 1 to 6. Appendix III. is a two-page table recording the results of traffic enumeration in Fulham.

The volume has, however, a broader aspect, for it includes, not as a separate study, but embodied in different parts, the author's conception of what a road crust is, and clearly expressed opinions which will frequently challenge the attention of county and district engineers. The book is very far from being a treatise on road construction generally, and the word "modern" in the title ought to have been rather "recent developments in," and "road construction" replaced by "the construction of road crusts and of streets." It would not have been easy, within the compass of 133 octavo pages, to have dealt more fully with rural roads, or with road making, without trenching upon the space so usefully employed in giving the results of the author's experience, and his opinions, in his own field.

Dealing now with the subject-matter of the book, it must be pointed out that the introductory chapter must not be taken as indicating the qualities of the book, the general level of which is far above that of this somewhat scrappy chapter, which includes incomplete or wrong statements, such as those relating to ruling gradients and to Indian roads. A ruling gradient of 1 in 22 cannot be approached in many very large areas, and it could, in hilly countries, never be worth while to make secondary and by roads with such a ruling gradient. As regards Indian roads, it is not the fact that the military authorities make these roads throughout India; Mr. Wood has in part confused the past with the present, and has failed to mark the difference between conditions in India generally and those in such parts of that empire as the North-West frontier. Again, in comparing asphalt with macadam, Mr. Wood suggests that asphalt might "be more advantageous than macadam" on steep gradients, "as an asphaltic surface is generally dry and free from mud." In another paragraph, on the opposite page, he has himself suggested that 1 in 60 should be the limiting grade for asphalt, noting that 1 in 40 is not unusual. Another paragraph, which is not quite fair to county engineers particularly, is that dealing with tractive effect on surfaces (p. 5). In many counties and districts surveyors have made broken-stone roads of which it cannot be said that "wet" involves "muddy." The extent to which rural surveyors have succeeded in meeting the wet conditions in some of our rainy counties in the West and North-West is not appreciated in the dry areas and in the towns. As regards the set of the wheels of vehicles, it is to be feared that it is not practicable to fit the wheel to the road, the camber of which, with greater economy in the long run, properly varies according to the circumstances. If, however, Mr. Wood means that wheels with very wide tyres might, in some cases, be fitted with devices which would allow of a little side play, restrained by stiff springs, he will probably be supported by other engineers. With respect to camber (belt of a sloping footway to it that the barrel shape generally accepted, having regard especially to the importance of making main roads safe and convenient for cyclists. Indeed, in the next chapter, the straight slope from the middle third is definitely recommended for roads with gradients steeper than 1 in 100.

In Chapter II. "Macadam Roads" are discussed,

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

and though several of the passages are deserving of praise, it is clear that Mr. Wood's heart is not in this short chapter of nine pages, in which a description of the "present-day macadam road" is given in eight lines, without any suggestion that there is any other way of making a macadam crust, or that a depth of more than 6 in. is often necessary or desirable. Tresaguet and Telford have ten lines between them, and a "modification of Telford foundation" eleven lines. The remarks on dust powder and moisture are, however, well worth attention. As regards abrasion tests, it is impossible to agree with the contention that if stones are firmly held by a suitable matrix all kinds wear alike, nor can it be gathered from Mr. Wood's further remarks that the rigid road specially appeals to him, for in Chapter IV. he suggests that the air enclosed in the voids of a road crust plays an important part. Chapter III., on the "Wear of Roads," extends to only six pages, but is very good matter. It may be suggested that, as regards pressures, sufficient consideration is not given to the distribution of pressure on the subsoil.

The chapter on tarred roads (fourteen pages) includes well-considered treatment of most of the leading points, and should be of much value to students. It is not clear, however, what is intended by the sentence "the writer is of the opinion that tar should only be used where it can be removed from the effects of atmospheric conditions."

In the three following chapters Mr. Wood describes "bitumen" and "methods of using tar and bitumen" in a very capable manner, and there follows a short, but useful, chapter on "rollers and rolling." As regards total compression and the percentage of voids, the view taken by the author probably conforms with ordinary practice; but some engineers would like to see tar-macadam crusts rolled tighter than is usually the case. Excellent use is made of the remaining thirteen pages, which are devoted to "paving" and "cost of maintenance," and the volume concludes with the appendixes already referred to. The book contains twenty-five illustrations, all closely related to and explanatory of the text, and altogether the volume, though it consists of only 133 pages, is equivalent to a much larger book of the kind in which liberal use is made of unimportant illustrations, or of compilation beyond the useful limit. The outside matter included in Mr. Wood's book is all of an authoritative nature, and necessary to the purpose, and the author's frank and lucid observations on matters of prime importance make it a work to be reckoned with.

One mis-print has been noticed, two letters having been trans-posed in the name "Tresaguet."

Preliminary Studies in Bridge Design. By Reginald Ryves, Assoc.M.Inst.C.E., M.S.A., F.R.Met.Soc., M.Cons.E. Price 2s. nett. London: 8t. Bride's Press, Limited.

In these days of computation and the revival of apparently drowned volumes by means of artificial respiration in puffs, it is refreshing to come across a book which is not only written by its author from end to end, but is illustrated by diagrams and sketches specially prepared for the purpose by the same hand. The author begins by recognising five primary types of river crossings, including the type in which the water is given a maximum speed, exemplified further on in the book by diagrams showing his design for a canal "drop" as fully developed, so as to provide a road crossing on an earthen embankment. The principle is one which has been followed in the case of small aqueducts, especially when designed under the influence of Moorish tradition, but Mr. Ryves is apparently the first engineer to apply it to canals or streams of considerable size. The nature of the attack which a stream makes upon a bridge is then studied with the aid of a classification of streams and rivers into three types, without distinction of size, and the problems which arise in the case of a "wandering stream" are carefully considered.

Throughout the book the conception of a bridge as a crossing of the road by the river is never lost sight of, and in considering any particular kind of bridge the author is evidently on the look out for indications that would suggest the economic advantages of a bridge belonging to some other of his five types. Indian experience clearly inspires his treatment of crossings of shallow rivers, but familiarity with the kind of watercourse that is "big enough to be a trout stream" keeps English conditions always in sight. The behaviour of a small stream is, fortunately for the student, very much like the behaviour of a great river—scale for scale. To the regular readers of The Surveyor it may be suggested that the volume form of the articles of which the book is a reprint is worth a place in the bookcase, while the student who begins the study of bridge design with a perusal of this little volume will be beginning at the proper place, with preliminary studies.

Mr. Raymond Unwin, F.R.I.B.A., architect of Letchworth Garden City and Hampstead Garden Suburb, is the author of a highly interesting booklet entitled "Nothing Gained by Overcrowding." Coming, as it does, from one of the leading authorities on the subject in Britain, the case against overcrowding, as presented by Mr. Unwin, is brought home by some striking facts and arguments. He has worked out with minute care and analysis what happens in the development of an estate under the ordinary or by-law method, and the result that is brought about by town planning, which limits the number of houses per acre. He makes it beyond question that the advantages are all on the side of the town planner and the investor. The pamphlet is exceedingly well illustrated by a striking number of charts and diagrams, as well as by photos illustrating the actual difference in houses and ground space which exists between the ordinary and the garden suburb. It is published by the Garden Cities and Town Planning Association, of 3 Gray's Inn-place, W.C., and the price is 3d.

Vol. vii. of the "Transactions" of the Edinburgh Architectural Association, which has just been issued, is a record of the various lectures and addresses delivered before and of places visited by the members of that body in the years 1908 and 1909. A list of members is included in the book.

"Enquire Within upon Poultry and Egg Production" is the title of a useful booklet which Mr. Ralph R. Allen, of Sawbridgeworth, the author, will forward to all interested free on receipt of postcard.

INSTALMENT PAYMENTS FOR ROAD CONSTRUCTION.

SYSTEM CONDEMNED BY DISTRICT AUDITOR

Some time ago the Holborn Borough Council entered into a contract with the Improved Wood Paving Company for the paving of Shaftesbury-avenue, and for the provision of a new concrete foundation, the payments therefor to be spread over a period of fifteen years, and to cover "first cost, interest, repairs, and renewals when necessary." According to the annual report of the council, just issued, the district auditor has condemned this arrangement as "certainly open to legal objection, for it is equivalent to spreading the cost of the new work done in the first year—that is, the major part of the whole work—over a period of years without sanction. The circumstances under which the expenditure was incurred appear to add weight to this objection. The estimates of the year did not include new work. . . ."

We refer to the matter in the present issue in "Minutes of Proceedings."

The Road Board Grants.—The clerk of the East and West Molesey Urban District Council at a recent meeting of that body read a letter from the Reigate Town Council with regard to the manner in which the Road Board had treated local authorities in the county as to grants under the Development and Road Improvements Funds Act. The town council were of opinion that the Road Board was not giving full effect to the intentions of Parliament, as, when the board was constituted, it was clearly laid down that a large portion of the grants made to it should be appropriated for road surface improvements for road widenings, the removal of objectionable corners, and so forth. It was manifest that these conditions were not being complied with, and not a little dissatisfaction had arisen owing to the manner in which applications were met by the Road Board. The Reigate Council asked to be acquainted with the council's views on this important question. The Highways Committee, who had considered the letter, recommended the council to pass a resolution in full sympathy with the action of the Reigate Town Council, and to instruct the clerk to forward a copy of the resolution to the town clerk. The recommendation was unanimously agreed to.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. Thomas, M.Inst.C.E., County Surveyor, Buckinghamshire.

COUNCIL MEETING.

At a meeting of the council, held at the offices of the institution on Saturday, the 7th inst., there were present: Messrs. R. J. Thomas (president, in the chair), W. N. Blair, T. W. A. Hayward, G. A. Phillips, G. F. Carter, W. H. Prescott, J. W. Cockrill, W. T. Lancashire, W. L. Redfern, O. E. Winter, A. E. Collins, A. H. Campbell, H. P. Maybury, W. Stubbs, J. S. Brodie, Thos. Cole (secretary) and H. A. Giles (assistant secretary).

The Constitution Committee reported the election of Mr. A. H. Campbell as chairman, and recommended that a letter be addressed to the hon. district secretaries of the institution reminding them that the time is now ripe for arranging the programme of the winter's work, and asking them to report to the council as to their proposals. An application from the hon. secretary of the South-Eastern District for the use of the offices for a meeting was granted.

The Housing and Town Planning Committee reported the election of Mr. J. W. Cockrill as chairman. A report from Mr. J. S. Brodie was read and ordered to be sent to the committee. Mr. Cockrill gave notice that at the next council he would move that a Town Planning Conference be held in connection with the next annual meeting, and that steps be taken with a view to obtaining the sanction of the Local Government Board to the payment of the expenses of delegates.

The Roads Committee reported the election of Mr. H. T. Wakelam as chairman. Messrs. J. Willmot and the presidents of the English, Scottish and Irish County Surveyors' Societies (for the time being) were co-opted to the committee. On the recommendation of the committee the council resolved to contribute a sum of 100 guineas to the International Roads Congress, 1913.

The Standardisation Committee reported the election of Mr. E. J. Elford as chairman. Messrs. E. B. B. Newton and F. W. Pearce were co-opted to the committee. A specification respecting street lighting was reported upon, and the secretary was instructed to send a copy to each member of the council. The secretary reported that the first edition of the Concrete Flag Specification was exhausted, and the committee were requested to consider certain amendments received from the Concrete Institute.

The Parliamentary Committee reported the election of Mr. A. D. Greatorex as Chairman.

The General Purposes Committee reported the election of Mr. J. Patten Barber as chairman. Messrs. Barber, Blair, J. S. Brodie, Greatorex, Harpur, Newton, Prescott and Winter were appointed further to consider the draft arbitration clause.

The Tramways Committee reported the election of Mr. W. Harpur as chairman, and Mr. A. E. Collins was co-opted to the committee.

The scheme of working of the Mutual Defence Fund was referred to the Constitution Committee. Messrs. Barber, Carter, Hayward, Maybury, Prescott, Scorgie, Wakelam and Winter were elected to the New Offices Committee.

The acting examiners for the October examination were appointed.

The council learnt with regret of the deaths of Messrs. T. Longdin and P. J. Lynam.

Mr. Hayward was elected as delegate to the Plumbers' Registration Council.

Mr. Scorgie was elected as a delegate to the N.A.L.G.O. General Purposes Committee.

An application for legal advice was referred to the president and secretary.

The Finance Committee reported the election of Mr. T. W. A. Hayward as chairman.

Elected as Members: Messrs. A. F. Churchill, first assistant to Director of Public Works, Hong Kong; R. E. Wilson, engineer and surveyor to the Knaresborough Urban District Council; E. D. Groves, surveyor and waterworks engineer, St. Austell; G. M. Seels, assistant engineer and surveyor, New Malden, Surrey; H. V. Snook, surveyor and inspector, Petersfield Rural District Council; G. C. Mitchell, assistant borough engineer, Stockton-on-Tees; J. E. Wilkes, town planning engineer to the burgh of Dunfermline; and T. H. Maxwell, surveyor to the Fylde Rural District Council, Kirkham.

Elected as Associate Members: Messrs. B. C. Hammond, senior surveying assistant, road surveyor's department, Worcestershire, and L. A. Cooper, first assistant, Chiswick Urban District Council.

Elected as Students: Messrs. J. W. Hill, city surveyor's office, Wakefield; H. Cliffe, surveyor's assistant, Mexborough; G. Kershaw, surveyor's office, Stretford Urban District Council; and R. W. Taylor, Town Hall, Gosport.

(By order of the Council)

Thomas Cole,
Secretary.

EASTERN DISTRICT MEETING AT GRAYS.

District Chairman—Mr. A. Fidler, M.Inst.C.E., Northampton.

An Eastern District meeting of the Institution of Municipal and County Engineers is to be held at the council offices, High-street, Grays, to-morrow (Saturday).

Programme.

11 a.m.—Meet at the council offices, High-street. Members will be received by Mr. H. E. Brooks, J.P., chairman of the urban district council.

11.15 a.m.—Formation of District Executive Committee. Paper, entitled "Municipal Works of Grays," by Mr. A. C. James, Assoc.M.Inst.C.E., surveyor to the urban district council (member).

11.30 a.m.—Discussion.

11.45 a.m.—Drive to the "Beach" Recreation Ground and open-air swimming pond, new infant school and school baths, Bridge-road, and thence to the Wouldham Cement Works.

1 p.m.—Light refreshments, by kind invitation of the Wouldham Cement Company.

1.30 p.m.—Inspection of the cement works.

3.30 p.m.—Proceed to the works of Messrs. Siegwart, Limited, to inspect the manufacture and testing of their reinforced concrete pipes.

Tea kindly provided by Messrs. Siegwart, Limited.

E. J. Elford,
Hon. District Secretary,
Southend-on-Sea. Borough Surveyor.

EAST MIDLAND DISTRICT MEETING AT ILKESTON.

District Chairman—Mr. E. G. Mawbey, M.Inst.C.E., Leicester.

An East Midland District meeting will be held at the Town Hall, Ilkeston, on Saturday, September 28th.

Programme.

10.45 a.m.—Reception by the mayor, Councillor S. Shaw, J.P., at the town hall.

11 a.m.—Special cars to Hallam Fields for Stanton Ironworks.

11.30 a.m.—Visit Stanton Ironworks.

1 p.m.—Lunch (kindly provided by the company) at the Stanton Ironworks Company's Hotel.

1.45 to 2.30 p.m.—Formation of District Executive Committee. Discussion on papers (which will be taken as read): "Ilkeston Sewage Disposal Works," by Mr. H. P. Raikes, engineer; "Twenty-eight Years' Municipal Work at Ilkeston," by Mr. H. J. Kilford, borough surveyor; "Ilkeston Tramways and Electricity Supply," by Mr. H. P. Stokes, borough electrical engineer.

3 to 4 p.m.—Inspection of the new sewage disposal works. The party will be conducted over the works by the engineer, Mr. H. P. Raikes.

4.10 p.m.—Special cars to the town hall, where tea will be provided.

Should time permit, a visit will be paid to the car sheds, police station, free library, cemetery chapels, lodges, gasworks, &c.

In order that the necessary arrangements may be made, members must give notice of their intention to be present not later than Saturday, September 21st, when a copy of the papers will be sent in due course.

R. A. MacBeath, M.Inst.C.E.,
Hon. District Secretary,
Lincoln. City Engineer.

EXAMINATION.

The October, 1912, examination will be held in Birmingham on the 10th, 11th and 12th of that month.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. E. A. STICKLAND, ASSOC.M.INST.C.E., Borough Surveyor, Windsor.
President-Elect—Mr. FRANK LATHAM, M.INST.C.E.I., F.S.E., Borough Engineer and Surveyor, Penzance.

NORTH-WESTERN DISTRICT.

A meeting of this district will be held at the Victoria Hotel, Manchester, on Wednesday, the 25th inst., at 7.30 p.m.

BUSINESS.

(1) To consider the extension of the area of this district.
(2) To fix date, &c., of proposed social.
(3) To discuss Mr. Bleazard's paper on "Municipal Progress in Clitheroe."
(4) General discussion to be opened by Mr. Foster (Salford).

J. W. CLEAVE.
"Brantwood," *Hon. District Secretary.*
Coomassie-street,
Heywood.
September 12, 1912.

ANNUAL GENERAL MEETING.

The fourth annual general meeting of the Institution of Municipal Engineers will be held in London on Friday and Saturday, October 11th and 12th next.

PROGRAMME.

Friday, October 11th.

11 a.m.—Meet in the council chamber, No. 4 Southampton-row, London, W.C.
11.15 a.m.—Annual general meeting:—
Minutes of last meeting.
Election of council for the year 1912-13.
Presentation of annual report of council.
Announcement of result of ballot.
Presidential address.
1 p.m.—Adjourn for lunch.
2 p.m.—Reassemble in council chamber.
2.15 p.m.—Discussion on the following papers to be presented to the meeting:—
"The Modernising of Building By-laws," by F. W. Platt (member).
"The L.G.B. Report on Intercepting Traps," by H. C. H. Shenton (member).
"The Influence of Town Planning upon the Public Health," by W. Louis Carr (member).
"Superannuation and Security of Tenure," by A. Winter Gray (Member).

(The papers will be taken as read, and advance copies may be obtained on application to the secretary, and will be forwarded as soon as the papers are in print.)

5 p.m.—Close of meeting. Ladies return to council chamber.

LADIES' MEETING.

(Held concurrently with General Meeting.)

11 a.m.—Meet in the council chamber, No. 4 Southampton-row, London, W.C.
11.15 a.m.—Leave council chamber and proceed to the stores of Messrs. Selfridge & Co., Oxford-street, W.
11.30 a.m.—Meet at the Duke-street entrance of the stores, where visitors will be met by a representative of the firm and conducted round the building.
1 p.m.—Lunch.
2.30 p.m.—Meet at the showrooms of Messrs. Doulton & Co., Limited, Lambeth, S.E., who have kindly arranged to conduct the visitors through their works and showrooms.
4.30 p.m.—Leave Messrs. Doulton's works.
5 p.m.—Arrive at council chamber, Southampton-row.
6.45 p.m.—Reception by the president at the Holborn Restaurant, followed by (7 p.m. to 11.30 p.m.) social evening, with musical programme, at the invitation of the president. Morning dress.

Saturday, October 12th.

10.30 a.m. Visit to Shakespeare's England, Earl's Court. Meet in booking hall, Earl's Court Station.
12.30 p.m.—Adjourn for lunch.
2.30 p.m.—Visit to the London Hippodrome.

B. WYAND,
39 Victoria-street, S.W. *Secretary.*

INSTITUTION OF WATER ENGINEERS.

VISIT TO SOUTH WALES.

To-morrow (Saturday), by invitation of Mr. C. H. Priestley, M.INST.C.E., engineer for the works, a visit will be paid by the members of the Institution of Water Engineers to the Llwyn-on reservoir, in course of construction for the Corporation of Cardiff.

PROGRAMME.

9.15 a.m.—Train leaves Cardiff (Rhymney Station) for Merthyr.
10.40 a.m.—Brakes leave Merthyr for Cefn-Coed, whence the party will be conveyed by the contractors' light railway to the Llwyn-on reservoir works, passing the Sychpant limestone quarry *en route*.
11.30 a.m.—Arrive at the works, which will be inspected under the personal guidance of Mr. C. H. Priestley and his staff. The drawings will be arranged for inspection at the office. A paper, descriptive of the reservoir, by Mr. Priestley, will be circulated among those taking part in the visit.
1.15 p.m.—Luncheon served in the mission hall.
2.15 p.m.—Brakes leave the works for the Cantreff reservoir (opened 1892) and for the Beacons reservoir (opened 1897), whence the drive will be continued to the top of the gathering ground, returning to Merthyr *viâ* the Cefn-Coed balancing reservoir, which will be inspected *en route*.
4.30 p.m.—Train leaves Merthyr for Cardiff, arriving at Rhymney Station 5.40 p.m.
6.8 p.m.—Train leaves Cardiff (G.W. Ry. Station), arrives Cheltenham 8.16 p.m., Birmingham 9.50 p.m.
6.43 p.m.—Train leaves Cardiff (G.W. Ry. Station), arrives Paddington 9.35 p.m.
7 p.m.—Train leaves Cardiff (G.W. Ry. Station), *viâ* Hereford, arrives Birmingham 10.20 p.m.

Arrangements have been made with the manager of the Park Hotel, Cardiff, to accommodate members and visitors on special terms: Bed, breakfast and attendance, 7s. 6d.; bed, breakfast, dinner and attendance, 10s. 6d. A smoking and conversation room will be reserved this evening for the use of those taking part in the visit.

MUNICIPAL TRAMWAYS ASSOCIATION.

ANNUAL CONFERENCE, WEST HAM.

The annual conference of the Municipal Tramways Association (Incorporated) will be held in West Ham on September 25th, 26th and 27th next. De Keyser's Hotel, Victoria Embankment, E.C., has been selected as headquarters for delegates, and the following programme has been arranged:—

September 25th.

10.15 a.m.—Reception by the Mayor and West Ham Council.
10.30 a.m.—Presidential address by Mr. H. E. Blain, tramways manager, West Ham.
Paper: "Tramways Administration by Municipalities: A Retrospect and a Forecast," by Mr. Councillor S. C. T. Neumann, deputy-chairman Bradford Tramways Committee.
1 p.m.—Luncheon.
2 p.m.—Proceed to Tramways Depot, Greengate-street, Plaistow, by special cars.
2.15 p.m.—Discussion on the interim report of the Corrugation Committee.
3.30 p.m.—Inspection of depot and of the Exhibition of Tramway Appliances, &c.
7.30 p.m.—Corporation reception at the town hall.

September 26th.

10 a.m.—Paper: "Tramway Fares and their Basis," by Mr. W. J. McCombe, tramways manager, Hull.
12.15 p.m.—Luncheon.
1.15 p.m.—Proceed by special cars to tramway depot.
1.30 p.m.—Meeting of managers' section.
1.30 to 3 p.m.—Inspection of depot and Exhibition of Tramway Appliances.
3 to 5 p.m.—Garden party in West Ham Park.
7 for 7.30 p.m.—Association dinner at the Liverpool-street Hotel, E.C.

September 27th.

9.45 a.m.—Annual business meeting at De Keyser's Hotel.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

President—Mr. JOHN D WATSON, M.INST.C.E., F.R.S.I.

YORKSHIRE DISTRICT MEETING.

By kind permission of Councillor W. G. England, J.P., chairman of the Sewage Works Committee, the members of the above association will visit and inspect the Barnsley sewage works to-morrow (Saturday).

Objects of Interest.—Screening chamber, suction-gas-pumping plant, sedimentation tanks, percolating filters, 100-ft. and 120-ft. diameter distributors, and syphon sewer.

PROGRAMME

2.30 p.m.—Reception in the town hall by his Worship the Mayor, Councillor J. H. Cotterill, J.P., and the chairman and members of the Works Committee.

p.m.—Proceed to the works, which are situated about 2 miles from the town. Conveyances will be provided.

3.20 p.m.—Descriptive paper will be given by Mr. J. Henry Taylor, ASSOC.M.INST.C.E., borough engineer and surveyor, who will also conduct the visitors over the works, assisted by the manager, Mr. Chas. M. King.

5 p.m.—Tea, by kind invitation of the chairman, Councillor W. G. England, J.P., at the Imperial Hotel.

The works have been recently reconstructed, and are well worth a visit.

ROBERT TYSON,
Hon. District Secretary.

Queensbury Sewage Works,
Amblethorn,
Nr. Halifax.

METROPOLITAN DISTRICT MEETING.

An inspection of the St. Albans sewage disposal works will be made by the members of the Association of Managers of Sewage Disposal Works on Saturday, September 28th, at 2 p.m.

The works comprise sedimentation tanks, sludge receiver, sludge distributing main, coarse contact beds, percolating filters, Fiddian travelling distributors, humus tank, final land treatment, &c. The pumping plant comprises a Teasdale suction-gas plant, two 12 h.p. gas engines, and two 6-in. centrifugal pumps.

PROGRAMME

Assemble at entrance to works near Park-street Station (L. and N.W. Rly.).

The party will be conducted over the works by Mr. A. Eade, the manager, who will explain the system of treatment.

A paper will be read by Mr. H. Howard Humphreys, Westminster.

His Worship the Mayor and other members of the corporation have promised to be present.

Those attending to be present will please notify the undersigned on or before Thursday, September 26th.

JAS. CRAIG,
Hon. District Secretary.

66 Empress-avenue,
Manor Park, E.

ROYAL SANITARY INSTITUTE.

PROVINCIAL SESSIONAL MEETING, LEWES.

At a meeting of the Royal Sanitary Institute, to be held at the Town Hall, Lewes, on Friday, October 4th, at 7 p.m., Mr. D. Roberts, the borough surveyor of that town, will open a discussion on "The New Sewerage System for Lewes, with Special Reference to the Discharge of Effluents into Tidal Streams," among those advertised to take part in the proceedings being Messrs. John H. Blizard, ASSOC.M.INST.C.E., Southampton, A. J. Martin, M.INST.C.E., Westminster, and A. E. Prescott, borough engineer and surveyor, Eastbourne.

The chair will be taken by Mr. H. Percy Boulnois, M.INST.C.E., chairman of council of the institute.

On the following morning the members will visit the Pipe-x Brickwork, and the Lewes Portland Cement and Lime works, and in the afternoon inspect the Lewes Victoria Hospital, the borough isolation hospital, the fire brigade station, and the waterworks.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

DISTRICT SURVEYOR.—September 21st.—Mutford and Lothingland Rural District Council. £125 per annum.—Mr. E. S. Norton, clerk.

TOWN PLANNING ASSISTANT.—September 23rd.—Corporation of Halifax. £150 per annum.—Mr. Percy Saunders, town clerk.

ROAD FOREMAN.—September 23rd.—Rushden Urban District Council. 35s. per week.—Mr. W. B. Madin, engineer and surveyor. Applications to be endorsed "Road Foreman."

CLERK OF WORKS.—September 23rd.—Deptford Borough Council. £3 10s. per week.—Mr. V. Orchard, town clerk.

ENGINEER'S ASSISTANT.—September 25th.—Watford Urban District Council. £100 a year.—Mr. W. Hudson, clerk.

INSPECTOR OF NUISANCES AND SURVEYOR.—September 25th.—Skegness Urban District Council. £100—£150.—Messrs. Tweed Stephen & Co., clerks.

INSPECTOR OF NUISANCES.—September 28th.—Corporation of Bradford. £85 per annum.—Mr. F. Stevens, town clerk.

CITY ARCHITECT AND SURVEYOR.—September 28th—November 1st.—Corporation of Calcutta. £90 per month.—The Hon. S. L. Maddox, C.S.I., I.C.S., chairman of the Corporation of Calcutta, East India United Service Club, 16 St. James's-square, London, S.W., or (up to November 1st) Mr. C. C. Chatterjee, secretary, Corporation of Calcutta.

CLERK OF WORKS.—October 2nd.—Hayes Urban District Council. £3 per week.—Mr. C. D. Lewis, clerk.

CHIEF ENGINEER AND COUNTY SURVEYOR.—October 7th.—London County Council. £2,000.—Sir Laurence Gomme, clerk.

DEPUTY CITY SURVEYOR.—October 19th.—Corporation of Manchester. £500 per annum. Mr Thos. Hudson, town clerk. Applications to be endorsed "Deputy City Surveyor."

ASSISTANT ENGINEER.—For the Government Waterworks in the Gold Coast. £650 per annum. Age between twenty-five and forty. Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W. Quote M. 5,605 on left-hand top corner of application.

ASSISTANT ROADS ENGINEER. Government of Southern Nigeria. £300—£400.—Mr. A. M. Buchanan, Government contractor, Suffolk House, Laurence Pountney-hill, E.C. Preference given to a man trained by the Kent municipal engineer.

MUNICIPAL COMPETITIONS OPEN.

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RANGOON.—September 28th—February 1st.—The date in the conditions in Clause 28 has been altered from August 31st to September 28th and in Clause 14 from January 1st to February 1st, 1913. The latest date for posting letters to reach Rangoon by February 1st will be by the Indian mail of January 10th.

LLANELLY.—September 30th.—Competitive designs and estimates for school buildings for over 1,000 children, also domestic subjects centre, for the Education Committee.—Mr. G. E. Halliday, F.S.A., F.R.I.B.A., Castle-street, Cardiff, will act as assessor and award premium.—Mr. I. W. Watkins, clerk, Education Offices, Coleshill-terrace, Llanelly.

WANDSWORTH.—October 14th.—Competitive designs for public swimming bath at Balham.—Mr. P. Dodd, borough engineer, 215 Balham High-road, S.W.

GLASGOW.—October 29th.—Preliminary sketch designs are invited by the corporation for the extension of the municipal buildings. Honorariums of 100 guineas to five selected designs.—Mr. John J. Burnet, A.R.S.A., 239 St. Vincent-street, Glasgow, is assessor.—Applications to the clerk, Mr. J. Lindsay, town clerk.

LLANDUDNO. October 31st.—Designs for laying out about 20 acres, for the urban district council. A premium of 50 guineas is offered.—Mr. A. Conolly, clerk.

HUDDERSFIELD.—October 31st.—Designs for laying out certain areas as a town planning scheme, for the corporation. Premiums of 100, 50, and 25 guineas. —Mr. J. Henry Field, town clerk.

ROSCREA.—November 1st.—Plans, specifications, and estimates of a sewerage system, for the Roscrea No. 1 Rural District Council. £21 to be awarded to the best plan. -Mr. T. Hoodley, clerk, The Workhouse.

ORSETT (Essex).—January 1st. For the construction of a sewerage and sewage disposal scheme in the parish of South Ockendon, for the Orsett Rural District Council. Premiums of £50 and £25 are offered.—Mr. James Beck, clerk, 2 Orsett-road, Grays.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

Buildings.

ENFIELD.—September 23rd.—For the erection of medical superintendent's quarters and four cottages, for the Joint Hospital Board.—Mr. R. Collins, Public Offices, Enfield.

BLACKBURN.—September 23rd.—For the erection of public halls, for the corporation.—Mr. L. Beard, town clerk.

STAFFS.—September 23rd.—For the erection of a school, for the Education Committee.—Mr. Graham Balfour, director.

BOURNEMOUTH.—September 23rd.—For the erection of a fire station and other works, for the corporation.—Mr. F. Lacey, borough architect.

HAMPSHIRE.—September 24th.—For the erection of a corrugated iron cookery room, for the county council. Mr. A. L. Roberts, architect, The Castle, Winchester.

LANARK.—September 24th.—For the construction of two bridges, for the county council. Mr. W. E. Whyte, district clerk, District Offices, Hamilton.

SOUTHAMPTON.—September 24th.—For the erection of a corrugated iron cookery room for the county council.—Mr. H. Barber, clerk, The Castle, Winchester.

SOMERSET.—September 25th.—For the erection of an infants' school, for the county council. County Education Office, Weston-super-Mare.

SALFORD. September 26th. For alterations and additions to town hall and sessions court, for the corporation. Mr. J. B. Broadbent, 15 Cooper-street, Manchester.

GLAMORGAN. September 25th. For improvements and alterations to schools, for the county council. The Clerk, County Hall, Cardiff.

HAMPSHIRE.—September 26th.—For the erection of a classroom and alterations to building, for the county council.—Mr. H. Barber, clerk, The Castle, Winchester.

MONTGOMERY.—September 26th.—For the erection of a school, for the Education Authority.—Mr. L. Phillips, clerk, County Education Offices, Newtown.

HALIFAX.—September 27th.—For the erection of a staircase at a school, for the Education Committee.—Mr. W. H. Ostler, secretary, Education Offices.

NELSON.—September 28th.—For the construction of a bridge, for the corporation.—Mr. W. Shackleton, borough engineer.

GREAT YARMOUTH.—September 30th.—For extensions to the fire brigade and police station.—Town Clerk.

ENFIELD.—October 1st.—For the erection of a school and cottage, for the Education Committee.—Mr. N. Hepworth, clerk.

LONDON.—October 1st.—For the erection of training college and hostel, and adapting existing house for a hostel, for the county council.—Sir Laurence Gomme, clerk.

NORTH RIDING.—October 2nd.—For the erection of a cookery and manual instruction room, for the Education Committee.—Mr. J. C. Wrigley, secretary, County Education Offices, Northallerton.

GREENOCK.—October 2nd.—For the erection of a school, for the School Board.—Mr. A. F. Niven, clerk, Municipal Buildings, Greenock.

SOUTHEND-ON-SEA.—October 2nd.—For the erection of pumping station and destructor buildings, inclined roadway, two cottages, and other works at the sewage disposal works, for the corporation.—Mr. H. J. Worwood, town clerk.

ALTRINCHAM.—October 7th.—For the erection of a public convenience, for the Sanitary Committee.—Mr. H. E. Brown, surveyor.

Iron and Steel.

MERTHYR.—September 23rd.—For the supply of cast-iron pipes and specials, for the corporation.—Mr. T. A. Rees, town clerk.

WHITEFIELD.—September 24th.—For the supply of ten ventilation columns, for the urban district council.—Mr. G. M. Denton, engineer and surveyor.

LONDON.—September 27th.—For the supply of cast-iron segments, for the Metropolitan Water Board.—The Clerk, Savoy-court, Strand, W.C. Tenders to be endorsed "Tender for cast-iron well segments, Shortlands."

LEEDS.— September 30th—October 7th.—For the erection of steel and corrugated-iron building, and constructing surface-water drainage, for the Tramways Committee.—Chairman of the Tramways Committee.

BRIDLINGTON.—September 30th.—For carrying out a water main extension, for the rural district council.—Mr. Geo. Hankinson, clerk.

HARROGATE.—September 30th.—For the extension of the royal pump-room, for the town council.—Mr. C. E. Rivers, borough engineer.

Roads.

TAMWORTH.—September 21st.—For the supply of granite, for the rural district council.—Mr. H. J. Clarson, surveyor of highways.

SMALLTHORNE.—September 23rd.—For carrying out street works, for the urban district council.—Mr. G. Phillips, clerk.

FELTHAM.—September 23rd.—For the supply of granite, for the urban district council.—Mr. G. Stevens, surveyor. Tenders to be endorsed "Tender for granite."

NANTYGLO AND BLAINA.—September 23rd.—For the supply of limestone granite, limestone chippings and granite chippings, for the urban district council —Mr. H. J. V. Shepard, clerk.

UXBRIDGE.—September 23rd.—For work of steam rolling and scarifying, for the urban district council. -Mr. W. T. Harvey, clerk.

RUNCORN.—September 23rd.—For making-up work with tar-macadam and ordinary macadam, for the rural district council.—Mr. H. Swetenham, surveyor, 49 Northgate-street, Chester.

HANWELL.—September 23rd.—For the supply of broken Guernsey granite, Kentish pit flints and distilled tar, for the urban district council.—Mr. Percy Scott, clerk.

PLYMOUTH.—September 23rd.—For making up several streets, for the town council.—Mr. J. Paton, borough engineer.

BLAINA (Mon.). September 23rd. For the supply of limestones, granite and chippings, for the urban district council.—Mr. W. J. Davies, surveyor.

BROMLEY.—September 24th.—For work of making up, for the corporation.—Mr. F. H. Norman, town clerk.

TOTTENHAM.—September 24th.—For the disposal by the urban district council of a 10-ton steam roller, fitted with scarifier.—Mr. Edward Crowne, clerk.

TOTTENHAM.—September 24th.—For the supply of a 10-ton single-cylinder steam road roller, fitted with an approved road scarifier, for the urban district council.—Mr. Edward Crowne, clerk.

ST. NEOTS.—September 24th.—For the supply of broken granite, Rocmac and Ferromac, for the urban district council.—Mr. J. Edey, surveyor.

SHOEBURYNESS.—September 24th.—For the supply of broken granite, for the urban district council.—Mr. F. Gregson, clerk.

FLEET.—September 24th.—For the supply of macadam, shingle and hoggin, for the urban district council.—The Surveyor.

SHERBORNE.—September 24th.—For forming a new road and footpath, for the urban district council. Mr. Duncan Brown, surveyor.

HARWICH.—September 25th.—For making up a road, for the corporation.—Mr. F. H. French, borough surveyor. Tenders to be endorsed "Making up of South Cliff-road."

WANSTEAD.—September 25th.—For work of steam rolling, for the urban district council.—Mr. Bruce Blewitt, clerk.

WILTON.—September 25th.—For the supply of flints, for the rural district council.—Mr. G. M. Wilson, clerk, 12 Bridge-street, Salisbury.

HAMMERSMITH.—September 25th.—For work of paving, for the borough council.—Mr. H. Mair, borough surveyor.

ENFIELD.—September 25th.—For private street works in parts of Durants-road and Malvern-road, for the urban district council.—Mr. T. W. Scott, clerk.

BELFAST.—September 25th.—For the supply of setts, for the Harbour Commissioners.—Mr. W. A. Currie, secretary.

KIRKHAM.—September 25th.—For making up a private street, for the urban district council.—Mr. W. J. Dickson, clerk.

GRIMSBY.—September 26th.—For road improvement work, for the rural district council.—Mr. J. F. Wintringham, clerk.

COCKENZIE.—September 28th.—For the construction of macadam roads, for the town council.—Mr. R. Tulloch, burgh surveyor.

KNUTSFORD.—September 30th.—For making good certain roads, for the urban district council.—Mr. E. L. Ashworth, clerk.

FAVERSHAM.—September 30th.—For the supply of granite or basalt, and chippings, for the corporation.—Mr. G. Tassell, town clerk.

SHREWSBURY.—September 30th.—For making up Water-street, for the corporation.—Mr. W. Chapple Eddowes, borough surveyor.

CHICHESTER.—October 1st.—For the supply of 1,000 tons of 2-in. broken granite, basalt, or other approved material, for the corporation.—Mr. J. W. Loader, town clerk.

TANGIER.—October 3rd.—For the construction of a road 1¼ miles long, for the Committee of Public Works.—Specifications may be obtained at the Intelligence Branch of the Board of Trade, 75 Basinghall-street, E.C.

SWANSEA.—October 3rd.—For works of road widening, for the rural district council.—Mr. E. Harris, clerk.

SHEERNESS.—October 15th.—For the supply of basalt or granite, Kentish ragstone, hoggin and Thames ballast, for the urban district council.—Mr. V. H. Stallon, clerk.

Sanitary.

NELSON.—September 21st.—For the laying of a pipe sewer, for the corporation.—Mr. W. Shackleton, borough engineer.

COLWYN BAY.—September 23rd.—For the construction of pipe sewer, for the urban district council.—Mr. J. Amphlett, clerk.

ALNWICK.—September 23rd.—For the construction of two inspecting sewers, for the rural district council.—Mr. H. W. Walton, clerk.

WHITEFIELD.—September 24th.—For the construction of sewerage and sewage disposal works, for the urban district council.—Mr. Chas. Bradshaw, clerk.

SOUTHAMPTON.—September 24th.—For the construction of soil and storm-water sewers, for the corporation.—Mr. R. R. Linthorne, town clerk.

DUNDEE.—September 24th.—For the supply of disinfectants and soaps, for the corporation.—Mr. W. H. Blyth, town clerk.

WIGAN.—September 25th.—For cleansing ashpits and cesspools, for the rural district council.—Mr. H. G. Ackerley, clerk.

LARNE.—September 25th.—For the execution of a complete sewerage scheme, for the rural district council.—Mr. S. M. Wallace, clerk.

REDDITCH.—September 26th.—For laying pipe sewers, for the urban district council.—Mr. A. J. Dickinson, engineer and surveyor.

COCKERMOUTH.—September 27th.—For the cutting of trenches, and construction of manholes, flush tanks, ventilators, sedimentation tanks, and percolating filters, for the rural district council.—Mr. J. B. Wilson, Grecian Villa, Cockermouth.

NELSON.—September 28th.—For the construction of sewers and sewage works extensions, for the corporation.—Mr. W. Shackleton, borough engineer.

SOUTHWICK.—September 28th.—For the construction of surface-water drains and outfall sewer, for the urban district council.—Mr. G. W. Warr, surveyor.

CAIRO.—September 30th.—For sanitary installations, for the Office of Public Works.—Administrative Service, Public Works Ministry, Cairo.

WATFORD.—September 30th.—For the supply of concrete tubes of 36 in., 30 in., and 21 in., for the urban district council.—Mr. W. Hudson, clerk.

BLEAN.—September 30th.—For the construction of sewage disposal works, for the rural district council.—Mr. F. A. Ward, Roseneath, Eddington, Herne Bay.

WATFORD.—September 30th.—For the construction of storm-water drainage and sewerage works, for the urban district council.—Mr. D. Waterhouse, engineer and surveyor.

TIPTON.—September 30th.—For the erection of public conveniences, for the Education Committee.—Mr. W. H. Jukes, surveyor.

STALYBRIDGE AND DUKINFIELD.—September 30th.—The Joint Sewerage Board notify that the time for the receipt of tenders for the extension of the Bradley Hurst works has been extended to September 30th.

EAST GRINSTEAD.—October 2nd.—For the construction of sewage disposal works, comprising detritus tanks, settling tanks, storm water, standing tanks, filter-beds, humus tanks, laying sewers and the construction of manholes, for the rural district council.—Mr. Francis S. White, clerk.

BRAILA (Roumania).—October 3rd—7th.—For work of drainage and laying conduits, at the estimated cost of £16,000, for the corporation.—Primaria Orasului Braila, Roumania.

BRADFORD.—October 9th.—For the construction of circular outfall sewer in tunnel, and two shafts, for the corporation.—Mr. Frederick Stevens, town clerk.

Stores.

FOLESHILL.—September 24th.—For the supply of brushes, spades, picks, cement, road lines, petroleum, Vax cylinder oil, engine oil, and cotton waste, for the rural district council.—Mr. A. P. Oswin, clerk.

Miscellaneous.

BROADSTAIRS.—September 23rd.—For water-softening house and ferro-concrete tanks, cast-iron pipes and specials, and sluice valves, for the urban district council.—Mr. L. A. Skinner, clerk.

ANDOVER.—September 24th.—For paving, sewerage, construction of water main and services, and team work, for the corporation.—Mr. R. Walter Knapp, borough surveyor.

KINGSTON-UPON-THAMES.—September 28th.—For the supply of sulphuric acid, for the corporation.—Mr. Harold A. Winser, town clerk.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ABERDEEN.—For the extension of the fish market, for the corporation. Mr. W. Dyack, burgh surveyor:—

Mason and Bricklayer Work.—W. Farquharson & Son, Aberdeen, £2,173.

Steel Work.—J. M'Millan & Co., Glasgow, £2,137.

ASHINGTON.—Accepted for cleansing ashpits and privies, for the urban district council:—

Districts No. 1 and 4.—Ashington Coal Company, Northumberland, £975 and £3,784.

Districts 2and 3.—E. Davison, Ashington, £326 and £128.

Districts 5 and 6.—E. Curtis, Hirst, £864 and £589.

BLAYDON-ON-TYNE.—For making up a road, for the urban district council:—

H. Bowers, Rowlands Gill	£1,992
W. G. Armstrong, Blaydon-on-Tyne	1,592
Hisco & Smith, Rowlands Gill	1,577
Johnson & Strong, Stanley, Co. Durham	1,488
J. W. Henderson, Newcastle-on-Tyne	1,309
J. Friend & Co., Blaydon-on-Tyne	1,267
G. Armstrong, Whitley Bay	1,244
E. R. Dawson, Blaydon-on-Tyne*	1,118

BROMLEY.—For work of steam-rolling, for the rural council:—

Pamphlin & Sons, Cambs., 25s., 4s.

Chattenden & Summonds, Limited, Maidstone, 25s., 2s. 6d.

Edbrson Steam Rolling Company, Dorchester, 25s. 6d., 2s. 9d.

Thos. Rowley, Jun., West-green, N., 18s. 6d., 2s. 6d.

T. Wood & Son, Limited, Swanley Junction, 18s. per day, scarifying, 2s. per hour.*

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

The Ventilation of Sewers.

In view of the renewed interest in the question of sewer ventilation caused by the recent Local Government Board report upon the intercepting trap, the paper by Mr. T. de Courcy Meade, M.INST.C.E., city surveyor of Manchester, which we print on another page, appears at a very appropriate time, and will be read with interest by all who have to deal with this problem. The paper is full of information, and the results of the experiments carried out in London and Manchester are particularly valuable. The observations on air currents in sewers showed that where sufficient free openings were provided the direction and force of the wind exercised a great influence, and overbalanced all other local conditions due to temperature, gradients, character of sewage, and so forth. This fact is now becoming more generally known, and is being recognised as the most important factor which has to be taken into consideration in any attempts to solve the problem. It is also undoubtedly the reason why the many ingenious methods of artificial ventilation and deodorisation have failed, in a greater or lesser degree, to produce the results which were anticipated. The author's conclusions are excellent and well set out. Although it is generally acknowledged that all sewers should be kept clean by flushing, this is not always carried out so thoroughly as it might be. The author's conclusion "that the *regular* and *efficient* flushing of sewers with fresh water is a more important desideratum than the introduction of large volumes of air . . ." is well illustrated by the case he quotes, and confirmed by the work done in Hampstead by the borough engineer and surveyor, Mr. O. E. Winter, A.M.INST.C.E. (See THE SURVEYOR August 16, 1912, pages 225 and 233.)

In the penultimate paragraph of his paper Mr. Meade refers to the experiments made by Professor Delepine, the results of which practically confirm those obtained by other investigators, which show that the presence of bacteria in sewer air, when found, is due to splashing or other disturbance of the sewage. It is specially interesting also to learn that an elaborate system of experiments has been commenced by Professor Delepine at the Public Health Laboratory, Manchester, to estimate the influence of sewer air upon health. In view of the conclusions arrived at by the Departmental Committee of the Local Government Board in its report upon the intercepting trap to the effect that, bacterially, sewer air is less dangerous than drain air, the result of these experiments will be anxiously awaited, as it is the one thing lacking in the Local Government Board report, and is required to satisfy those who view with distrust the recommendations for the abolition of the intercepting trap. In order to prevent adverse criticism, however, we suggest that these experiments should be conducted upon practical lines. For example, the sewer air used for the experiments should be taken after discharge at the top of a soil pipe on a house drain which is *not* disconnected from the sewer; in fact, the conditions which would exist if the recommendations in the Local Government Board report were adopted in their entirety should be provided.

* * * *

Rubber and Leather, as Measuring the Value of a Road Crust.

It is a fallacy that the cost of maintenance can be fully measured by money spent annually in the upkeep of a road regardless of other factors. The service performed by the road must necessarily be taken into consideration—that is, the value of the road compared with what it might be under the conditions brought about by reasonable variations in the methods adopted and materials employed. No comparison is here made between one road and another or one class and another, these remarks being confined to a consideration of the value of any particular kind of road-crust on a given road as regards both its cost and its value to the public. As regards a considerable number of the comparisons that can be made between one of the possible road-crusts and another, these are matters which cannot be dealt with by measure, but must be left to the judgment of the surveyor. Small differences in the total effort of hauling upon different surfaces, slight differences in the tendency of vehicles to sideslip, the effect of a slippery surface in reducing the average speed of vehicles—these and other considerations may be taken into account, but they cannot be measured or even estimated except by an effort of imagination coupled by sound judgment and a knowledge of the local requirements of the public. There are, however, a considerable number of items which can be measured, roughly at any rate, or may be the subject of estimation based upon partial but significant data.

We allude to such matters as the effects of certain materials used in the road-crusts upon the wear and tear of boots and shoes and of rubber tyres, including the important matter of punctures. It would not be difficult to make in an actual case a fair estimate of the mileage life of bicycle tyres upon different kinds of road surfaces, and the

average number of miles per puncture. The average life of both tyres should be taken, because some kinds of roads are relatively less or more severe upon front or back tyres. The rough enumeration of the number of bicycles passing along a given road with a specified kind of road crust will then furnish us with an estimate of the total amount of loss on that road. The basis of comparison may be either the best possible kind of surface, the difference in cost being accounted as a loss, or added to the cost of maintenance, or the worst kind of road may be taken as a starting-point for comparison of the differences expressed as a saving due to the particular kind of material employed and the method of making the crust. Another item which can be roughly estimated is the wear and tear of boots and shoes. On very rough roads a considerable amount of damage is done by actual cuts produced by sharp stones, but generally on ordinary roads what matters is the rate of wear of the soles. Due regard should be paid to the habits of the population; thick-soled boots furnished with stout hobnails do not suffer nearly so much as the boots usually worn by the upper classes and by women, and this must be duly considered in the enumeration of pedestrians, which will form the basis of this estimate. There is a considerable number of other items which have to be taken into account in the present connection, but the two already considered, rubber and leather, are the most important.

* * *

Grays.

The Eastern District meeting of the Institution of Municipal and County Engineers which was held at Grays on Saturday last was a very pleasant and successful function from every point of view. Favoured as regards climatic conditions, and provided with an excellently arranged programme, the meeting was fully appreciated by the large number of members who were present. A pleasing feature of the meetings of the Institution is the almost invariable interest which is displayed in the proceedings by leading members of the local authority of the town in which the gatherings are held; and in this respect the town of Grays was no exception, the members being received on arrival by Mr. T. N. Banks, J.P., the vice-chairman of the urban district council. A preliminary piece of business had to be transacted in the formation of a District Executive Committee (and the fact that of the twelve members elected three were deputy surveyors is both noteworthy and satisfactory), and this having been done, Mr. A. C. James, Assoc.M.Inst.C.E., the surveyor to the council, submitted his paper on "Municipal Works of Grays." This paper was a model of its kind inasmuch as it contained a careful epitome of the public works of the town, the author wasting no time in the discussion of unimportant matters or topics unsuited to the character and purpose of the meeting. The paper will be found in another column, and may be left to speak for itself.

The duties which have fallen to Mr. James as surveyor to the council have not been light, the whole of the works described in his paper, with two exceptions, having been designed by him and carried out under his supervision by direct labour; and the visits to the various works which took place in the afternoon showed that they have been well done in every way. In the course of the discussion which followed the reading of Mr. James's paper two matters received special attention. These were the remarkably low cost of road maintenance and the desirability of the standardisation of road materials. The cost of surface dressing at Grays has been kept at a low figure. The president, in closing the discussion, referred to the question of standardisation, which was raised by Mr. James. He agreed—and this is now the general opinion—that the standardisation of road materials can only be described as a crying need, and he expressed the opinion that the efforts of the Standards Committee would have results which would be of great benefit to the members in this direction. We need only add that any such results will be both widely and deeply appreciated.

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Colonel Crompton and Calumny.

Under the caption "New Type of Road Surface: the 'Carpeting' Principle," we give elsewhere in this issue a brief chronicle of the laying in London of the new type of road surface which has been devised by Colonel R. E. Crompton, and has been the subject of much discussion of late. Since The Surveyor first saw the light we have read, especially in the general Press, of about as many discoveries of "the perfect road" as there are religions in the world or sauces in France; but, like the source of life, that highway is still to seek. We are cautious, therefore, in committing ourselves even to qualified prophecy as to Colonel Crompton's device. Time will test it, and the result will be waited for with the greatest interest. Meanwhile we take the opportunity of making an authoritative statement, which we hope will dispose of certain voiced and printed calumnies that are all unjustified and some malignant. It has been said, to meet the matter squarely and plainly, that Colonel Crompton, though an official of the Road Board, is "out," as the Americans have it, to increase such remuneration as he receives in that capacity by trading in the manufacture and laying of his road surfacing. Personally we should have nothing adverse to say if this were so. We do not know the detailed conditions under which Colonel Crompton gives his scientific services to the Road Board, and if we did we should take it that the observance of those conditions is solely a matter between that body and their official. What is of public concern is the advancement of road engineering, and if Colonel Crompton has in any degree effected this it is immaterial whether he be a Government or local government official, a manufacturer, or an airman. But in fact Colonel Crompton has not made, is not making, and does not propose to make a penny piece out of the supply and laying or the use of his road surface. There is no secret about its composition or magic in its manufacture, and anybody who is competent can make and lay the Crompton pavement in accordance with the specification of its inventor. If his device triumphantly emerges from the test of sufficient practical trial, Colonel Crompton must be ranked as a public benefactor of the highest self-effacing type; meanwhile, by the irony of fate, he has been assailed by more ignorant abuse than is usually suffered—even by pioneers.

* * *

Seizing the Opportunity.

The policy of delaying street improvements which are urgently required for reasons either of public health or of traffic requirements is usually not to be commended, and where adopted the underlying reason is ordinarily a desire to effect an immediate economy without regard to possible exorbitant expenditure in the future. A case in point has recently arisen at Berwick-on-Tweed, and we mention it chiefly in order to congratulate the borough surveyor (Mr. R. Dickinson) on his exceedingly wise and courageous report. It appears that a public house situated at the corner of two very narrow thoroughfares is to be rebuilt, and that the plans have received the approval of the justices. The question of setting back was therefore directly and urgently raised, and in the course of a report on the subject Mr. Dickinson refers to previous cases in which buildings had been re-erected without the opportunity being taken of effecting necessary public improvements. The report concludes with the following paragraph:—"I have not referred to the question of cost—the determining factor in so many issues, but in this it ought not to

rule. A matter of this kind, embracing as it does the abolition of the congestion to traffic, inconvenience and danger to the public, defective circulation of air, and unhealthy conditions, should be decided on higher grounds than monetary considerations, and be treated as a matter of principle. If these conditions exist, as they surely do exist, no question of cost ought to delay their abolition for the benefit of the community. Similar conditions would not be allowed to continue in the hands of a private individual." With this view we cordially agree, and we venture to commend Mr. Dickinson upon the stand which he is taking to secure that in questions affecting public health decisions shall rest upon a higher ground than pounds, shillings, and pence.

* * *

Persecution: The Cause.

We are constantly hearing through the local press and from other sources of cases in which the surveyor to a local authority is made the target for a groundless attack on his personal or professional reputation or is subjected to a course of petty persecution which renders his position intolerable. When the attack is made in public (which is by no means always the case) the prime mover usually commences by disclaiming any prejudice or personal hostility. Such statements are capable of being easily appraised, and may usually be disposed of by adding "*Qui s'excuse s'accuse;*" for there are three customary grounds of such baseless attacks, and merely to state them is to put an unanswerable case for Government protection. In some gross instances it is sought to get rid of a surveyor simply in order to appoint a desired new man in his stead; more commonly, a certain type of councillor, who by education and training is incapable of appreciating the difference between a navvy and an engineer, is moved by something akin to jealousy to harass an official who is "highly paid by the ratepayers," and who in his opinion ought to be a "practical man" satisfied with a weekly wage; the most usual cause of the trouble, however, is the interested councillor with whom the surveyor has come into collision in the conscientious discharge of his duties. Hardly a week now passes without a case of one of these types occurring, and the question of Government protection or security of tenure is becoming one of increasing urgency. It is usually coupled with the demand for superannuation, but the two matters are not inseparable, and we would suggest that the Institution of Municipal and County Engineers should take steps to obtain reliable evidence of some typical cases and submit them to the Local Government Board with a request for some effective departmental or legislative action.

* * *

Sterilisation of Sewage Effluents.

The sterilisation of sewage effluents at small works, though such a difficult matter in scientific discussions, is so simple in actual practice that it is apt to be overlooked when the works are described. The addition of a little hypochlorite of lime to an effluent is a much easier matter than its application to a water supply, seeing that there is no question of a taste or smell arising from the minute quantity of chlorine which may remain in the water after an overdose. From time to time we read descriptions such as that of the works at Pleasantville, recently quoted in these pages, or that of the works to deal with 564,000 gallons of sewage per day in Pennsylvania, which show that in America it is usual to sterilise sewage effluents which are likely to cause trouble.

It will be observed that at Pleasantville reliance is placed in the process of sterilisation as affording sufficient proof that an ice-pond used for the supply of ice to New York is not polluted with harmful germs, with the idea that this will be a safeguard against any legal proceedings. At the works we describe in the present issue it will be seen that a Pennsylvanian State institution has adopted the process. It may be that there are few places in this country where such works are required, but there can be no doubt as to the ease with which sewage effluents can be sterilised in practice. The adoption of sterilisation of sewage effluents in America at various places is also referred to in Mr. Fuller's recently published book upon sewage disposal. It is thus difficult to understand why the sewage effluents from hospitals for infectious diseases should ever be allowed to escape where pollution is remotely possible without sterilisation.

* * *

Motor 'Buses and Road Maintenance.

The undoubted grievance which is suffered by the ratepayers of many suburban districts in being compelled to pay an increased rate for road improvements which are necessitated entirely by the advent of the motor omnibus was strongly voiced at the Richmond conference on the subject, which we report elsewhere. It is claimed that an equitable share of the petrol tax should be allotted to the work of improving roads which are unsuited to the new traffic requirements. A specific instance occurs in Richmond, where Kew-road is being converted from macadam to wood at a cost of about £20,000. This work follows as a necessary consequence upon the increase of motor omnibus traffic, and it seems only reasonable that the omnibus company should be asked to pay their share of the expense. This they might do, in part at any rate, through the petrol tax, were it not for the limited interpretation which the Road Board put upon their own powers. The demand is clear, and the outer London authorities are unanimous in asking that the petrol tax should be handed over to those who have to pay for repairing and improving roads which the motor omnibuses destroy. If the Road Board cannot lawfully do this, we hold that a case for such legislation as may be necessary to enable them to comply with the demand has been abundantly made out.

* * *

The L.C.C.—a New Enterprise!

We have before us a copy of a rather extraordinary document which emanates from the Estates and Valuation Department of the London County Council. It appears that the council have revised and are keeping up to date a set of ordnance-sheets of the county, and they have issued a circular offering to supply tracings of the revised portions at stated charges, or to give special quotations for larger orders. We understand that this circular has been sent to surveyors, but we are not aware how much wider its circulation has been. We would point out, however, that if such tracings are supplied to the general public, the council are setting up the business of surveyors, and that their competition with the existing members of the profession in practice within the county will operate very hardly.

* * *

Chlorine or Hypochlorites.

An article by Mr. Eric Rideal on the respective merits of chlorine and hypochlorites for the sterilisation of water is given elsewhere in these pages. It is interesting to note that this statement from the chemist's point of view bears out exactly what was said in our minute of September 20th, dealing with the proposals of Dr. D. D. Jackson, of New York, given in his paper read before the American Waterworks Association. We then pointed out that chemists would not readily agree that sterilisation by means of chlorine gas would produce the same results as sterilisation by means of hypochlorites. Mr. Rideal shows very clearly that there are grave disadvantages to the use of chlorine gas, and his article is a valuable contribution to the literature of the subject.

The Ventilation of Sewers.*

By T. DE COURCY MEADE, M.Inst.C.E., City Surveyor of Manchester.

In England sewers were originally constructed for the purpose of conveying storm waters from roofs, street surfaces, yards, and so forth, to the nearest rivers or streams, and the admission of fæcal matters into sewers was forbidden by law. When the water-carriage system of sewage came into vogue in the early part of the last century sewers were gradually utilised for the reception of the overflow of liquids from cesspools and for the removal of house drainage. The admission of excremental matters into sewers was not only legalised, but made compulsory in London in 1847, and in the rest of England in the following year.

Prior to that time sewers were constructed with large open shafts placed at or near to the side walks for the admission of surface waters: these shafts were untrapped and were covered with grids of large size. There were no ventilating shafts in the centre of the carriageways, nor were there any side entrances for gaining access to the sewers. Ventilation was therefore effected by the gully shafts, the effluvium from which gave rise to very general complaint in London as early as 1830, and as the use of sewers for the conveyance of fæcal matter was extended, these complaints became intensified. Public attention was consequently directed to the subject with the object of devising some means of remedying this evil, with the result that in London and some other English towns the gullies were trapped and shafts were erected in the centre of the carriageways to admit of the escape of the sewer gases at points as far removed from the houses and side walks as practicable; this system was completed in the City of London by the end of 1848. The arrangement, however, did not remove the nuisance; it merely transferred it from the sides to the centre of the streets, most of which are narrow, with carriageways largely used by pedestrians.

In 1852 the English Board of Health advised the ventilation of public sewers, and in 1878 "suggestions" as to the preparations of plans for main sewerage, &c., were issued under the direction of Sir Robert Rawlinson, C.B., the Chief Engineering Inspector to the Local Government Board (the successors to the Board of Health). The Local Government Board advocated:—

(*a*) Sewers constructed in straight lines.

(*b*) Manholes or lampholes at each change of direction and gradient, and terminating at the street surface.

(*c*) The trapping and ventilation of all house drains.

The advice given by the Government Department has been generally followed by English engineers in the design of drainage works in Great Britain, but the sewer-gas problem still remains unsolved, and the nuisance from sewer emanations continues. . . . Numerous proposals have in the past been made for abating the nuisance caused by sewer gas; for example, mechanical ventilation by means of fans, specially constructed shafts with furnaces to extract and consume the gases, flexible screens to regulate the air currents, connections with factory chimneys, and numerous methods of chemical deterioration were suggested and tried more than fifty years ago with varying results.

EARLY DEVICES.

The old fallacy that the application of the principles successfully used in ventilating mines would be equally successful if applied to sewers is still retained by some theorists. Those who know how widely dissimilar the conditions are can readily appreciate that the remedial measures which prove successful in the one case may be worthless in the other. Plenum or vacuum systems, either separately or in conjunction, can be applied to mines, sufficiency of power being the principal factor; but in sewers dependent on water-sealed drain traps the application of power sufficient to produce an effective current of air throughout a large system is impracticable.

Most municipal engineers are conversant with the methods here referred to, and doubtless with many others too numerous to mention. They are well aware of the conditions that have to be met and of the impracticability of the suggestions put forward by many inventors, whose proposals, although sometimes of undoubted ingenuity, are generally found lacking in essential points.

Among the earliest suggestions should be mentioned those for deodorising the sewer gases by the admixture of chlorine gas and other chemically produced gases, the application of vegetable charcoal as a deodoriser, and the admission of smoke from factory chimneys forced into the sewer by water-driven fans.

The oxidising effect of charcoal, which had been determined by the researches of Lowitz, Saussure, Thenard and others in the latter part of the eighteenth century, was, at a later period, investigated by Drs. Stenhouse, Grace-Calvert, Letheby, and others; and under the direction of Colonel Haywood, when City engineer of London, this material was utilised for purifying sewer air by means of trays inserted in the ventilating shafts. Several mechanical arrangements were devised for the practical application of charcoal to this use, notably those of Messrs. Bean and Burgess, and later the spiral tray ventilator of Mr. Baldwin Latham.

The ventilator devised by the last-named gentleman possessed many advantages over the arrangements which preceded it, but in practical use it was found that charcoal, however skilfully applied, rapidly lost its power of deodorisation, mainly owing to the moist atmosphere with which it was necessarily brought into contact. Charcoal, therefore, failed to act as a useful deodoriser unless the ventilators were recharged with it very frequently. The air currents also within the sewers were reduced by its introduction. This was fully recognised by Lieut.-Colonel Haywood and Dr. Letheby, who were careful to point out that, while charcoal diminished the escape of effluvium into the streets, it was essential that the dilution of the gases generated in the sewers should not be so lessened by the diminished air supply as to render the atmosphere in the sewers dangerous to the men who work in them. These investigators, however, candidly admitted that, on the other hand, the diminution of the air currents did not appear to have any appreciable effect on the condition of the air within the sewers. The use of this material has been abandoned in the City of London and most other British towns where it had been tried.

The necessity for ventilating sewers conveying fæcal matter was generally recognised by most of the leading English engineers, notably by such pioneers as Mr. Frank Foster, Sir Joseph Bazalgette and Lieut.-Colonel Haywood, engineers whose names are well known in connection with the main drainage of London. Recent research, however, indicates that this view must be accepted with some reservation.

Since the period more particularly referred to (1840-70) many methods have been tried experimentally in towns in Great Britain, and much has been written on the subject, not infrequently by those who have had no opportunity for personal research. The author has had the advantage of closely studying the practical aspect of the problem, first under the direction of Lieut.-Colonel Haywood in the City of London, subsequently in other British towns, and more recently in conjunction with Prof. Delepine and other experts at Manchester.

ENGLISH AND AMERICAN PRACTICE.

He proposes in the first place briefly to refer to the systems in use in some of the principal English and American towns. A few years ago information was kindly furnished to him by the municipal engineers of upwards of sixty of the principal towns in the United Kingdom, and of several important towns in Canada and the United States, from which it appears that the methods adopted in various towns differ considerably, even in cases where the local conditions are somewhat similar.

For example, we find that Belfast adopted a system of ventilation at the surface of the streets somewhat similar to that already described in relation to the City of London, Birmingham a combination of surface grids and high ventilating shafts, Bristol practically unventilated sewers, and Leicester ventilation by openings at the street surface, superseded by high-shaft ventilation.

The cities of Buffalo, Chicago, Detroit, Minneapolis,

* Paper submitted to the recent Congress of the Royal Institute of Public Health in Berlin.

Philadelphia, Washington, Boston (U.S.), and Toronto adopted surface ventilation with—it is alleged—fairly satisfactory results, the house drains being cut off from the sewers by intercepting traps in seven out of the eight cities named.

Of the sixty towns in England from which information has been derived, we find that eight towns adopted ventilation by surface grids only; five, a complete system of trapped house drains; four, untrapped street gullies; twenty, surface ventilation supplemented by high shafts; twenty-three, a combination of surface inlets and high shaft outlets; four, trapped drains, and sewers ventilated by high shafts only. The sizes given of the ventilating pipes and shafts vary from 4 in. to 12 in. in diameter, according to the size of the sewer. These are usually placed about 150 yds. apart, and in the majority of cases they are fixed against buildings.

In one town the ventilating shafts are supplemented by brick structures 42 ft. in height, with a sectional area of 9 sup. ft.

BRISTOL.

The method adopted at Bristol is of special interest, as that city is an exception to the rule prevailing elsewhere, being the only large town in England in which no attempt has been made to ventilate the sewers systematically, but the author is informed that the sewer workmen in that city have met with no accident due to poisoning, suffocation, or explosion for many years, although the sewage is combined with trade refuse from breweries, soapworks, tobacco manufactories, cocoa works, tanneries, and so on. The death-rate also compares favourably with that of other towns of similar size and character, being 12·71 per 1,000 in 1911.

In one town, where the brewing industry forms a large proportion of the trade, the sewers are ventilated by connections with tall chimneys. Surface ventilators are not used owing to the objectionable smell arising from the brewery refuse, and the sewers in the residential portions of the town are not directly connected with the main drainage system; sewers in the residential areas are ventilated by high shafts. In another town situated on the South Coast of England the sewage is practically free from trade refuse, but considerable difficulties have been experienced in dealing with the emanations from sewer ventilators, and many methods, such as open gratings, tall shafts, specially devised surface grids and cremation by lamp ventilation, have been tried to obviate the nuisance, but these systems have been found unsatisfactory and discarded, either wholly or partially.

Taking as another example a fashionable residential town in the South-West of England, where the sewage is mainly of a domestic character, there are no surface ventilators, only a comparatively few ventilating shafts being in use; all modern house drains are trapped, and complaints of nuisance are seldom made. Another example will be found in a residential town of about 50,000 inhabitants not far removed from the place last referred to. There is no system of sewer ventilation, the sewage is of a domestic character, the house drains are trapped. Some of the sewers have flat gradients and flushing is resorted to. The public health and death-rate compare favourably with other towns of the same size and character.

In forty-seven of the towns previously referred to the flushing and cleansing of the sewers is systematically carried out. In eleven the sewers have little fall; in four the falls are considerable; in thirty-two the gradients vary; in seven the sewers that have flat gradients are flushed. In six (some of the latter being of considerable size) the sewers are not flushed.

In most of the American towns from which information has been received flushing is systematically carried out.

From the foregoing remarks it will be seen that the modern practice regarding sewer ventilation in England varies greatly, and where ventilation on a uniform system has been attempted the methods adopted have in most cases been subsequently modified to meet the difficulties that have arisen. When nuisance has been experienced by smell from ventilators terminating at the street surface, the remedy most generally adopted by English engineers has been the substitution of vertical shafts fixed in suitable positions and supported by buildings or independently. This arrangement affords a better diffusion of the gases emanating from the sewers, and frequently obviates the complaints by transferring the nuisance from the surface of the streets to a higher point, but it cannot be accepted as a satisfactory solution of the problem.

In the city of Manchester the tramway standards have for some years past been utilised as sewer ventilators, and the results have been fairly satisfactory.

AIR CURRENTS IN SEWERS.

The direction and velocity of the flow of air in sewers have been carefully investigated for a period of upwards of sixty years in several towns in England, commencing with the well-known series of experiments conducted in the City of London under the direction of Lieut.-Colonel Haywood about the middle of the last century.

Temperature observations conducted by the author in London and in Manchester show that the conditions in winter and in summer are reversed, the air in the sewers being warmer than the external air in winter and cooler in summer. These conditions, however, vary largely with climate and the character of the sewage, and the latter varies materially in different parts of some large towns where manufactories predominate. Some twenty-five years ago the author made an investigation of air currents in sewers and in pipe ventilators. A number of metal and earthenware pipes varying in diameter and in height were erected; some were placed vertically, both with and without bends, others were erected at different angles for the purpose of experiment. It was found that each pair of right-angled bends diminished the efficiency of an ordinary 4-in. metal pipe in calm weather by from 7 to 10 per cent, but this was largely varied when there was wind. The experiments were carried on continuously for eight months, and the pipes were afterwards used for ascertaining the extracting value of different kinds of cowls. Some of the cowls tested were found useful under certain conditions in preventing down draught, and some of them increased the up current in windy weather.

In experiments on two 30-ft. lengths of 4-in. cast-iron ventilating pipe of heavy section it was found that under favourable conditions the heat of the sun's rays was sufficient to alter the direction of the air currents in a length of 76 ft. of 6-in. diameter house drain, laid with a fall of 1 in 45. One pipe experimented upon was exposed to the south-east and the other to the north-west. With three exceptions the pipe exposed on the south-east was the upcast shaft in the earlier part of the day and the downcast shaft shortly after the sun's ray passed to the other side of the building. The exceptions occurred on days when the wind was high. The experiments were conducted on these latter pipes during hot weather only.

The observations on air currents in sewers showed that where sufficient free openings were provided the direction and force of the wind exercised a great influence and overbalanced all other local conditions due to temperature, gradients, character of sewage, and so forth.

Before the instruments were allowed to record, it was found necessary to restore the normal conditions within the sewer which are invariably disturbed by the opening of manhole or side entrance covers for the purpose of entry when placing the recording instruments in position. To effect this the writer devised a small case of sufficient size to hold each anemometer. At opposite sides, and facing the fan of the anemometer, were hinged doors; these were opened by pneumatic pressure applied by a small tube brought to the surface. The doors were balanced to close when the pressure was released. By this means the instruments were not brought into use until the normal conditions within the sewer were restored. In order to check the record of each instrument while exposed to the action of the air currents, two anemometers were placed side by side suspended in boxes from the crown of the sewer, and an interval of twenty minutes was allowed to elapse before these instruments were independently brought into action by the means described. Eight instruments in all were used and were carefully corrected from time to time during the progress of the work.

Records were taken under similar conditions with the ventilating spaces in the manhole covers closed and open for a distance of 1 mile on each side of the point of observation, and the results differed so slightly that the author came to the conclusion that the effect produced within the sewer by the ordinary type of ventilating cover was negligible. On the other hand, he found that the action of the wind and variation between internal and external temperatures on the open end of a large sewer, such as a storm overflow, will produce a very material current of air for a considerable distance along the sewer, but the

velocity of the current will gradually diminish, and in time cease altogether.

EFFECT OF WIND PRESSURE.

Where surface ventilating covers are used, wind pressure has undoubtedly an effect upon the air within the sewers, but even with high winds the author has found the effects much smaller than what has often been attributed to this cause.

These remarks apply to large sewers, sufficient for a man to enter. In the case of smaller sewers—pipes varying from 12 in. to 18 in. in diameter—he has found the effect of wind pressure on surface ventilators more pronounced.

In the type of ventilating manhole which has hitherto been in use in the city of Manchester, the proportionate ventilating area amounts to—

24·5	per cent of the cross sectional area of 12 in. diameter sewer.							
2·7	,,	,,	,,	,,	,,	3 ft.	,,	,,
·98	,,	,,	,,	,,	,,	5 ft.	,,	,,
·24	,,	,,	,,	,,	,,	10 ft.	,,	,,

The distances between the ventilating manholes varies from 100 yds. to 150 yds. in the case of the smaller sewers, and from 150 yds. to 300 yds. in the case of the larger sewers. It will therefore be seen that the effect of air pressures under such conditions must of necessity be much less in sewers of large section than in those of a smaller type.

The results of the author's observations may be briefly summarised as follows:—

(*a*) Where shaft ventilation only is relied upon, some of the shafts become inlets and others outlets.

(*b*) These conditions are not continuous, the directions of the air currents are at times reversed, the outlets acting as inlets, and *vice versâ*.

(*c*) The air currents within the sewers are governed to a large extent by the differences between the external and internal temperature, the flow of sewage, the construction and character of the sewer and other local circumstances.

(*d*) All these conditions are neutralised, and at times reversed by the change of direction and force of the wind.

(*e*) Ventilation by metal shafts is affected, and in some cases materially assisted, by the heat of the sun.

(*f*) No general rule can be laid down which would be applicable to all cases and under all conditions.

(*g*) Under normal conditions, in properly constructed and regularly flushed sewers not receiving trade refuse, the perceptible odours are less when they are unventilated than when ventilated.

(*h*) Air currents do not invariably flow from lower to higher levels, the reverse being frequently the case even where gradients are steep.

(*i*) Air in sewers in partial use is generally more offensive than that in similar sewers which are used to their full or nearly full capacity, other conditions being equal.

(*j*) That the regular and efficient flushing of sewers with fresh water is a more important desideratum than the introduction of large volumes of air. A case in support of this view may be quoted where intermediate manholes were inserted in an old sewer in fair condition, which increased the ventilation openings by 100 per cent, but did not appreciably improve the condition of the air within the sewer. Flushing was resorted to and a marked improvement was immediately effected.

(*k*) All methods which replace or retard natural ventilation are inadvisable except under very exceptional circumstances.

(*l*) Ventilation of sewers is necessary for the safety of the workmen, and for the free escape of air when sewers are rapidly filled in times of storm.

(*m*) Methods usually adopted in the ventilation of houses cannot be successfully applied to sewers.

MANCHESTER CORPORATION'S INVESTIGATIONS.

In 1902 the Manchester Corporation appointed a special committee with a twofold purpose: First, to determine on the generally accepted hypothesis that the ventilation of sewers is necessary—the best method of accomplishing this object; secondly, to investigate the composition of sewer air bacteriologically and chemically obtaining under varying conditions, such as are to be found in the Manchester city sewers, and to determine as far as practicable the influence of these circumstances on health.

The committee appointed Prof. Delepine, M.B., C.M., M.Sc., Director of Public Health Laboratory, Manchester University; Dr Fowler, D.Sc., F.I.C., consulting chemist, Davyhulme sewage works; and the author, to investigate and report. Prof. Delepine undertook the bacteriological work, Dr. Fowler the chemical work, and the author the experimental installations, investigation of air currents, &c.

As a rule, when matters of public interest are about to be officially investigated in England, numerous remedies are suggested by irresponsible persons from outside. These were anticipated by advertisement in the public press intimating that the Special Committee were prepared to receive particulars of methods for improving the ventilation of sewers. In response to this invitation twenty replies were received. Most of them contained particulars of some proprietary arrangement or method of ventilating sewers. Each case was carefully considered, and four of those who responded were invited to furnish additional particulars, and after further consideration arrangements were made for a practical test of the method advocated in each of these four cases, which will here be referred to by the letters A, B, C, and D respectively.

Method A consisted of an electrically driven fan to extract air from the sewers and discharge it through an outlet shaft into the open air, fresh air being admitted to the sewers through inlet shafts fixed at suitable points to replace that extracted. The fan used in the experiments was 20 in. in diameter, and had a velocity of 650 revolutions per minute. It was driven by a 4 b.h.p. electric motor, placed in a brick chamber under the roadway. The upcast shaft was of steel, 20 in. in diameter, with an outlet 28 ft. above the road level. The base of the shaft was concreted into the side of the fan chamber and connected to it by a concrete duct. There were twenty-two fresh-air inlet shafts, 4 in. in diameter, varying from 5 ft. to 30 ft. high. Twenty were fitted with inlet caps by means of which the amount of air admitted at each inlet was adjusted so that the extracting power of the fan could be equally distributed throughout the whole system to be ventilated.

The area experimented upon in this case was 39½ acres. The sewers within that area had a capacity of about 25,000 cub. ft., and the resident population was about 3,000. The area included two cotton mills, an india-rubber works, a soapworks, an artificial manure factory, &c., two schools attended by 1,175 scholars; 322 water-closets and 186 pail-closets; the length of the sewers was about 5,560 yds. The area was, in fact, selected because the local conditions made the sewers within it the most difficult to ventilate that could be found in a city where from various circumstances the problems regarding the efficient ventilation of the sewerage system are, perhaps, among the most difficult and complicated in England.

The contractor who supplied the fan had guaranteed that it would discharge 6,000 cub. ft. of air per minute against a water pressure of an inch, but in actual use only 4,036 cub. ft. per minute was registered. Anemometer tests showed that 247 cub. ft. of air per minute was brought into the sewers through the air inlets, and that four of the inlets at times acted as outlets. The water gauge registered a vacuum of 1 in. in the pipe connecting the sewer with the 20-in. upcast shaft.

This system of ventilation produced a considerable dilution of the sewer air where the connections were good, but only a small proportion was drawn in through the regulated fresh-air inlets that were provided, and this notwithstanding that every care was taken, short of relaying the sewers, to make them air-tight; the system was, however, considered worthy of further investigation. The air escaping from the outlet shaft contained no more bacteria than the street air, and on some occasions much less. It had, however, an unpleasant smell, and it was considered doubtful whether there was any advantage in throwing into the street air at one point large quantities of bad-smelling gases such as escaped from the outlet shaft.

Method B consisted of a special type of lamp column placed on the footways or carriageways, and connected with manholes in the centre of the road or closet with the sewers by earthenware pipes. The pipes used were 6 in. in diameter, enlarged to 9 in. in diameter near the sewer or manhole. The column of the lamp contained a 6-in. diameter vertical copper tube connected at its lower end with a pipe leading to the manhole, and at the upper end to three incandescent gas burners in the lantern. The lantern was airtight, with the exception of the outlet situated immediately over the burners; the sewer air extracted by the lamp passed through and round the

burners, and was discharged into the open air through the outlet at the top.

The current of air passing from the manhole through the pipe was generally so small that the most sensitive anemometer obtainable, when placed in the end of the pipe, did not record it; therefore the end of the pipe was closed with the exception of the space occupied by the recording instrument, in order to set up a sufficient velocity to enable the instrument to register. A small current of air was thus produced in the 6-in. drain attached to the base of the column, but its effect on the air in even the smaller sewers was practically *nil*, and quite worthless in the case of large sewers. The average quantity of air extracted per lamp was 723·9 cub. ft. per hour.

The amount of coal gas per lamp consumed from June 20 to September 21st was 33,000 cub. ft., at a cost of £3 14s. 3d. At another site the average amount of air drawn from the sewer by this apparatus was about 1,100 cub. ft. per hour.

Prof. Delepine found no evidence of any material dilution of the air in the sewer even close to the ventilating column. When the lamp was not lighted there was an escape of bad-smelling air, but the number of bacteria reaching the lamp outlet was very small. When the gas was lighted, the smell was not noticeable. The temperature of the air at the outlet was so high (exceeding 250 deg. Cent.), that even during a rapid transit it is believed that the bacteria suspended in the air would be destroyed, and this was proved to be so in the case under investigation. The system appeared to be capable of reducing a local smell nuisance without affecting the state of the air in the sewers, and the action of each lamp appeared to be very limited.

Method C consisted of forcing the sewer air, after admixture with fresh air, by a jet pump through clean water, which was supposed to wash it and free it from all impurities. Complaints were received of smells from one of these washing installations, which it was ascertained did not come from defective covers or any points outside the apparatus. Each ejector installation required about 254,000 gallons of water per quarter if worked continuously. The cost for water at Manchester amounted to about £13 13s. per ventilator per quarter.

The proprietors claimed that the sewers would be kept entirely free from sewer air, but this was not justified by the results obtained. Prof. Delepine found that this apparatus did not materially affect the composition of the air contained in the sewer to which it was applied. The air escaping from the outlets at the level of the pavement usually contained about twice as much carbonic acid as the air collected about 5 ft. above the pavement, and distinctly more carbonic acid than the air collected at the level of the pavement. The air also had an unpleasant smell.

Method D consisted of a cylindrical casting containing a cotton-wool filter and disinfectants, and fitted into the manhole shaft, and the inventor claimed that by this method the heat of the sewer air could be made use of to prevent the cotton wool becoming saturated by the condensation of warm, damp sewer air, but the results of the tests would not warrant the general application of the system.

Shortly stated, the investigation of the subject at Manchester showed that the air within the Manchester sewers, situated at a depth exceeding 10 ft. below the surface, generally contained more carbonic acid than the worst street air, and that the proportion of carbonic acid in sewers increases with the depth below the surface and becomes considerable when all openings are closed, a condition more apt to mechanical ventilation. Although a large quantity of carbonic acid can be extracted by mechanical ventilation, a greater proportion was found in the air of sewers that were so ventilated, which may be accounted for by the restriction of free ventilation, a condition indispensable under Methods A, B, C and D.

Prof. Delepine found that the bacteria in the air of the street sewers ventilated in the ordinary way were subject to variations which appear to be due to sudden disturbances of the air, such as steps in sewers, the fall of sewage from inlets above the level of the flow, and condensation on the sewer surfaces exposed to the air.

In order to estimate the influence of sewer air upon health, an elaborate system of experiments has been commenced by Prof. Delepine at the Public Health Laboratory, Manchester, and has not yet been concluded; the results obtained up to the present are, however, extremely interesting and instructive.

TAR AND CEMENT PAVEMENTS IN GERMANY.

Experiments have been made in Bremen and elsewhere with a street pavement composed principally of tar and cement, and which for one reason or other has been baptised "terbacca," which has a familiar sound, not entirely suggestive of street paving.

A test section at the Oldenburg freight station shows, after two years of heavy traffic, but little surface wear and no cracks, although laid on filled ground. The surface layer remains plain and level, and shows less wear than the adjoining sections, which are stone paved on sand bed, and which are more uneven, showing in many places considerable ruts.

The tar-cement pavement is laid on a bed of 5 in. to 6 in. of beton, or over broken stones slicked with cement mortar, say about 2 in. or 3 in. for ordinary streets, ¾ in. to 1½ in. for foot pavements, and 1½ in. to 2 in. for courts. The mixture is made up of ninety volumes of hard, broken stone of three different sizes, ten of gravel and sand, and forty to sixty of Portland cement, mixed dry, then 10 per cent of water is added, and at least five parts of coal tar, thinned down with a solvent. The tar-cement mixture is laid on much more quickly than required finally, and tamped down with a 6-lb. rammer to the required thickness. Where grades are unusually steep more cement is used than on levels.

To prevent the formation of cracks, it is sufficient in ordinary climates to leave openings of ⅛ in. every 40 ft., filling these with asphalt.

In Gothenburg, Sweden, and on the Kaiserstrasse in Hagen, Wesphalia, this pavement has done well; and in the latter city the tar-cement covering is only 7 centimetres (1·78 in.) thick, but a week after its laying it is run over by a steam roller without showing any signs of ill-usage. Here the grade is 1·60. This street shows a smooth, even surface after about eighteen months' use. The Bergstrasse, Elberfeld, on part of which the grade is 1·10, has an equally good appearance after nineteen months' use.

As regards the strength of the mixture for sewer pipes and the like, tests of a five-week-old pipe, 15 cm. (5·8 in.) clear diameter, 27 mm. (1·05 in.) thick, showed that it could carry 130 metric cwt. (14,300 lb.).

In the matter of impermeability, after subjecting plates 1 cm. to 2 cm. (0·394 in. to 0·788 in.) thick to water columns in glass pipes 2 metres to 2½ metres (5·56 ft. to 8·2 ft.) long, for six weeks the under sides of the plates were not wet.—From the *Contract Record* (Toronto).

CREOSOTED WOOD PAVING.

The immense amount of creosoted wood paving laid during the year is said to establish a record in the use of this class of road material, and its suitability for heavy motor traffic is rapidly becoming recognised, according to a statement of the Improved Wood Pavement Company, Limited, of 46 Queen Victoria-street, London, E.C.

A list of a few of the contracts undertaken by the company this year, up to July 1st last, shows that over 239,000 sq. yds. of creosoted deal blocks were laid by them for the authorities of the City and County of London, Birmingham, Chelsea (Chelsea Embankment), Chiswick, Finsbury, Hammersmith, Hampstead, Hove, Kensington, Kingston, Lewisham, Liverpool, Paddington, Richmond, Stoke Newington, Stafford, Westminster (fifteen thoroughfares), Wolverhampton, Wandsworth, Willesden and Wimbledon.

The company recognise that the extension of the loan period has made a very great difference, but they contend that the principal reason for the wider adoption of creosoted deal is its suitability for motor traffic, already referred to.

Rat Plague in France.—Rats are again devastating certain agricultural districts on the eastern frontier of France, and the French Government have made a special grant of £8,000 to be spent on their destruction, which is being effected by the application of Danysz Virus in liquid form, prepared by the Pasteur Institute, Paris, who are at present sending out several hundred quart bottles of Danysz Virus daily. This same preparation can, we understand, be obtained at the Danysz Virus London depot, 52 Leadenhall-street, E.C.

Institution of Municipal and County Engineers.

EASTERN DISTRICT MEETING AT GRAYS.

A pleasant and most profitable time was spent by those who were present at the Eastern District meeting of the Institution of Municipal and County Engineers held on Saturday at Grays. Excellent weather favoured the gathering, and the interesting round of visits at the close of the usual business proceedings took place under the best possible conditions. The meeting opened in the Victoria Hall, High-street, where, in the absence of the chairman, Mr. H. E. Brooks, J.P., Mr. T. N. Banks, vice-chairman of the council, welcomed the members, who included Messrs. H. Percy Boulnois (Westminster), A. T. Bridgewater (East Ham), B. F. Cadle (Gillingham), E. R. Capon (Epsom), S. H. Chambers (Hampton), R. Chart, junr. (Croydon), A. Clark (Croydon), J. Dewhirst (Chelmsford), R. H. Dyer (Southend-on-Sea), E. J. Elford (hon. district secretary, Southend-on-Sea), W. Farrington (Woodford), H. S. Graves (Ashford), G. G. Haman (Gillingham), P. T. Harrison (Chelmsford), A. C. James (Grays), P. G. Killick (Finsbury), C. Lawson (Southgate), H. W. Line (London), R. J. W. Layland (Billericay), J. Liversedge (Leigh-on-Sea), A. J. Mason (Brentwood), E. J. Messent (Southend-on-Sea), T. G. Newcomen (Finchley), W. H. Prescott (Tottenham), A. H. Quick (Thornton Heath), J. L. Redfern (Gillingham), E. J. Reynolds (Friern Barnet), J. E. Sharpe (Cheshunt), L. J. Small (Woodford), C. Chambers-Smith (Westminster), J. P. Spencer (Tynemouth), F. W. Wale (Wealdstone), H. T. Wakelam (Middlesex), H. Walker (Wealdstone), H. C. Whitehead (Southend-on-Sea), H. F. Wilkinson (Tottenham), E. Willis (Chiswick) and O. E. Winter (Hampstead).

Mr. R. J. THOMAS (Buckinghamshire), the president, occupied the chair.

In his address of welcome to the members Mr T. N. BANKS, the vice-chairman of the council, said he was afraid there was little in Grays to boast of. The industries which had been carried on there for many years past had deprived the district of much of its former beauty. They must be content, therefore, with seeing what remained.

The PRESIDENT (Mr. R. J. Thomas) said it was his pleasant duty to propose a hearty vote of thanks to the vice-chairman of the council for his reception of the institution. It was always a pleasure for officials to examine the work of their *confrères* in other towns, and in the case of municipal engineers particularly they were able to learn much more from such inspections than from the mere reading of papers descriptive of undertakings in which they were interested. He felt sure that they would see many things to admire and profit by during their stay in Grays.

Mr. E. WILLIS (Chiswick) seconded the proposition.

The vote of thanks was carried with acclamation. Mr. Banks making a brief acknowledgment of the compliment.

ELECTION OF DISTRICT EXECUTIVE COMMITTEE.

The minutes of the last Eastern District meeting, held at Lowestoft, having been read and confirmed, the matter of the formation of a district executive committee was introduced by the hon. district secretary, Mr. E. J. Elford.

At the outset a protest was entered by Mr. R. CROOME (Cromer) against considering the appointment of the committee at a meeting of that kind.

The PRESIDENT said he presumed the correct course was for representatives of the district only to take part in the proceedings.

Mr. H. T. WAKELAM (Middlesex) expressed the view that, as the meeting had been called for the purpose in question, they should proceed with the business.

Mr. S. H. CHAMBERS (Hampton) contended that, in view of the small number of local representatives present, they were hardly properly constituted for the purpose. He moved that the matter be adjourned.

Mr. ELFORD questioned whether anything would be gained by that. They wanted the committee, and it was to be hoped that the meeting would proceed to its election. If they called a special meeting at the [illegible] they might be asked [illegible] At any rate, they had [illegible] Let us get on with our business.

Mr. H. PERCY BOULNOIS (Westminster) said he supported Mr. Elford. They were met for a specific purpose, and he saw no reason for delay.

On being put to the vote the motion was lost, and the meeting, without further discussion, elected the following to act as the district executive committee—*viz.*, Messrs. C. Brown (Edmonton), S. H. Chambers (Hampton), A. E. Collins (Norwich), A. Gladwell (Eton), P. T. Harrison (Chelmsford), W. H. Prescott (Tottenham), J. E. Sharp (Cheshunt), C. Vawser (New Barnet), E. Willis (Chiswick), H. Collins (Norwich), W. R. Hicks (Ealing), and F. Wilkinson (Wimbledon), the three last-named being deputy engineers in their respective towns.

The following paper next came before the meeting for discussion:—

THE MUNICIPAL WORKS OF GRAYS.

By ARTHUR C. JAMES, ASSOC.M.INST.C.E.,
Surveyor to the Urban District Council.

[Mr. James is a native of Malvern, and was educated at the local grammar-school. He was articled to Mr. G. Eastlake Thoms, M.I.C.E., borough engineer of Wolverhampton, and on the latter's resignation remained a few months under his successor, Mr. R. E. W. Berrington, M.I.C.E. He was assistant borough surveyor at Cambridge from 1887 to 1893, under Mr. J. T. Wood, M.I.C.E., and the late Mr. E. W. Harry, and took part in the preparation of the scheme of drainage for the borough carried out by Mr. Wood. Mr. James has occupied his present post since September, 1893, and has carried out various municipal works in the town of the value of about £100,000.]

The history of Grays Thurrock goes back for many centuries. Its name, Thurrock, is a corruption of Thor's Oak, reminiscent of a druidical worship under the oak trees of the neighbourhood. Harold, the last of the Saxon kings, was Lord of the Manor of the middle part of Thurrock. Grays, the name by which the town is now known, except for official purposes, was added by the grant of the manor of Thurrock to Henry de Grey by Richard I. in 1194, the grant being confirmed by John in 1199. The original grants are still in existence, and facsimile copies are hung in the free library.

The municipal history of the district dates from 1886, when the local board was formed. Before the construction of Tilbury Docks, Grays was little more than a riverside port for the conveyance of agricultural and other produce to and from the surrounding countryside. There were also extensive chalk quarries and, later, the cement industry found employment for a considerable number of men. The docks were commenced in 1882, and opened in 1886, and the population increased from 5,327 at the census of 1881 to 11,199 in 1891, the town becoming the residential and shopping centre of the district. At the census of 1911 the population was 15,998, and the rateable value is £51,062, or only £3 3s. 10d. per head of the population. When the low rateable value per head, and the fact that the district is a new one, in which the needs of modern urban life have had to be provided for within the last twenty years, so that few of the loans have yet fallen in, are considered, it is not surprising that the general district rate is 4s. 4d. in the £. The poverty of the place has permitted little expenditure except for necessaries, but the author trusts that members may find something of interest in the following brief description of the work which has been carried out.

The district is approximately 2¼ miles from north to south, 1¼ miles in width, and the land area is 1,382 acres. The levels range from 6 ft. above ordnance datum in the south, to 115 ft. above ordnance datum in the north-west. The low-lying land adjoining the Thames is alluvium, and much of it is below high-water level, being protected by the river-wall, for which the Essex Sewers Commissioners are responsible. The higher ground consists chiefly of gravel beds overlying the chalk. The death-rate for 1911 was 10·7 per 1,000, only three deaths being attributable to infectious disease.

SEWERAGE AND SEWAGE DISPOSAL.

The first task of the local board was the provision of a system of sewerage, the town then being entirely drained into cesspools which were not watertight. Designs for schemes were invited and that of Mr. W. H. Radford, ASSOC.M.INST.C.E., of Nottingham, was selected. Work was commenced in August 1892, and the disposal works were brought into use in November, 1894, the cost being £12,000. The scheme is designed on the partially separate system, all rain water from streets and front roofs being taken by surface-water

drains to four main outfalls. The sewers are laid chiefly in the back roads, with which all streets are provided, and receive all yard and back-roof drainage, in addition to the sewage proper. A system of ventilation by means of columns 30 ft. and 40 ft. high was installed in 1902. The disposal works are placed on the marsh land in the southern part of the district, where all the sewage is pumped and treated. The sewage from Chadwell St. Mary (now the recently formed urban district of Tilbury) and Little Thurrock, two parishes in the Orsett rural district, also drains to the works, being pumped and treated by the Grays Council under agreement. The average daily flow to the works last year was 238,000 gallons from Grays, and 233,000 gallons from Tilbury and Little Thurrock. The dry-weather flow from Grays is about 11 gallons per head.

Originally the works were designed for the treatment of the sewage by chemical precipitation, but in 1902 the precipitation tanks were converted into septic tanks, and new bacteria beds constructed at a cost of £4,500. The original tanks cracked considerably owing to bad foundations; the walls and floors of the new beds were therefore reinforced with old railway metals, and no cracking has been experienced.

The works do not present any features of special interest. Daily records of the quantities of sewage pumped have been kept since the works were opened, and some years ago the author had occasion to extract details of the daily flow over a period of eleven years, particulars of which may be found useful, as they bear upon the requirements of the Local Government Board for new works. It was found that the increase in the dry-weather flow due to rainfall was as follows:—

Exceeding once, but not exceeding	1¼	times the D.W.F.,	562	times.
,,	1¼	times	,,	,,	2	,,	,,	125	,,
,,	2	,,	,,	,,	3	,,	,,	43	,,
,,	3	,,	,,	,,	3½	,,	,,	8	,,
,,	3½	,,	,,	,,	4	,,	,,	once.	
,,	4	,,	,,	,,	4½	,,	,,	once.	
,,	4½	,,	,,	,,	5	,,	,,	once.	
,,	5	,,	...	...	...	...	...	never.	

It will be seen that the total daily flow exceeded twice the dry-weather flow only on fifty-four occasions in eleven years.

For some years there has been a proposal before the district for the provision of a joint outfall sewer for West Thurrock and Stifford, to the west of Grays, as well as the three parishes now using the Grays works, with new disposal works below Tilbury. A Provisional Order forming a joint sewerage board for this purpose has recently received Parliamentary approval.

SURFACE-WATER DRAINAGE.

Owing to the low level of portions of the district the disposal of surface water is an expensive matter. For one portion of the town a tank to contain the rain falling at high water had to be provided, its contents being discharged to the river at about half-tide. The centre of the town, which drains to a tidal ditch, was subject to considerable flooding, and a new 30-in. drain was constructed in 1904, at a cost of £3,550, by which a large part of the drainage was diverted from that outfall. This proved still to be insufficient, and recently further works were undertaken, at a cost of £2,230, which included the provision of electrically driven centrifugal pumps to discharge the flow direct to the river at high tide. The rising main from the pumps is about a ¼ mile long, and is constructed of Siegwarts' reinforced concrete pipes. The author has lately presented a report upon flooding in other parts of the town, recommending certain works, estimated to cost £4,100, pumping being necessary at two outfalls.

SCAVENGING AND HOUSE REFUSE COLLECTION.

About 9 miles of streets are regularly scavenged either daily or two or three times weekly as required, and the main shopping streets are swept twice daily. The sweepings are taken to a farm in the district, but, since the advent of surface tarring, the farmer finds they are useless as manure. The annual expenditure is about £670. Formerly the house refuse was carted to any convenient tip, but in 1901 a destructor was provided in connection with the electric lighting station then being built. The plant consists of a Meldrum Simplex twin cell and Lancashire boiler, the steam being utilised by the electricity department. The destructor is placed in the centre of the district, 300 yds. from the council offices, and the cost was £3,284, including fencing the land and heavy foundations necessitated by the character of the site. The refuse is collected once weekly in covered carts containing 2½ cub. yds., and the cost is 3s. per load, or 3s. 6d. per house per annum. Trade refuse is not collected, but is received and burnt free of charge. The clinker has been largely used for making up back roads and other purposes, and finds a ready sale at 1s. per load, the income from this and from the sale of old tins being about £60 per annum.

PARKS.

In 1898 the council purchased 8¾ acres of land in the centre of the district, at a cost of £2,100. Of this 1½ acres were set apart for a depot, and the balance laid out as a public recreation ground. Stabling, &c., was at the same time erected in the depot, the total expenditure on the scheme being £3,400. Further buildings have since been erected, at a cost of £850. Though small, the park forms a useful open space, which would otherwise undoubtedly have been occupied by cottages ere this. Attention may be called to the use of concrete in the boundary walls where appearance is not material. This wall, 6 ft. 6 in. high, cost only 8s. 6d. per yard, including foundations, and there has been no expense for maintenance. Ivy is planted against the wall, forming a good background for the gardens and shrubs.

In 1903 the council purchased 4¾ acres of land adjoining the river Thames for £1,880, and the owner gave 1 acre as a memorial of the coronation of King Edward VII. The land is situated on both sides of the river wall, and the part next the river has been filled up and covered with Thames ballast and sand to form a beach, and the ground is known as "The Beach." This was not done, as was widely assumed at the time, with the idea of making Grays a seaside place, but as an economical method of rendering useful land which is covered by the river at spring tides. It is much appreciated by the children of the neighbourhood, who make use of it in large numbers during the summer. On the land side of the river wall, which is about 8 ft. lower than the wall, it was proposed to construct a model yachting pond, and the plans also provided for an enclosed open-air swimming bath. The Local Government Board declined, however, to sanction a loan for the latter. When work was begun, the Sewers Commissioners issued an order for the river wall to be raised 18 in., and it was therefore determined to deepen the pond in order to provide the necessary soil for raising the wall, and at the same time make the pond available for swimming. Water is supplied to and removed from the pond at spring tides by a 21-in. pipe communicating with the river by way of the surface-water storage tank above referred to. The cost of a special communication with the river was thus avoided. Although the bottom was only of mud, the bathing proved such an attraction that in the autumn of 1905. It was decided to deepen the pond, line it with concrete, erect dressing sheds, and provide a well and pump to supply fresh water. The concrete bottom is only 6 in. thick, and is reinforced with wire netting. The walls round the pond are of the same thickness, reinforced with wire. The pond is 90 yds. long by 50 yds. wide. It is 1 ft. 9 in. deep at the sides, sloping towards the centre, where there is a portion, 70 ft. by 30 ft. in front of the diving stage, which is from 6 ft. 6 in. to 6 ft. 9 in. deep. A refreshment kiosk was at the same time built, the shop being at the level of the river wall, while beneath it are a store for model yachts and conveniences for both sexes. Altogether £4,500 has been spent on this work. The pond is open for bathing daily during the summer months, from 6 a.m. to 9 a.m., and from 6 p.m. till sunset, at a charge of 1d., and 2d. is charged for a private dressing box. Ladies are admitted free from 9 to 11 daily, and boys of school age from 9 till noon on Saturdays. On other days the boys from the elementary schools have the use of the pond for swimming instruction.

CEMETERIES.

The council act as the Burial Board, and possess two cemeteries, one adjoining the church in the town and the other in the parish of Little Thurrock, about 1½ miles distant. This was purchased and laid out thirty years ago. In 1900 the council purchased 7½ acres of land adjoining the Little Thurrock cemetery for the purpose of extension, and this has been fenced and partially laid out to find work for unemployed. The fence consists of about ¼ mile of concrete wall similar to that at the park, but rendered on the outside, where [illegible] a public road.

WORKMEN'S DWELLINGS.

In 1901 twenty-five cottages were erected in Parker-road. The cottages [illegible] parlour, kitchen, scullery,

larder, and three bedrooms, and the contract price was £5,250. The cost of the land was £272, and that of roads and sewers £206 10s. The cottages were first let at 8s. per week, afterwards reduced to 7s. 6d., and again, three years ago, when many of the houses in the town were empty, to 6s. 6d. At 7s. 6d. per week the houses might pay their way, but at 6s. 6d. this is impossible, and there is a considerable debit balance on the account.

LIGHTING.

An electric lighting scheme for the district was carried out in 1901 by Messrs. Preece & Cardew, and since its completion in October of that year the town has been entirely lighted by electricity. There are 284 public lamps, the candle power ranging from 50 to 400, with an average of 70-candle power. The price of current for public lighting last year averaged 3·1d. per unit. For private lighting the price of current is from 4½d. to 3d., according to the quantity consumed, the average price received being 3¾d. For power the charge is 2½d. per unit, and motors equivalent to 294-horse power are supplied. The undertaking makes a small nett profit, after payment of all charges.

HIGHWAYS.

The main roads of the district are 2 miles 7 furlongs in length, and are maintained by the council, contracts being entered into from time to time with the county council for periods of five years. The annual sums paid have been: 1896-1906, £1,140; 1906-1911, £900; current contract, £950. For special improvements extra payments are made. It will be seen that the large increase in the cost of maintenance which has been experienced elsewhere, owing to the advent of motor traffic, has not obtained here, although there is a very considerable motor traffic, both heavy and light, through the district between London and Southend, and to Tilbury Docks.

Some 5½ miles of private streets have been made up during the author's term of office, the specification being as follows: –

Carriageways.—9-in. chalk flint foundation and 4-in. hand-broken chalk flint surface.

Footways.—*In situ* concrete, composed of 3-in. Thames ballast concrete, faced with 1-in. granite concrete (cost 3s. per square yard).

Kerbs.—Straight, 12-in. by 8-in. concrete, similar to the footway, formed *in situ* (cost 1s. 6d. per yard); circular, 12-in. by 8-in. granite.

Channels and Crossings.—Formerly of granite setts on concrete, but latterly of scoriæ bricks.

The price of flints has largely increased of late, and on the last streets made up the carriageway construction was varied to 4-in. destructor clinker, 6-in. flints, and 3-in. granite macadam, without extra cost. Most of the streets in the district are 40 ft. wide, and the average cost is about 10s. 6d. per foot of frontage. Formerly, none of the streets were channelled, but the author persuaded the council to include this work when the first batch of private streets was taken in hand. It was afterwards decided to channel all the existing roads. In all, 11¼ miles of kerbs, 17¾ miles of channels, and 9½ acres of footway paving have been laid down since the author's appointment. Very considerable improvements have been effected to existing roads, some 2 acres of land having been added to the highways. Advantage was taken of the opportunity when widening a road to strengthen the foundation of the road dealt with over its total width, and it is to this that the fact that maintenance costs have not increased is in large measure to be attributed. For many years granite chippings have been used in binding road surfaces, and it is the practice when re-scarifying a road to remove all the small scarified material, which, when sifted, is used for repairs in streets of less traffic, and for patching.

Surface tarring was first tried experimentally in 1905, and since 1906 all streets have been tarred annually without any addition to the total expenditure. The cost of watering has been reduced from £240 per annum to an average of £80, while the quantity of mud removed during the winter and the contents of street gullies has decreased 45 per cent. It is certain that both of these items would have been largely increased as a consequence of the motor traffic, had not this or some similar treatment been adopted. Crude tar has for several years been applied by machine at a cost of 0·42d. per square yard, with tar at 2d. per gallon, sand 2s. 6d. per yard at the pit, horse hire 8s. per day, and labour 6d. per hour. This cost includes the special preliminary scavenging and foreman's wages. This year dehydrated tar at 2½d. per gallon has been used, while horse hire has risen to 9s. per day, and labour to 7d. per hour. Several lengths of macadam grouted with bituminous material have been laid down, the following materials having been used: crude tar, tar and pitch, roadoleum, natural asphalt matrix, asphaltmac and camarco. Until the last two years 1½-in. macadam has been employed, it being found to give a smoother surface than larger stone, and to minimise the wheel friction, with the result that less dust is created. With the advent of heavy motor traction 2-in. stone has been substituted on the roads of heaviest traffic, but the author is of opinion that with bituminous binders 1½-in. material is preferable.

While dealing with the subject of highways the author would like to emphasise the importance of standardising materials, especially macadam. Samples sent with tenders are generally well broken, and of the specified sizes, but, to judge by the character of subsequent deliveries, must sometimes have taken a considerable time to find. Having had to reject a good many cargoes of stone on account of bad breaking the author knows from experience how difficult it is to convince some contractors that when "cubically broken" stone is specified it is of any consequence that it should be supplied. The rejection of a ship's cargo of 200 tons is a serious matter both for the contractor and the council, and it is sincerely to be hoped that practical good may result from the efforts of the Standardisation Committee of the Institution in this direction.

CONCLUSION.

The whole of the works above described, with the exception of the sewerage scheme as originally designed and the electric lighting scheme, have been designed and carried out under the author's supervision by the direct employment of labour, contractors only being employed for the erection of buildings.

The fire station in Orsett-road was designed by the author's predecessor, the late Mr. Chas. Cobham, F.S.I., and erected in 1892 at a cost of £1,500. The free library in Orsett-road was built in 1903 at a cost of £3,000, provided by Mr. Andrew Carnegie, from the designs of Mr. C. M. Shiner, A.R.I.B.A., of Grays.

DISCUSSION OF MR. JAMES' PAPER.

Mr. H. Percy Boulnois (Westminster) congratulated Mr. James on his paper, which was concise and quite to the point. It gave an admirable epitome of the work which Mr. James had carried out. The table with regard to the flow of sewage in the district he regarded as exceedingly valuable, and he hoped that every surveyor in the country would follow the example of Mr. James and prepare similar tables. The Local Government Board only had overflows put in the sewers when six times the dry-weather flow had been reached, but the return showed that at Grays that had never happened; five times had only been reached once, and four and a-half and four only once each. That was the sort of information they wanted, and it would be useful if the practice of obtaining it could be extended to other towns. It was very difficult, of course, to criticise the paper until one had seen the various works which it described, and he threw out the suggestion that members might after their tour of inspection communicate by letter with Mr. James in regard to any point on which they desired to be enlightened. He had pleasure in proposing a vote of thanks to the writer of the paper.

Mr. E. Willis (Chiswick) seconded. In regard to the levels of the district, he did not think all of them were aware that any part of the district was as much as 115 ft. above ordnance datum. He thought that was very fortunate for the district, because they were gradually reducing these levels in the chalk hills. In connection with the surface-water drainage, he would like to know whether Mr. James had had any serious difficulty with flooding; he knew there had been some, but it was not stated whether it had been serious. He had the tide running up the centre of his district, and had had to carry it away by the sewer. Vans of a capacity of 2½ cub. yds. were used in the collection of house refuse, and he would like to know whether these had proved economical. He himself had started with vans of 3 cub. yds. capacity, and had gone up to 6 cub. yds. But his district was very flat, which accounted for his being able to use such large vans, and they had been able steadily to reduce the cost of collection in spite of the increasing population, and without any apparent additional wear and tear on the horses. On the matter of highways he congratulated the author on the fact

that although the traffic had developed so much in recent years the current contract for maintenance was lower than in 1906. That seemed remarkably good. Some information appeared to be required as to the *in situ* concrete footpaths. He had had trouble in effecting repairs where there were any trenches underneath, and he would like to know whether Mr. James had experienced similar trouble. Then as to the wear of concrete kerbs he had had no personal experience with them, but if they really did wear well they might be worth considering. They were told in the paper that the cost of watering had been very considerably reduced since the adoption of surface tarring. He did not know whether that had been the universal experience of the members of the institution; at any rate it was not his. He had tarred between one-third and one-half of the roads in his district, and the watering had not been reduced very much. Residents did not seem to like roads that had not been watered. Perhaps other members would give their experience?

Mr. E. R. Capon (Epsom) said he noticed that the paper did not state what area was covered per gallon of tar. The work was done at a very low price, so low, in fact, that he could not touch it by a penny, his price being from 1¼d. to 1⅜d. per square yard. Some information on the point he had mentioned seemed desirable. The Grays carriageways were constructed with only 4 in. of flint surface. He would like to know how these had lasted, and have some information also as to the concrete kerbs.

Mr. E. J. Elford (Southend-on-Sea) said he was sure the council of the institution would appreciate the way in which Mr. James' paper had been written. If all papers were written in the same concise, business-like way the printing bill of the institution would be very much reduced, and he did not think they would lose much in the usefulness of the papers. Mr. James' contribution gave one the impression that he had done his work very well and economically. There was not the scope in Grays that there was in larger districts, but what he had done he appeared to have done most capably. Proceeding, Mr. Elford said he would like to know the weight of the 6 cub. yd. vans referred to by Mr. Willis.

Mr. Willis: The tare is just over a ton.

Mr. Elford: That is an exceedingly low tare. The cost of house refuse collection in Grays was very economical. The plans for the open-air swimming bath were not approved by the Local Government Board, and it would be interesting to know the reason for that. A sum of £4,500 was spent on the refreshment kiosk, a store for model yachts, conveniences and baths. Had that been paid for out of loan or revenue? The fact that a profit was being made out of the electric light undertaking was very creditable in the case of so small an undertaking. Mr. James had not yet commenced to use tar-macadam or other similar material for private street works, but he would have to come to it, and the cost would not be much greater. The use of 1½-in. macadam on the majority of roads and 2-in. stone on the heavier traffic roads was mentioned, but personally he favoured 1½-in. stone for all situations, a road made up of good 1½-in. material being much more satisfactory than one constructed with larger material.

Mr. S. H. Chambers (Hampton), in adding his thanks to the author, asked what was the water supply per head in the district. A sewage flow of 11 gallons per head was an abnormally low one, and he did not think there were many places in the country where the quantity was so small. It was interesting to see the particulars of flows given, but he thought it must be a very dry neighbourhood, considering that the average flow was some 15 gallons per head per day. As to the cost of watering, he asked whether Mr. James had to pay for the cost of the meters.

Mr. H. T. Wakelam (Middlesex) said he also wished to thank the reader of the paper for presenting such a valuable document. Having watched the growth of the district under Mr. James' administration, and followed his career for several years past, he could testify to his engineering abilities.

Mr. C. Lawson (Sandgate) put a question as to the cost per annum of the electric lighting, and the number of hours during which the lamps were burning.

Mr. P. T. Harrison (Chelmsford) said the information given in the paper was so concise that he did not think he could touch upon any point except the stables. He was particularly interested in that class of work, and would like to know the cost per horse, and to have any figures with regard to the cost of the stables separately from the depot buildings.

The President, in putting the vote of thanks, referred briefly to one or two points in the paper. In the first place he wished to echo the remarks of one of the speakers as regarded the cheapness of the surface tarring done in Grays. One halfpenny per square yard was a very low price, and it would, he agreed, be interesting to know the area over which a given quantity of tar was distributed. Figures as to the average rainfall might usefully be included in the paper. He himself had found concrete kerbs fairly satisfactory. At times they chipped, but they were true in line, and were very economical. The paragraph with reference to the standardisation of materials was interesting. Standardisation was one of the most crying needs of the day, particularly in connection with road materials. At present they had all sorts and kinds of stone labelled as granite, and to a young officer not conversant with the quarries from which the materials were derived it was confusing. He quite believed the efforts of the Standards Committee would result in their obtaining considerable assistance in that direction.

The vote of thanks was passed.

Mr. James, in reply, expressed regret that there was not more in the town to show the members. They were very poor, and everything had to be done as economically as possible, though they had tried to do the work so that it would not require to be done over again. The surface-water drainage flooding referred to in the paper was due to rainfall, and not to the breaking of the river wall. They had had one break of that kind, however, when they had to stop pumping altogether. In June last they had 2½ in. of rain in an hour, and they suffered from flooding in consequence in the low-lying part of the town, one building—a chapel—having as much as 3 ft. of water in it. But such a thing did not often happen. With regard to dust collection, at present they used carts, and if one day they scrapped these they might go in for vans, though not of a capacity of 6 cub. yds. For one thing, they would have considerable difficulty in manipulating the vans in the back streets. They had received £1,500 a year from the county council. The reason for the lower cost of the main roads was entirely that which he had given in the paper. They had widened the roads and taken the opportunity to put in a good foundation. The tarring of the roads had also a considerable effect in increasing their life. The area of the roads was about double what it was fifteen or sixteen years ago, and the cost was just about the same. They did not have trouble with the trenches underneath the concrete footpaths. They had a bar from 6 ft. to 10 ft. long, with a special loose cast-steel head, which they drove under the paths, and threaded either a cable or water or gas pipe through to the premises. They only had to break up a path if it was more than 8 ft. wide, and then they cut open the path to a regular size and kept slabs made ready for repair at once. They began the tarring very early, commencing on April 2nd and finishing by the middle of May. If one put the work off until June one could effect no saving in the matter of watering. Seven square yards had been covered with each gallon of tar, and with dehydrated tar 6 sq. yds. The price was ·55d. They did not know why the swimming bath was omitted from the loan, but perhaps because it was thought they were too extravagant. The £4,500 was for building and everything except the fencing. They had not used tar-macadam on private streets, but the last one or two streets they tar sprayed, practically without any addition to the cost of water binding. It was too early to say whether it would stand. There were several pieces of bituminous-grouted road. The water supply per head he was afraid he could not give. Practically the district was without any baths at all. He was told that in the mining districts in the North of England the flow at the sewage works was the same as at Grays. The sewers were absolutely watertight. After they were laid the sewers were lying empty for several months, and he was not able to trace any leakage into them, although they were laid in low and marshy ground. The rainfall was about 19 in. per annum. He knew only of Shoeburyness being drier than they were. The water meters belonged to the council. The water company used to charge them 27s. rent. It was about £70 the water company wanted for them second-hand before they bought them. They had then paid £53 in rent. Last winter they had Tantalum lamps in the streets, the lanterns holding two 25 c.p. lamps. For these they had sub-

stituted one Osram lamp, with the result that they were saving £150 a year. He was afraid he could not separate the cost of the stables from the other work. The concrete kerbs were adopted sixteen years ago, at the suggestion of the father of the chairman of the council, who had seen it in Philadelphia. It was laid down against his (the speaker's) wishes, but he was now convinced that it was perfectly good for any purpose. He did not say it was good for heavy traffic, but he had seen it opposite the Waverley Station, Edinburgh, and in St. George's-square, Glasgow.

An inspection of the "Beach" Recreation Ground and open-air swimming pond, and the new infants' school and school baths in Bridge-road, was afterwards made by the members, following which the party were driven to the Wouldham Cement Works. Luncheon was provided on arrival, the hospitality of the company being acknowledged on behalf of the members by the president of the institution (Mr. R. J. Thomas). In the subsequent tour of the works the members were shown the various processes of manufacture, which were followed with the greatest interest by all present. Later in the afternoon the manufacture and testing of reinforced concrete pipes were witnessed at the works of Messrs. Siegwart, Limited.

AN EXTENSIVE WATERWORKS FILTRATION SCHEME.

Situated between the Wessenden Valley reservoirs of the Huddersfield Corporation and the Woodhead reservoirs of the Manchester Corporation is the watershed of the Ashton, Stalybridge, Mossley and Dukinfield Joint Waterworks Board. In the valleys at Greenfield, Chew and Swineshaw are seven or eight large reservoirs, which supply water to a population of 140,000 people, distributed over an area of 52 square miles. For some years complaints of lead poisoning were prevalent in the Yorkshire part of the board's area, and in order to remedy this the board decided to undertake a scheme of filtration.

This work has been carried out, at a cost of £80,000, and last week the filtration stations at Greenfield, Saddleworth and Swineshaw—among the largest of their type in the kingdom—were officially opened. The two installations comprise thirty-six pressure filters, designed to purify collectively 5,352,000 gallons of water per day. The filters and the chemical plant have been supplied and erected by Messrs. Mather & Platt, Limited, of Manchester. Practically the whole of the power in the filter-houses is generated by water.

Cheshire Sanatorium Scheme.—The Chester Town Council have approved of a scheme under the Insurance Act for a joint sanatorium district for the county of Cheshire and the county boroughs of Chester, Birkenhead, Stockport and Stoke-on-Trent and the borough of Wallasey. It is proposed to build a sanatorium for 150 beds at a cost of £25,000.

Street Dust and Street Pavements.—In a recent article published in *Hygiene* Dr. Rasser draws attention to the considerable danger connected with street dust, the action of which on the human organs of respiration is responsible to a great extent for the origin of tuberculosis and similar diseases of the lungs and wind-pipe. But, apart from this kind of trouble, dangerous chronic inflammations of the eye should be put down to the action of street dust. In fact, an increase in the frequency of catarrhs has been observed with continued dry weather and a reduction on the occurrence of the first rain. Under these conditions road engineering, apart from its technical task, has primarily to fulfil a sanitary task. As the production of dust depends on the fixing of roads, a pavement complying with all hygienical requirements should be looked for. Asphalted streets would seem to comply with most of these conditions, provided there be an extensive and thorough removal of waste matter followed by an abundant sprinkling of the road surface. Granitchrome pavement, as used with especially satisfactory results in London, would seem to be most desirable. Dr. Rasser does not seem to think very highly of the sprinkling of roads with chemicals, such as salts and tar. An ideal means of laying street dust which has been suggested of late years is sprinkling with a solution of sulphite pitch in water, which would seem to avoid any dust for at least six weeks. Sulphite pitch is obtained as a by-product in manufacturing cellulose.—*Scientific American.*

CORRESPONDENCE.

"Be calm in arguing; for fierceness makes
Error a fault and truth discourtesie."
—Geo. Herbert, "*The Temple.*"

TOWN PLANNING: THE PRELIMINARY SURVEY.

To the Editor of The Surveyor.

Sir,—In your issue of September 20th you note the reference of Prof. Geddes, University College, Dundee, to the necessity of a survey being made before the preparations of any town-planning scheme can be satisfactorily undertaken. We found it advisable at Letchworth to have the whole estate of 4,000 acres odd contoured for every 5 ft. difference of level. From this we were able at once to see the main line for the sewers and position of sewage farm, and obtain other necessary information.

Having had charge from the commencement of the engineering work at Letchworth, I should like to emphasise Prof. Geddes' warning. It is impossible to make an economical plan without a careful survey. In my opinion at present too much consideration is given to the bird's eye view of town plans (the result of which can only be seen from a flying machine when the place is built). The drainage should determine the roads rather than the roads the drainage. —Yours, &c.,

A. W. E. Bullmore, Assoc.M.Inst.C.E.

Estate Office,
Letchworth, Herts.
September 26, 1912.

IS THE ROAD BOARD A FAILURE?

To the Editor of The Surveyor.

Sir,—As I notice you are inviting correspondence on this subject, it is my opinion that if the Road Board has not yet had time to prove itself a failure, there is no doubt that this will be its end.

In the article you refer to it is said they have "splashed tar about," and this has apparently been done quite freely.

There is also another material that they appear to favour, although it has no particular advantage with the exception that it belongs to contractors who, I believe, are closely connected with the Government.

To make better roads, or to know how to make them, it is necessary to have some knowledge of the materials being used, and it will be interesting to hear other views on this subject.—Yours, &c.,

Practical.

September 24, 1912.

[With deference to our correspondent we suggest he has misinterpreted our invitation. A general statement that the Road Board appears to favour a material which is supplied by contractors who are closely "connected with the Government" is neither convincing nor helpful. Does our correspondent suggest that the Board's Advisory Committee are parties to this unholy partiality? On this minor point we think it can be accepted that the Road Board make their grants solely on their unprejudiced judgment as to the merit of the specific work under consideration. The important broad issue is this: The board has at its disposition a certain revenue for the stimulation and encouragement of roads improvement. Does it disburse this income on right lines? If not, how could it improve upon its methods?—Ed., Surveyor.]

Standard Pipe Specifications.—We have been favoured by the British Engineering Standards Committee with copies of the newly issued standard specifications for cast-iron pipes and fittings. The specifications, which are obtainable at the price of 5s. each, are two in number, one relating to pipes and fittings intended for soil, and a separate one dealing with pipes and fittings for other purposes. It is hardly necessary to say that the specifications are most carefully drawn, and are complete in every particular. Each deals separately, as far as drawings and dimensions are concerned, with straight pipes, bends, inspection doors, double sockets and holder bats. A large scale drawing is given of each pipe or fitting, and the standard dimensions are indicated by means of letters corresponding to the required dimensions in tables applicable to pipes of varying sizes. These standard specifications will be indispensable to all users of cast-iron pipes for any purpose, and it affords us pleasure to call the attention of our readers to their publication.

New School at Chiswick.

DETAILS OF CONSTRUCTION.

The Chiswick Urban District Council have erected at Strand-on-the-Green a boys' school, the design of which embodies a number of interesting features, and which in point of cost compares favourably with other buildings of a similar class in the metropolitan area.

SITE.

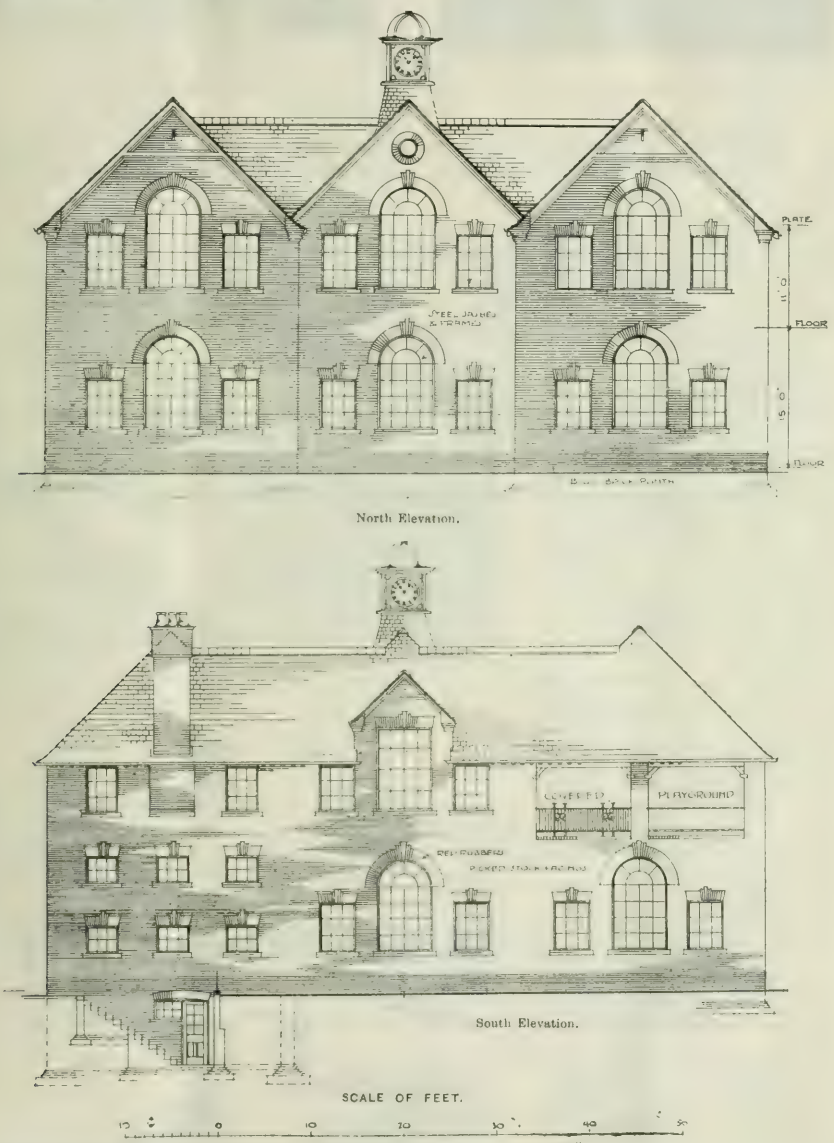
About 2,800 sq. yds. of site have been covered, the school occupying about 440 sq. yds. The playground has been raised and tar paved for an area of 1,850 sq. yds., and about 510 sq. yds. has been left for the boys' gardens.

The whole area has been enclosed by solid unclimbable iron railings, but double gates have been fixed for the admission of the fire-escape should it be required. The existing southern gate will form the main entrance for boys. The covered playground at present forms part of the school, but should it be required for open-air classes, an additional covered playground at ground level may be added.

DRAINAGE.

The whole area is drained by gullies only at the sides into the storm-water drainage system, thus leaving an even and unbroken surface for games. The heating chamber and coal store, which forms the only basement, is provided with a fixed semi-rotary pump for lifting all waste or rain water to the general drainage level.

Lavatories are provided in the head master's room (for use during medical examination), and in the cloak-rooms, on mazzanine and ground floors, these



North Elevation.

South Elevation.

Strand-on-the-Green School, Chiswick.

discharging into the foul-water sewer in Brook-road. One masters' and two additional boys' water-closets have been provided with dials worked by the same master clock in the head master's room.

Strand-on-the-Green School, Chiswick.

Corner of Covered Playground, Strand-on-the-Green School.

have been provided with extra urinal accommodation, while three "Purita" fountains placed outside the school provide a continuous supply of drinking water.

STRUCTURE.

The walls are of stock bricks, with red brick dressings and blue brick plinth, all below the damp-proof course being in cement mortar. The roof is of wood construction covered with boarding, felt and best Broseley tiling.

The internal surface of the walls to the staircase is finished with brown salt-glazed brick facings, this material also forming a dado 4 ft. high on both floors, the remaining surface being distempered. The thresholds and steps are of York stone, while the window cills are made with blue brick blocks, and the arches of rubbed brick, with Portland keystones. Bull-nozed angles are provided both externally and internally at all projecting angles.

The windows in all walls are formed with steel casements, with hopper openings for the prevention of draught and better ventilation. This type also gives a maximum amount of light for the size of the opening. The borrowed lights are similarly of steel construction, and are made to open for ventilation.

The internal joinery to the classrooms is in pitch pine throughout, with yellow deal for the cloakrooms and lavatories.

The floors to the classrooms are of steel and concrete, finished with 1½-in. pitch pine blocks laid to herring-bone pattern, while the staircase is ferro-concrete, and the cloak-rooms and corridors are all finished with granolithic paving. Blue brick paving is adopted in the basement.

VENTILATION, HEATING AND LIGHTING.

In addition to the ordinary windows extra ventilators are provided to all classrooms, four opening direct into the external air, and four discharging through a ventilating turret about 40 ft. high. Fanlights are fixed to the classroom doors, and at all times cross-ventilation in either direction is possible.

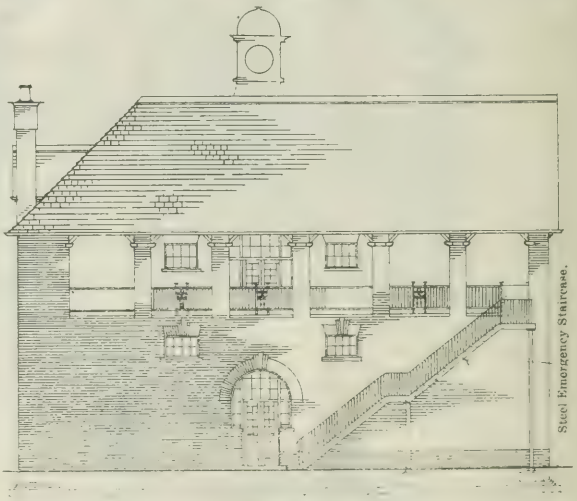
The heating of classrooms, lavatories and corridors is effected by a low-pressure system, regulated automatically with a sectional boiler in the basement and radiators in all classrooms, the master's and assistant masters' rooms being warmed by open fires.

The artificial lighting throughout is by means of gas, inverted incandescent mantles being used in the classrooms and plain guarded burners in the corridors.

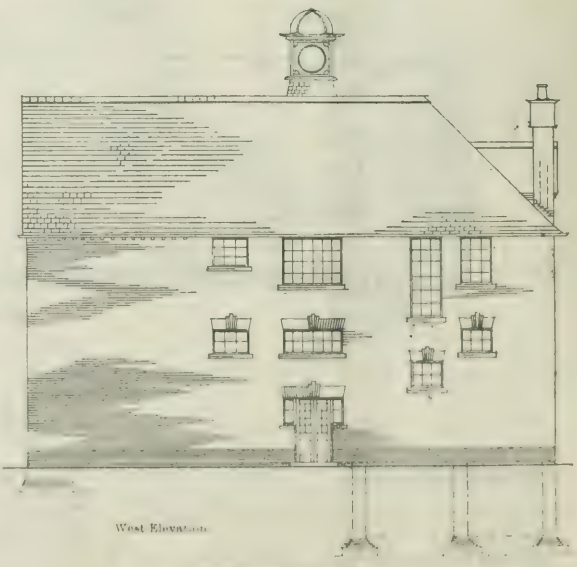
FITTINGS.

All rooms are provided with the Magneta Time Company's clocks, and [illegible] the "Metrical" [illegible]

A special pendulum fire alarm and telephone is fixed in the ground-floor corridor at the foot of the staircase, this ringing direct to the fire station. The



East Elevation.



West Elevation.

For Scale see page [illegible]

Strand-on-the-Green School, Chiswick.

turret, chimney stacks, and so forth are properly protected by lightning conductors connected to a copper earth-plate on the southern side.

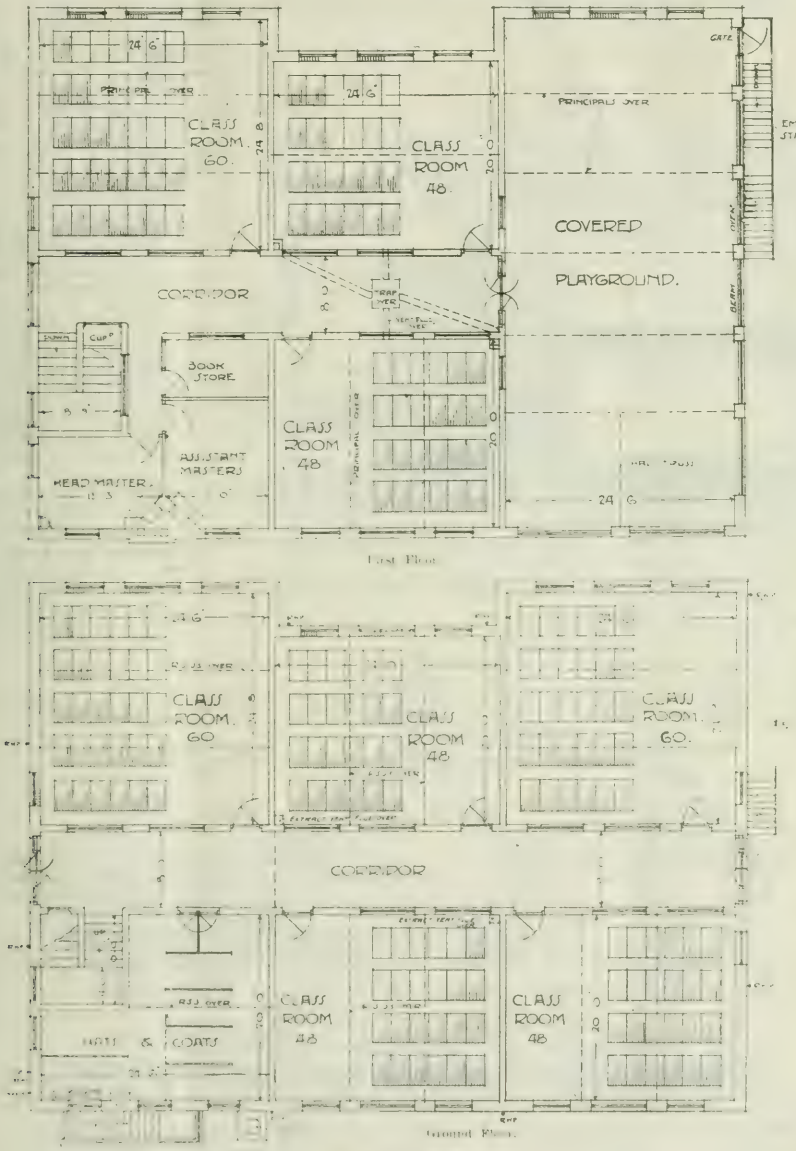
ACCOMMODATION.

The building comprises two floors and basement, heating chamber and coal store. The ground floor includes a bicycle store, three classrooms for forty-eight and two for sixty boys, with three lavatories and cloak-room accommodation.

his supervision by Mr. W. J. Macklison, of Canning Town, Mr. J. Empson being the clerk of works.

It is anticipated the final cost of the building will not exceed £5,000, or about £12 per school place.

Change of Address.—Owing to their premises having been acquired by a company with a view to rebuilding, Roadite, Limited, will remove to-morrow from



First Floor.

Ground Floor.

Strand-on-the-Green School, Chiswick.

The first floor has only one classroom for sixty boys and two for forty-eight boys, making 420 as the total present school accommodation. The lavatory and cloak-room accommodation for first-floor scholars is on the mezzanine floor.

The design was prepared by Mr. Edward Willis, Assoc.M.Inst.C.E., F.S.I., architect to the Education Committee, and the contract was carried out under

9 Great Georges-street to Broadway-court, Westminster, S.W.

Tiverton Surveyor and Tar Spraying.—The borough surveyor of Tiverton, Mr. J. Siddalls, in his annual report states *inter alia* that the advantages in the way of economy and comfort derived from tar spraying are more apparent in the case of side streets than on main thoroughfares.

MUNICIPAL TRAMWAYS ASSOCIATION.

ANNUAL CONFERENCE AT WEST HAM.

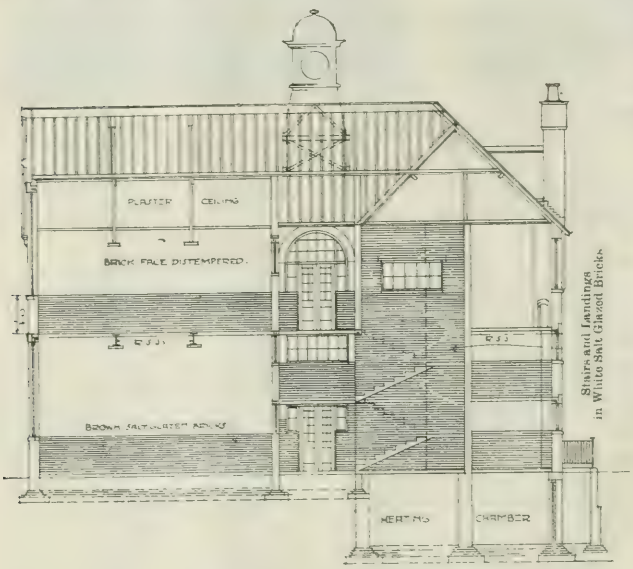
About 250 delegates, representative of the tramway undertakings of most of the principal towns in the United Kingdom, are attending the eleventh annual conference of the Municipal Tramways Association, which opened on Wednesday at Stratford Town Hall.

In his presidential address, Mr. H. E. Blain, tramways manager to the West Ham Corporation, dealt with the subject of motor 'bus competition. Taking structive effects of motor omnibus traffic. While recognising, as he did to the fullest extent, the rights of private enterprise, and the exceedingly valuable traffic facilities which had been furnished by motor omnibuses in many areas, it was unreasonable and unfair that when competition of such magnitude existed there should not be such central authority for the control of traffic as would be empowered to enact satisfactory street regulations, or that the municipally owned undertakings should be at the enormous disadvantage (in competition with private enterprise) which was entailed by their road maintenance and rating responsibilities. If competition was to exist on the public highway for the conveyance of the public, all such means of traction should pay a proportionate cost of road maintenance, should be rated on similar lines, and should be governed in the conduct of traffic by similar public regulations.

RAIL CORRUGATION.

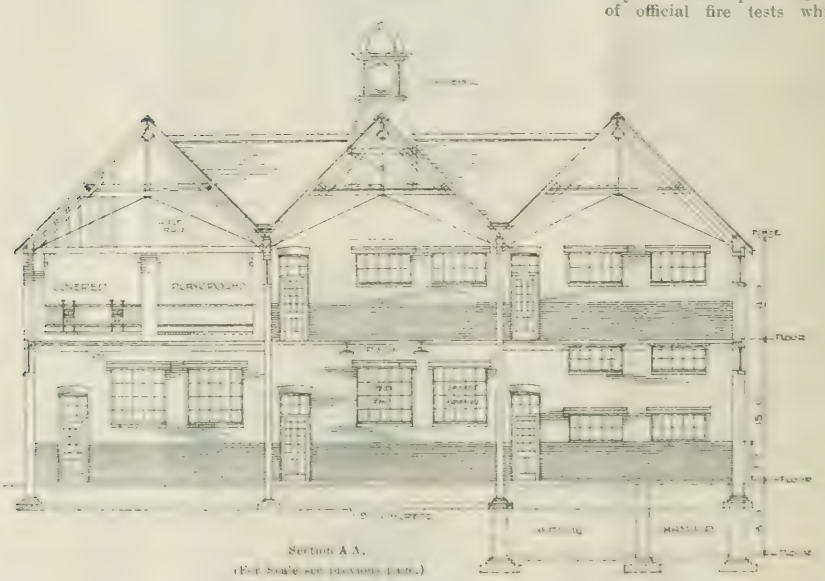
A debate took place in the course of the proceedings on the interim report of the Corrugation Committee.

Mr. C. A. King, who forwarded some explanatory comments, said that, while the action which resulted in corrugation had not yet been definitely proved, there had been a great clearing up of the subject, and future investigation could be confined within reasonable limits with the assurance that within these limits the corrugating influence would be found.



Section B B.

Celluloid and Petrol Dangers.—The British Fire-Prevention Committee opened its autumn session on Wednesday with two important series of official fire tests which



Section A A.

(For Scale see previous page.)

STRANDON THE GREEN SCHOOL, CHISWICK.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

273. Cast-Iron Stanchion.—Calculate the size of a cast-iron stanchion 12 ft. in height alongside an external or party wall to carry a load of 54 tons. (T. R.)

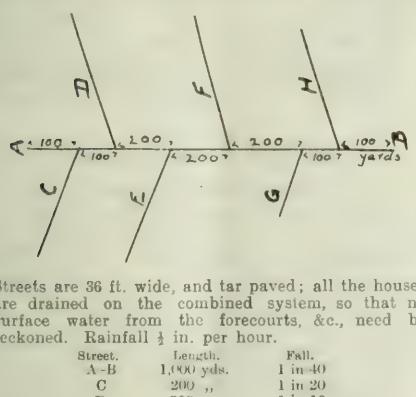
275. Cantilever.—A cantilever of uniform cross-section and length L carries a concentrated load W at the free end. A prop is placed at a point $\frac{L}{4}$ from the free end, bringing this point to the same level as the fixed end. Find an expression for the reaction at the prop, and the deflection of the free end of the cantilever. Neglect the weight of the cantilever. (B.Sc.Eng. Final.) (H. F. W., *Tottenham.*)

276. Roof Design.—It is found necessary in designing the steel trusses for a roof to adopt some system of wind bracing. Explain in detail how the cross-sectional area of the wind ties is determined. (H. F. W., *Tottenham.*)

277. Sewage Disposal.—What main principles should be kept in mind in arranging the sewage disposal of the following: (*a*) A village of 800 inhabitants (purely agricultural)? (*b*) A town of 2,000 inhabitants (industrial)? (*c*) An infectious diseases hospital of 100 beds? ("Charger.")

REPLIES TO QUESTIONS.

272. Surface-Water Drainage.—State, showing the method of working out, the sizes of pipes necessary to take the surface water from streets as per sketch.



Streets are 36 ft. wide, and tar paved; all the houses are drained on the combined system, so that no surface water from the forecourts, &c., need be reckoned. Rainfall ¼ in. per hour.

Street.	Length.	Fall.
A–B	1,000 yds.	1 in 40
C	200 ,,	1 in 20
D	800 ,,	1 in 10
E	200 ,,	1 in 20
F	500 ,,	1 in 30
G	100 ,,	1 in 15
H	150 ,,	1 in 50

(F. H. S., *Sheringham.*)

In working out this problem, the first step is to arrive—taking each street in turn—at the quantity of surface water to be carried off, and upon the falls given, to select by calculation a pipe of sufficient capacity for the same. It is also well to ascertain that the velocity of the sewer is a self-cleansing one *viz.*, not less than 2 ft. 5 in. to 3 ft. per second although it is apparent in this case that there is ample velocity.

Commencing with road C, area to be drained = 36 ft. by 600 ft. = 496 acres = for all practical purposes ½ acre.

Rainfall of ¼ in per acre = 11·32 gallons per hour the pipe must be capable of carrying off 5,662 gallons per hour, which is equal to 15·12 cub. ft. per minute. A 6-in. circular pipe (the minimum size for main drainage) will carry off 87·71 cub. ft. per minute, running full (the fall being 1 in 20), so that a 6-in. diameter glazed stoneware socketed pipe should be laid in this street. This is worked out as follows:—

$$\text{Velocity} = V = 55 \sqrt{x \times 2f} \text{ where } x = \frac{\text{sectional area of flow, feet}}{\text{wetted perimeter, feet}}$$

and f = fall in feet per mile.

$$\therefore 55 \sqrt{\frac{1963 \times 2 \times 264}{1{\cdot}57}} = 55 \times 8{\cdot}124 = 446{\cdot}82 \text{ ft. per minute velocity.} \quad \text{(Eytelwein.)}$$

Discharge or carrying-off capacity = V × sectional area of flow = 446·82 × ·1963 = 87·71 cub. ft. per minute discharge. (Eytelwein.)

Street D, 900 ft. × 36 ft. = ·74 acre, say ¾ acre to be drained, which equals 22·68 cub. ft. per minute. A 6-in. pipe with a fall of 1 in 10 has a velocity of 631·95 ft. per minute (working as previous examples), and will carry off 124·05 cub. ft. per minute, so that a sewer of this diameter should be laid here.

Street E, being exactly similar to street C—15·12 cub. ft. surface water per minute to be carried off—a 6-in. sewer should be provided, the capacity of which is 87·71 cub. ft. per minute.

Street F, 1,500 ft. × 36 ft. 1·24 acres, say 1¼ acres to be drained, equal to 37·8 cub. ft. per minute. A 6-in. pipe with a fall of 1 in 30 has a capacity of 365·2 ft. per minute, and will carry off 71·68 cub. ft. per minute, so that a sewer 6 in. in diameter should be laid in this street.

Street G, 300 ft. × 36 ft. = ¼ acre to be drained, equal to 7·56 cub. ft. per minute. A 6-in. pipe with a fall of 1 in 15 has a velocity of about 500 ft. per minute. It is scarcely necessary to work this street out further, as it will be clearly seen by the preceding streets that a 6-in. sewer is undoubtedly ample.

Street H, 450 ft. × 36 ft. = ⅜ acre to be drained, or 11·34 cub. ft. per minute to be carried off. A 6-in. pipe with a fall of 1 in 50 will be found to have a velocity of 280·5 ft. per minute, and will carry off 55 cub. ft. per minute, so that a sewer 6 in. in diameter should be laid in this street.

Street A B, from A to street D, 600 ft. × 36 ft. = ½ acre to be drained, which equals:—

15·12	cub. ft. per minute, plus	
15·12	,, ,,	discharge from sewer in road C
30·24	,, ,,	total.

A 6-in. pipe with a fall of 1 in 40 has a velocity of 316·25 ft. per minute, and will carry off 62 cub. ft. per minute, so this section of sewer should be 6 in. diameter.

Street I B, from street D to H, is 2,100 ft. × 36 ft. 1¾ acres to be drained, which equals:—

52·92	cub. ft. per minute, plus	
30·24	,, ,,	discharge from sewer A to D, plus C
22·68	,, ,,	discharge from sewer D
15·12	,, ,,	,, ,, ,, E
37·80	,, ,,	,, ,, ,, F
7·56	,, ,,	,, ,, ,, G
166·32	,, ,,	total to be carried off.

A 9-in. pipe with a fall of 1 in 40 has a velocity of 386·65 ft. per minute, and a capacity of 170·78 cub. ft. per minute; and a 9-in. diameter sewer will therefore be just sufficient for this length.

The remainder of the street, from street H to point B, 300 ft. × 36 ft. = ¼ acre to be drained, which equals:—

7·56	cub. ft. per minute, plus	
11·34	,, ,,	discharge from sewer H
166·32	,, ,,	,, ,, whole of the other sewers
185·22	,, ,,	total to be carried off.

A 9-in. pipe is just too small here, so a 12-in. sewer (the next larger size) should be laid for this portion.

All the gully connections should, of course,

be made with 6-in. diameter pipes. (W. H. A., *Romford.*)

Dealing first with the inclination of the surface-water sewers, it is clear that the gradients of the streets will allow each sewer to be laid to a satisfactory fall. A comparison may be made with Maguire's general decimal rule, which states the following gradients: 6-in. pipes, 1 in 60; 9-in. pipes, 1 in 90; 12-in. pipes, 1 in 120. These gradients provide a self-cleansing velocity of flow of nearly 4½ ft. per second, which may be considered as satisfactory in the present case. The size of the pipes can be found from the equation:—

$$A = \frac{Q}{V}$$

Where A = area of pipe in feet = $\cdot 7854\, d^2$

Q = quantity discharged in cubic feet per second

V = velocity of flow in feet per second.

Taking the point B, the quantity discharged will be the total area of all the streets multiplied by the depth of rainfall—that is, $7{,}350 \times 36 \times \frac{1}{24} = 11{,}025$ cub. ft. This is discharged in sixty minutes, equivalent to 3·06 cub. ft. per second.

$$\cdot 7854\, d^2 = \frac{3 \cdot 06}{4 \cdot 5}$$

$$d^2 = \frac{3 \cdot 06}{4 \cdot 5 \times \cdot 7854}$$

$$d = \cdot 93 \text{ ft.}$$

$$= \text{say } 12 \text{ in.}$$

If the sewer A B is laid to a fall of 1 in 40, the necessary calculations would be as follows, assuming a 9-in. pipe to be adequate. First, to find the velocity by Eytelwein's formula:—

$v = 55 \times \sqrt{r \times 2f}$.

v = velocity in feet per minute.

r = hydraulic mean depth in feet = one-fourth the diameter in this case = ·187 ft.

f = fall in feet per mile = $\frac{5{,}280}{40} = 132$ ft.

$v = 55 \times \sqrt{\cdot 187 \times 2 \times 132}$

$= 55 \times 7 \cdot 02$

= 386 ft. per minute, or 6·43 ft. per second.

The size of pipe can be calculated as before:—

$$A = \frac{Q}{V}$$

$$\cdot 7854\, d^2 = \frac{3 \cdot 06}{6 \cdot 43}$$

$$d = \cdot 78 \text{ ft.}$$

It is thus shown that a 9-in. pipe is not large enough at B. From B to the connection of G, therefore, the sewer A B should be 12 in., and above this point 9 in.

Similar calculations can be used to find the correct sizes of the remaining sewers. Six-inch pipes would be large enough to drain the water from the side street, but, owing to the gully branches being formed with 6-in. pipes, and the possibility of further connections, it is usual to construct the sewers with 9-in. pipes at least. (F. E. Y., *Richmond.*)

274. Administration.—What is the best arrangement of the columns in a surveyor's cash-book (also wages-book), to show, in addition to the usual items, separate columns for the workmen's and the council's contributions under the National Insurance Act? ("R. D. C.")

The diagram shows a combined cash account and wages book, and is, I think, self-explanatory. The column on the extreme right balances with the one on the left. The intermediate space can be arranged to suit the locality. Of course, the wages-book could be kept separate, if desired.

In that case the Insurance Act part would be the same, and an ordinary cash-book could be used, an item being added to the wages to cover the insurance stamps—in this case 8½d. over the gross wages. (L. B., *Ware.*)

COMBINED WAGES AND CASH BOOK.

Date.	Cheques received from Council.			Workmen's name and time, &c.	Total wages due.			National Insurance contributions. Part 1. Workmen.			Part 1. Council			Part 2. Workmen.			Part 2. Council.			Nett wages, after National Insurance deductions.			When paid.	Receipts.		Week's total, including wages and stamps.		
	£	s.	d.		£	s.	d	£	s.	d.	£	s.	d.	£	s.	d	£	s.	d.	£	s.	d.	1912.	Brt. frd. £		£	s.	d.
Brt. frd.	76	15	5	Tom Smith—sweeper	1	2	0			4			3						1	1	8	Sept. 15					
				T. Jones—bricklayer	2	0	0			4			3			2			1	19	5½	,, ,,					
Sept. 10	100	0	0																								
£	176	15	5	Totals	3	2	0			8			6			2½			2½	3	1	1½				3	2	8½
																							Carried forward £		53	4	8½
																							Balance £		123	10	8½
																							£		176	15	5

NEW TYPE OF ROAD SURFACE.

THE "CARPETING" PRINCIPLE.

The members of the council of the Roads Improvement Association last week inspected, under the guidance of Colonel R. E. Crompton, a new type of road surface now being laid down in Addison-road, Kensington. The material consists of graded granite, cement, bitumen and sand, heated and mixed to a temperature of 600 deg. The cost of the work—comprising a sub-layer of material 2¾ in. thick and a "wearing carpet" of smaller material 1 in. thick, making a total thickness of new surface 3¾ in.—is about 4s. 6d. per super. yard, and the contractors (The Taroads Syndicate, Limited) have given a five years' guarantee.

After inspecting the work of laying the already prepared material on the road the members travelled to the depot, and there saw the various materials mixed and heated. Colonel Crompton afterwards entertained the council at his house and, in his laboratory, demonstrated the various processes in fuller detail.

Something New in "Booby" Prizes.—A western United States town has an interesting method of selecting workmen for repairing its roads, and at the same time ridding it of undesirable citizens. When tramps hit the burg they are gathered in by the town marshal and placed in the lock-up until there are a sufficient number. They are then taken out and lined up in front of the town hall at one end of a half-mile stretch of straight road. At the other end a constable is stationed. At a pistol shot the tramps start running, and the last man to reach the end of the half-mile section secures a job repairing the roads for his board and lodging. The remaining tramps are allowed to keep on running as long as they keep headed away from the town. *The Contract Record* (Toronto).

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
An Extensive Waterworks Filtration Scheme	420
Appointments Vacant	440
Assistants' and Students' Section	425
Association of Kent Surveyors	439
Association of Managers of Sewage Disposal Works	440
Chlorines or Hypochlorites?	411, 438
Colonel Crompton and Calumny	410
Combined Drainage	431
Correspondence	420
Damage to Roads by Motor 'Buses	411, 436
Institution of Municipal and County Engineers — Eastern District Meeting at Grays	410, 416
Notices	438
Institution of Municipal Engineers:— Notices	439
Institution of Water Engineers: Visit to South Wales	435
Is the Road Board a Failure?	420
Law Notes	428
L.C.C.—A New Enterprise	414
"Llwyn-on" Reservoir	435
Local Government Board Inquiries	430
Manchester Sewage Disposal	427
Motor 'Buses and Road Maintenance	411, 436
Municipal Competitions Open	440
Municipal Contracts Open	441
Municipal Tramways Association	424
Municipal Work in Progress and Projected	432
Municipal Works at Grays	416
National Association of Local Government Officers	427
New School at Chiswick	421
New Secondary School for Hereford	429
New Type of Road Surface	426
Persecution the Cause	411
Personal	433
Prestwich Town-Planning Scheme	427
Royal Sanitary Institute	440
Rubber and Leather as Measuring the Value of a Road-crust	409
Seizing the Opportunity	410
Sewage Effluent Sterilisation at Polk State, Pennsylvania	411, 437
Society of Engineers	440
Sterilisation of Sewage Effluents	411, 437
Tar and Cement Pavements in Germany	415
Tenders for Municipal Works or Supplies	442
Town Planning: The Preliminary Survey	420
Ventilation of Sewers	408, 412

NATIONAL ASSOCIATION OF LOCAL GOVERNMENT OFFICERS.

A mass meeting of the National Association of Local Government Officers will be held in the Congress Hall of the Latin-British Exhibition, Shepherd's Bush, to-morrow (Saturday), at 3.30 p.m. The speakers will include Sir Homewood Crawford, City solicitor, London (president); Sir Laurence Gomme, clerk to the London County Council (vice-president); Mr. E. R. Pickmere, town clerk of Liverpool (vice-president); Mr. A. P. Johnson, town clerk of Hampstead (chairman, National Council); Mr. J. E. Balmer, Cheetham, Manchester (vice-chairman, National Council); Mr. H. E. Blain, general manager, West Ham Corporation tramways; and Mr. J. M. McElroy, general manager, Manchester Corporation tramways.

The seventh annual meeting of the National Council of the association is to be held at the City of London Guildhall, on Saturday, October 12th, at 10.30 a.m.

QUERIES AND REPLIES.

We cannot undertake to reply to any queries which are not accompanied by the writer's name and address. These are required as a guarantee of good faith, and not for publication. Sketches accompanying queries should be made separate, on white paper, in plain black ink lines. Lettering or figures should be bold and plain.

894. Cesspool Emptying.—"H. C." writes: Will you kindly inform me what firm makes Bexley carts (cesspool emptiers)? I am desirous of obtaining a cart that will empty cesspools by creating a vacuum in the cart.

The cart referred to by our correspondent is made by Messrs. George Waller & Son, Stroud, the London representative of whom is Mr. W. E. Horsman, 127 Pendle-road, Streatham, S.W.

Wandsworth Borough Council's Dispensary.—A dispensary for the treatment of consumption is about to be established by the Wandsworth Borough Council, at a cost not exceeding £1,000.

MANCHESTER SEWAGE DISPOSAL.

RIVERS COMMITTEE'S REPORT.

In its report for the year ended March 31st last the Rivers Committee of Manchester Corporation, which has control of the sewerage and sewage disposal systems of the city, states that the total charge on the rates in respect to its work during the period referred to was £112,360. Of this amount a sum of £35,108 was required for the upkeep of the Davyhulme, Moss Side, Withington, and Gorton sewage works, and for general rivers work, comprising the administration at the town hall, the cost of labour and various rivers improvements, contribution to the Mersey and Irwell Joint Committee, &c. The remainder, amounting to £77,252, was applied in the payment of interest on loans, and repayment of debt on the capital outlay on intercepting sewers throughout the whole of the city, and on the purification plant at the various sewage works.

During the year 11,667 tons of house refuse were delivered at the Withington bunkers and destroyed. In addition, 365 tons of garbage were removed from the screens and burned in the destructor, making a total of 12,032 tons of refuse destroyed. The record obtained from the gaugings at the works shows that the volume of sewage delivered at the Withington works during the year under report was 1,673,345,100 gallons, or an average of 4,597,100 gallons per day. The average daily flow of sewage per head has ranged from a minimum of 39 gallons for the four weeks ending September 13, 1911, to a maximum of 86 gallons for the four weeks ending February 28, 1912. The greatest daily flow was recorded on March 15, 1912, when 11,250,000 gallons passed down to the works.

The volume of sewage delivered at the Davyhulme works from March 30, 1911, to March 27, 1912, inclusive, was 12,382,950,000 gallons. A portion of this quantity, amounting to 129,227,000 gallons, was diluted beyond the 5 to 1 limit up to which the works are designed to treat. The average daily flow of sewage was 34,019,000 gallons, that of the previous year being 36,182,000 gallons, showing a decrease at the rate of 2,163,000 gallons per day, or nearly 6 per cent.

The report states that there are definite indications, apart from the question of rainfall and temperature, that the amount of putrescent matter in the Ship Canal water is being gradually reduced. The average effluent obtained during the year shows a higher percentage of purification of the raw sewage than has hitherto been obtained. "Further improvement," the report adds, "in the final average effluent may be anticipated as the beds on the Barton area which are at present under construction come into operation."

PRESTWICH TOWN PLANNING SCHEME.

FOUR-FIFTHS OF DISTRICT INCLUDED.

Prestwich Urban District Council have decided to make application to the Local Government Board for permission to prepare a town planning scheme under the Act of 1909, and as a preliminary a meeting of owners or other persons interested in any lands likely to be affected was held recently.

It was explained by the chairman of the council, Mr. A. E. G. Chorlton, who presided, that the main lines of communication in the district would follow the present accepted routes, and, if necessary, be extended so as to coincide with the ideas which the various landowners had formed. The preservation of trees would not be lost sight of, and with respect to residential thoroughfares it was proposed to have them constructed in a less expensive manner, with narrower carriageways, with more garden space. They proposed also to limit the number of houses per acre, and that where a certain class of house had been erected in a particular locality its value should not be depreciated by building other houses of an inferior character. Provision would be made for recreation grounds in various parts of the district, and other amenities of a social character.

The urban district of Prestwich covers an area of 2,482 acres, its population is 18,000, and the rateable value stands at £84,591. The area included in the scheme—which was unanimously decided upon by the council after consultation with the surveyor, Mr Sydney H. Morgan, ASSOC.M.INST.C.E.—is approximately four-fifths of the total area.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. *The letter* X, *combinations such as* X.Y.Z., *and words such as* "engineer" *and* "surveyor," *should never be used.*

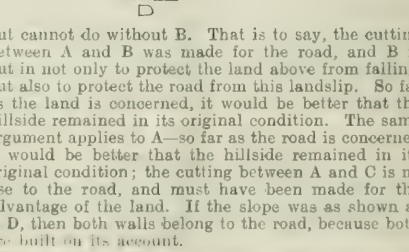
COMBINED DRAINAGE.—"Saxon" writes: A local co-operative society some years ago obtained land and built upon the front portion of it a number of shops. For the drainage of these shops the society, by arrangement with the owners of the adjoining land (now partly occupied by a street of houses), laid a drain through the land to the public sewer. On this drain the society built a manhole, but never placed a proper cover upon it. At a later period the society built five cottages at the rear of the shops, and drained these cottages into the shops drain. Up till now the society have kept the whole of the above drains clean and in repair, and have never at any time asked to have any portion of them taken over by the council as a sewer. Quite recently seventeen houses on the adjoining land were built by the owners of the land. The line of the co-operative society's drain would have been beneath two or three of these houses, so a new drain was laid by the owners of the land, and the society's drain was connected into the new one by arrangement between the parties. You will see the council have had no part in the laying of these various drains, neither, up to the time of writing, have they been requested by any of the parties to take over any portion of the drains as a public sewer. But since the opening out of a roadway (private) between the society's shops and the new houses, complaint has been made about the nuisance and danger arising through the inadequate covering of the manhole built on this ground by the society, and my council have requested the society to complete the manhole and abate the nuisance by providing and fixing a proper cover on the manhole. This the society refuse to do, now—and not until now—bringing forward as their reason the suggestion that the manhole is part of a public sewer, and that the council should do the repairs required. I contend it is not a case of repairs, but a case of uncompleted work, and that, putting all other questions of fact aside, it cannot become a public sewer until the work is completed, and the council have been asked, and have agreed, to take it over in the usual way.

In my opinion the whole of this drain, from the point at which it receives the drainage of more than one building, is a sewer: unless, therefore, it falls within either of the exceptions mentioned in sec. 13 of the Public Health Act, 1875, it is vested in the council under that section. The manhole is part of the sewer. *Staunton* v. *Wrockenham Local Board*, 11 Ch.D., 838), and the council are liable to keep it in repair under sec. 15 of the Act. I do not think the fact of its being imperfect prevents it from vesting in the council as part of the sewer, or relieves them from liability. With regard to that portion of the sewer which is in the private road it may be that the council could recover the road at the expense of the frontagers, if sufficient time has not elapsed from the construction of the sewer for the presumption that they were satisfied with it to arise. See *Waltham-stow Local Board* v. *Staines* (L.R., 1891, 2 Ch., 695.)

EXTRAORDINARY TRAFFIC.—"H. H. L. B." writes: I shall be much obliged if you will kindly advise me whether in your opinion a claim could reasonably be made for extraordinary traffic under the following circumstances. A macadamised county road, of about ½ mile in length, about 1½ miles from the nearest town, and having sand pits in the possession of three different owners on both sides, has been used for between thirty and forty years for sand carting by horse haulage, and during that time, on account of the extent of the traffic, has required annual repair. About two years ago one of the sand-pit owners commenced to use a steam tractor and trailer on this road. The weight of the tractor is within the axle-limit allowed under the Heavy Motor Cars Act, 1905, and the weight of the trailer is 4 tons 10 cwt. The load carried has been about 6½ tons, consequently the weight on each axle has been 4 tons. The road authority has now forwarded an intimation that they are about to make up the road in question in a more substantial manner, and at considerable expense and charge the owner of the tractor with the cost. The work proposed includes filling up ditches on each side after laying earthenware drainage pipes therein, and reforming the entire roadway to an increased width, with an ironstone foundation and broken granite surface. The owner of the tractor and trailer, however, only carries one-third of the sand taken over the road, and a fair amount of ordinary traffic also passes through it. The *World's Carriers* of May 15th last reported (on page 247) the result of a similar case at Greenock. As an appreciative reader of your "Law Notes" in THE SURVEYOR, however, I would value your opinion of the case herein set forth very much.

The case referred to is an interesting and instructive one. The traffic consisted of the haulage, by traction engines, of machinery, boilers and cylinders, weighing up to 65 tons (which is far in excess of the weights carried in the present case). Engineering, iron-founding, and boiler-making were staple industries of the district, and the defendants had hauled loads over the road for thirty-three years. The judge held that the substitution of traction engines for horse-drawn vehicles did not make the traffic extraordinary, and that the loads were not excessive in weight; also that the primary cause of the damage was that the plaintiffs had failed to lay down setts capable of sustaining the traffic; and he gave judgment for the defendants. Although the claim was for damages for a nuisance at common law (and not under the Locomotive Acts), the case appears to have been decided much upon the same principles as are applicable to cases under the Acts. It was established in *Hemsworth Rural District Council* v. *Micklethwaite* (68 J.P., 16, 345) that the local authority must, either in fact or as a matter of calculation, make up the roay so as adequately to carry the ordinary traffic (including locomotives if they have become part of such ordinary traffic), and only when thid has been done can a locomotive owner be made liable for extras ordinary traffic in addition. In the present case I think it is improbable that the authority would succeed in recovering the whole of the cost of the proposed works from the owner of the tractor—though they might recover something.

HIGHWAY WALLS.—Mr. G. P. Robertson, M.I.MUN.E., M.I.C.E., &c., municipal engineer, Darjeeling, writes: On p. 770 of THE SURVEYOR for May 24th I notice a query from "R. C. C." anent "Highway walls." He says that the wall at B rightfully belongs to the owners of the land, and you say that it is a "question" of fact whether or not the wall is part of the highway. In Darjeeling the "question of fact" considered is the original run of the bank. If this was as shown at B C, then B belongs to the highway and A to the land, because the highway can do without A,



but cannot do without B. That is to say, the cutting between A and B was made for the road, and B is put in not only to protect the land above from falling, but also to protect the road from this landslip. So far as the land is concerned, it would be better that the hillside remained in its original condition. The same argument applies to A—so far as the road is concerned it would be better that the hillside remained in its original condition; the cutting between A and C is no use to the road, and must have been made for the advantage of the land. If the slope was as shown at B D, then both walls belong to the road, because both are built on its account.

This is a very interesting communication, and the test suggested undoubtedly seems to afford a very practical method of solving the problem, when the original slope of the bank can be ascertained.

WATER RATE.—"S." writes: I shall be glad of your opinion on the following matter: "A corporation water undertaking has usually, in the case of an altered (reviewed) assessment, based their charges from the commencement of a quarter immediately after the actual date of entry on the overseer's books." Is this correct or should the altered charges date back to the date of appeal? In the case of general district rate I am aware that the latter is correct, but in the case of water rent I suggest the former is correct, seeing the clause reads: "The R.V. of any such premises as above and shall be ascertained by the valuation list in force at the commencement of the quarter

for which the rate accrues." As you are aware, water rate can be demanded in advance by equal quarterly payments.

According to a strict reading of the clause this would appear to be correct. The assessment committee are bound to alter the valuation list in conformity with the decision of the Court of Appeal, but until they do so the unaltered list is presumably "the valuation list in force."

Alterations to Building.—"R. J. H." writes: In this district the work of reconstructing an old cottage is being carried out in the following manner: The old roof has been left underpinned and the new walls, &c., are being built underneath. This work is being carried out under a notice from the inspector under the Housing and Town Planning Act. Is it necessary for the persons erecting this building to submit a plan to the council's surveyor? The council have adopted the by-laws of the Local Government Board. Will this be termed a new building within the meaning of the Act?

The question what alterations constitute the erection of a new building for the purpose of by-laws is one of fact to be determined in each particular case after considering all the circumstances. In the present case I should think it would in all probability be held that a new building is being erected, in which event plans must be submitted.

Private Street Works: Resewering.—"Arosa" writes: A street has been sewered to the satisfaction of the local authority, and some years afterwards made up by the local authority under sec. 150 of the Public Health Act, the council at the same time putting in a new surface-water sewer, and charging for it with the cost of making up the street to the frontage owners. I am informed that the local authority cannot charge the cost of laying the new surface-water sewer with the making up of the street, as the street has already been sewered. I shall be much obliged if you will inform me of any decisions by the Local Government Board or of any cases.

If a street has once been sewered to the satisfaction of the local authority they cannot require it to be resewered at the expense of the frontagers. As a general rule, and in the absence of special circumstances, when a sewer has existed for a long period, it will be assumed that the authority have accepted it as a sewer laid to their satisfaction (see *Homelia* v. *Twickenham Local Board*, 29 Q.B.D., 951). As an instance of special circumstances entitling the authority to resewer at the frontagers' expense, see *Walthamstow Local Board* v. *Staines*, L.R., 1891, 2 ch., 498. If no special circumstances exist in the present case the authority cannot, in my opinion, charge the frontagers with the cost of the new surface-water sewer.

Alteration of Area: Main Roads.—"Clairnian" writes: Has a borough, upon extending its boundary, powers compulsorily to take over the main roads in the new portion? In the case in question, at the passing of the Local Government Act, 1888, the borough took over the repairs of the main roads passing through it. Can it do so with those portions of the main roads acquired in the proposed extension of the borough? The powers in the Local Government Act, 1888, appear to apply to areas in existence at the time of the passing of the Act.

I do not think the council could claim to retain roads within the added area which for twelve months prior to the date of the extension of the boundary had been main roads (see "Lumley's Public Health Acts," 9th Edition, note (c) on p. 600). But as to other main roads I think the council could claim to retain them within twelve months from the respective dates of their becoming main roads.

Highway: Tunnelling under Carriageway.—"G. L. M." writes: A large ratepayer has business premises on either side of a narrow street in my district. He wishes to connect the two places by tunnelling under the carriageway, and claims that he has the right to do this seeing that he holds the freehold on both sides. Can he do this after giving the council due notice?

This being an urban district, the owner cannot construct any vault arch or cellar under the carriageway without the written consent of the urban district council, under sec. 26 of the Public Health Act, 1875. See *Walker Urban District Council* v. *Wigham Richardson & Co.* 106 J.P., 152.

NEW SECONDARY SCHOOL FOR HEREFORD.

On the 14th inst., Sir James Rankin, Bart., performed the opening ceremony in connection with a new secondary school for boys at Hereford, the total cost of which, including land and furnishing, has amounted to £10,000.

The building, which is the largest of its kind in the county, is constructed of local red bricks, with Bath stone facings, and the arrangements are of a thoroughly up-to-date character. The accommodation provided is as follows: Ground floor—separate cloakrooms and lavatories for senior and junior boys, caretaker's store, head master's and assistant master's rooms. Immediately behind the main block is placed the large assembly hall and six classrooms, two of the latter being so constructed as to be easily convertible into part of the large hall. On the first floor there are science and art rooms, together with a dining-room and kitchen attached. The school is heated on the low-pressure hot-water system.

Hereford New Secondary School.

Messrs. E. W. Wilks & Son, Hereford, were the contractors, Mr. G. H. Jack, F.G.S., county surveyor and architect, being responsible for the design of the new building.

Third International Road Congress.—A meeting of the Traders' Committee will be held at the offices of the Road Board on Monday next, at 2.30 p.m., to receive reports from the Entertainment and Demonstration Sub-Committee, the Exhibition Sub-Committee and Motor Car Sub-Committee, and to transact any other business.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangement well suited for easy reference.—*The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By Sydney G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Bacup T.C. (September 10th. Mr. R. H. Bicknell). £17,148 required for the paving of Burnley-road, Rochdale-road, and York shire-street.—The borough surveyor, Mr. J. Entwistle, stated that the average breadth of Rochdale-road is 34 ft. 9 in. The carriageway was 28 ft. 9 in. It was not proposed to widen the roadway. There was a footway on one side only measuring 6 ft. At present the road was partly of local setts and macadam. These would be taken up, and excavations sufficient to enable them to put down 6 in. of concrete, and on top of that granite setts 5 in. by 4 in., pointed with pitch and oil. The length of Burnley-road to be paved was 668 ft., and the area 1,804 ft. Tenders had been provisionally accepted for the work as follows: Rochdale-road (except the setts), £7,007; Yorkshire-street, £443; Burnley-road, £715.

Bristol T.C. (September 19th. Mr. M. K. North). —£6,646 for the electricity undertaking, and £1,391 for the widening of Blackswarth-road, Wood-lane, Lodge-hill, Fishponds-road, Bath-road, Victoria-road, Bedminster; Soundwell-road, Dean-lane, Southville, and Johnson's-lane, St. George.—The schemes for street widening were explained by Mr. W. H .Wise (from the town clerk's office). He stated that in each case there was a provisional arrangement for the purchase of the land at an agreed sum. The land was only of the actual extent required for the improvements, and there would be no surplus. In only one case had the work been begun in anticipation of the sanction of the Local Government Board, and that was at Johnson's-lane. Under the by-laws the minimum width of a road must be 30 ft., and the alterations complied with that rule. Asked if there had been an independent valuation of the properties, Mr. Wise said the values had all been settled by the consulting engineer, Mr. T. H. Yabbicom. The loan of £6,646 for the electrical undertaking consisted of several items. At the Temple Back works it was intended to instal a motor converter and switch gear at a cost of £3,785. At the Avonmouth works there would be improvements in the water supply costing £1 398, and a secondary coal-handling plant costing £515. These were new items. Then, in connection with the laying of the electric mains from Bristol to Avonmouth, £947 had been expended over and above the estimated amount sanctioned by the Local Government Board, and that money they sought powers to borrow. As to the motor converter and switch gear at Temple Bank, owing to increased load, it was imperative that it should be installed, preferably before the 1912 winter load.

Blyth U.D.C. (September 5th. Mr. R. H. Bicknell). —£900 for the purchase of land at Cowpen Quay for purposes of public walks and pleasure grounds, and for certain street works in connection therewith, and £1,025 for purposes of Cowpen Cemetery.—The necessary particulars were given, the surveyor, Mr. R. Grieves, stating that the loan for cemetery purposes had been increased from £600 to £1,025 for the purpose of draining the extended area—about 3½ acres.

Bourne U.D.C. (September 12th. Mr. W. O. E. Meade-King).—£925 for the purchase of land adjoining the sewage works.—The land in question consists of about 14 acres. The council, it was stated, propose to let the land not required for sewage purposes as allotments.

Chatham T.C. (September 13th. Mr. M. K. North). £2,500 for the extension of the cemetery.—It was stated that the land was suitable in every way for the purposes of a cemetery: it was high and dry with a chalky soil, and there was no source of the water supply of the town near the site. The subsoil was of a porous nature, and no drainage would be required. The area of the land was over 36 acres.

Colne T.C. (September 10th. Mr. F. H. Tulloch).—£24,462 for paving Alkincoates-road and a hundred other streets, £438 for the widening of the Red-lane footpath, and £470 for the widening of the Black-lane path. The town clerk (Mr. A Varley) said a number of objections had been made by private owners against the work being carried out. Some asked for time to pay, but this would not affect the inquiry. The town clerk added that the hundred streets included fifty-two front streets and forty-eight back streets. The scheme was explained in detail by the borough surveyor, Mr. T. Hartley.

Cosport U.D.C. (September 17th. Mr. M. K. North). —£1,670 for sanitary works.—The surveyor, Mr. H. Frost, explained that it was desired to complete the drainage system by connecting properties not already included. There was no opposition to the application, but Mr. Hooley raised the question of the recovery of a portion of the cost of this work from the property owners. The inspector said that was a matter that would come before the council when the loan had been secured. Their clerk or legal adviser would direct them upon the point. Mr. Savage and Mr. Fleming hoped that this matter would be pressed as much as possible, pointing out that the owners of the property in question were those who had hung back from carrying out the connection of their property.

Harrogate T.C. (September 7th. Mr. R. H. Bicknell).—£2,700 for the extension of the Royal Pump Room; £250 for the provision of a new entrance for the Valley Gardens; £4,170 for the extension of the water supply of the borough, including the provision of a supply to Goldsborough; and £2,000 for additions to the Victoria Baths.—The town clerk, Mr. J. Turner Taylor, stated that the application for £2,700 for extensions to the Royal Pump Room was made by the corporation under statutory powers granted them for the purpose of utilising the mineral waters, and there was a great need for the extension of the present pump room for the accommodation of people resorting there to take the waters. They had no covered place to which the people could go, and in a season such as the present one, when there were so many wet days, the pump room became very congested, and they received many complaints. What they proposed to do was to construct additional accommodation in connection with the main building, which would not be interfered with in any way. The borough surveyor, Mr. C. E. Rivers, presented plans and estimates for the proposed work. With respect to the Goldsborough water supply it was stated that the Harrogate Corporation had power to supply water to places outside the borough boundary, and Lord Harewood, who was the owner of all the land in the village of Goldsborough, had asked them to provide a supply for that village. The Knaresborough Rural District Council, under whose jurisdiction the village was, had power to take over the supply when they had paid to the Harrogate Corporation the capital outlay. There was a great need for a proper supply of water to this village. It was further explained that the £2,000 for the Victoria Baths was required for additional accommodation for the taking of sulphur and mineral water baths, and various other treatments.

Hay (Brecknock) U.D.C. (September 19th. Mr. A. A. G. Malet).—£4,000 for purposes of sewage disposal.—M. Holt, town clerk of Hereford, urged the promotion of the scheme at the earliest possible date, for at present the sewage of Hay was a source of pollution to the river Wye, from which Hereford inhabitants drew their water supply. Hereford's intake was below Hay, and the present proceedings were the result of pressure. They had not taken legal action, but were prepared to do so if necessary. The clerk, Mr. R. T. Griffiths, explained how at present the town emptied its sewage into the river Wye and its tributary, Dulais Brook. In reply to Mr. Corner, Mr. Wilcox said he did not think the sewage farm would mean any depreciation in the value of the surrounding properties. The inspector: Are you taking the sewage on to undrained land? Mr. Wilcox: Yes. The inspector: I am afraid the board will not agree to that.

Smethwick T.C. (September 13th. Major J. Stewart). —£7,950 for street improvements in Rolfe-street and Raybone-lane, Smethwick.—Mr. J. C. Lloyd, deputy town clerk, explained that the scheme was to relay part of the existing granite pavement in Rolfe-street, and to lay the remaining portion with granite setts. In consequence of the heavy traffic along these thoroughfares between Smethwick and Handsworth it was thought it would be more economical to pave the road.

Stalybridge T.C. (September 10th. Mr. T. C. Ekin). —£6,400 for alterations and additions at the public baths, and £1,692 for the erection of buildings and workshop at the Waterloo-road depot for the highways department. It was explained that the old baths were out of date, and that the intention was to make extensive improvements and additions to the building, including the Turkish baths. It was proposed to introduce continuous filtration and aeration of the water

used in the baths. With respect to the proposed new buildings for the highways department, it was stated that it was proposed to put on the ground floor a room for the fire escape and horse ambulance, as well as a wheelwright's shop, and accommodation for the weights and measures department.

Wednesbury T.C. (September 12th. Mr. H. R. Hooper).—£3,700 for the purchase of an engine and dynamo at the electricity station. In the course of the inquiry the inspector said that according to the plan the roof would not be fireproof. He understood they had had a fire already, and it was highly desirable that such buildings should be fireproof.

York T.C. (September 6th. Mr. R. H. Bicknell).—£3,030 for the purchase of land in Bull-lane, Heworth, York, for the purpose of a recreation ground.—It was stated that there was a demand for a recreation ground and bowling greens at Heworth. The value of the land was far above £3,000. The inspector said he had visited the place, and he considered it a most reasonable site, but he hoped the children would get their fair share of the land.

APPLICATIONS FOR LOANS.

Linthwaite U.D.C.—£2,500 for new sewers.

Nuneaton T.C.—£6,000 for an improvement scheme.

Portland U.D.C.—£5,079 for new municipal offices.

Rishton U.D.C.—£4,200 for the provision of working-class dwellings.

Saffron Walden T.C.—£863 for making up a street.

Southampton T.C.—£5,670 for sewage disposal works.

Southend T.C.—£3,900 for an additional 500-kw. steam generating set.

Swansea T.C.—£3,600 for relaying water main.

Woking U.D.C.—£1,337 for proportion of the cost of new bridges.

LOANS SANCTIONED.

Battle U.D.C.—£1,500 for the erection of six working-class cottages.

Bo'ness T.C.—£1,000 for electricity extensions.

Buckingham R.D.C.—£1,100 for the provision of six cottages.

Chester-le-Street R.D.C.—£8,500 for the council's share of the cost of building a bridge over the Wear.

Darfield U.D.C.—£1,722 for the provision of a cemetery.

Godalming T.C.—£5,000 for repaving the main streets.

Hayes U.D.C.—£8,717 for workmen's cottages.

Leatherhead U.D.C.—£1,650 for the provision of a recreation ground.

Lowestoft T.C.—£1,812 for street improvement works.

Mansfield T.C.—£1,000 for the purchase of a recreation ground.

Oswaldtwistle U.D.C.—£3,000 for meters and cookers.

Southend T.C.—£7,013 for works of street improvement.

FORTHCOMING INQUIRIES.

SEPTEMBER.	£
30.—**Friern Barnet.** For private street works (Mr. Courtenay Clifton)	—
30.—**Teddington.** For works of sewerage (Mr. R. H. Bicknell)	550
OCTOBER.	
1.—**Barking Town.** For street improvement purposes (Mr. R. H. Bicknell)	1,622
1.—**Buckley.** For sewage disposal purposes (Mr. A. G. Drury)	—
1.—**Dewsbury.** For electricity and water aëration purposes (Mr. T. C. Ekin) ...	15,300
1.—**Forehoe.** For a housing scheme (Mr. W. H. Collin)	1,500
1.—**Weston-super-Mare.** For road and allotments purposes (Mr. Edgar Dudley) ...	2,319
1.—**Willesden.** For private street works (Major J. Stewart)	243
1.—**Woolwich.** For the provision of an underground convenience (Mr. A. A. G. Malet)	1,400
2.—**Batley.** For sewage disposal and road works (Mr. P. M. Crosthwaite) ...	20,011
2.—**Derby.** For electricity and street purposes (Mr. T. C. Ekin)	12,585
2.—**Fleet.** For private street works (Mr. R. H. Bicknell)	350
2.—**Fulham.** For the provision of an air-lift pumping plant (Mr. A. A. G. Malet) ...	1,782
2.—**Wirral.** For authority to prepare a town planning scheme (Mr. T. Adams) ...	—
3.—**Birmingham.** For sewerage, electricity, road and destructor purposes (Mr. T. C. Ekin)	45,975
3.—**Northampton.** For the provision of a recreation ground (Mr. Edgar Dudley) ...	—
3.—**Swinton.** For the gas undertaking (Mr. P. M. Crosthwaite)	20,000
4.—**Rochdale.** For works of sewerage (Mr. P. M. Crosthwaite)	2,049

COMBINED DRAINAGE.

METROPOLITAN COMMITTEE'S PROPOSALS.

The Public Health Committee of the Camberwell Borough Council recommend the council to concur in a resolution passed by the Executive Committee of the Metropolitan Boroughs Standing Joint Committee in the following terms: "That the Standing Joint Committee be recommended to endeavour to secure in the next Session of Parliament an amendment of the law relating to combined drainage on the lines of the Metropolitan Sewers and Drainage Bill of 1908, and that the City and Metropolitan Borough Councils be requested to agree to bear a proportionate part of the cost of the promotion of the proposed Bill, and to concur in the promotion thereof." It is suggested that the proposed legislation should follow the lines adopted at a conference of metropolitan authorities convened by the St. Pancras Borough Council in 1908, but that in order the better to ensure the Bill being properly considered, it should be promoted as a private measure by or on behalf of the Metropolitan, City and borough councils at the joint expense of those authorities.

The following is the clause proposed: "In and for the purposes of the Metropolis Management Acts, 1855 to 1899, and the Public Health (London) Act, 1891, or any Act or Acts amending the same, the word 'drain' shall be deemed to include any sewer or drain, whether constructed before or after the passing of this Act, with which two or more houses, buildings or premises are, at the date of the passing of this Act, or may at any time thereafter be connected, or which is used or capable of being or intended to be used for the conveyance of the drainage of such houses buildings or premises directly or indirectly to any sewer which has been approved as such by the Metropolitan Commissioners of Sewers, the Metropolitan Board of Works, or the London County Council, but shall not include any sewer so approved as aforesaid."

Problems in Engineering with Solutions.*—The English journal The Surveyor and Municipal and County Engineer carries on a section devoted to various questions which might be put in an examination for the position of municipal engineer in an English town or city. The questions are given one week and answers provided by various correspondents given in subsequent issues. The volume noted above is the first one to be made up from these questions and answers. As is well known, the position of municipal engineer in England is one of most varied activity, so that the subject covered by the questions and answers extends through the whole field of engineering. For example, the chapter headings are as follows: Mechanics and Hydrostatics; Strength and Elasticity of Materials; Theory of Structures; Surveying and Levelling; Water Supply and Hydraulics; Sewerage; Sewage Disposal; Road Making and Tramways; Building Construction and Materials; Law and Miscellaneous. While the questions and most of their solutions are distinctly British in character, the wide range of subjects and the method of treatment make the book of some value to American engineers. There is a good deal to be said in favour of the question and answer method of instruction.—*Engineering News.*

* Being Questions and Answers reprinted from the Assistants' and Students' Section of The Surveyor and Municipal and County Engineer. First Series, 1909-10. Edited by Sydney G. Turner, associate, i.s.e.e. London: St. Bride's Press, Limited. Price 5s. nett.

Municipal Work In Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Barnsley, Birmingham, Cardiff £15,000, Edinburgh £7,000, Grimsby £13,333, Worcester; housing and town planning—Gosport; roads and materials—Darlington, Hastings £13,000, Morecambe, Swansea; sewerage and sewage disposal—Southampton £5,670; water, gas and electricity—Hastings £32,109.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

BUILDINGS.

Barnsley T.C.—A committee has been appointed to consider the question of providing new offices and a town hall.

Birmingham T.C.—The work of completing the Birmingham Council House extension and art gallery was advanced another stage on Monday last, when the General Purposes Committee accepted, subject to the approval of the council, the tender of Messrs. Barnsley & Sons, at £57,058. The contract, which is to be finished in eighteen months, provides for the extension of the art gallery by the erection of a further suite of "Feeney Galleries," which will have an imposing entrance from Great Charles-street, and the provision of additional departmental accommodation and a museum of casts. Messrs. Jeffreys & Co., the present contractors for the heating, ventilation and hot-water supply, will extend the system to the new buildings, at a cost of £1,742.

Blackpool T.C.—The borough surveyor, Mr. J. S. Brodie, has been instructed to prepare plans and estimates for the construction of new and more suitable public conveniences near the Layton tramway terminus.

Camberwell B.C.—The Public Health Committee recommend that the borough engineer, Mr. W. Oxtoby, be authorised to carry out the repainting of the public baths, Church-street, at a cost of £258.

Cardiff T.C.—The Watch Committee, on Monday last, received the awards of the assessor, Mr. A. Marshall McKenzie, F.R.I.B.A., of London, in the competitive designs for the new fire station, to be erected in Westgate-street, at a cost of £15,000. The awards were: (1) Messrs. E. Vincent Harris & Thomas J. Moodie, London; (2) Messrs. Ivor Jones & Percy Thomas, Cardiff; (3) Messrs. Mangor & Littlewoods, Manchester; (4) Messrs. Wilmot & Smith, Cardiff. The committee unanimously accepted the design of Messrs. Harris & Moodie, who were the architects for the new county hall in Cathays Park. The award of £75 for the second design goes to Messrs. Ivor Jones & Percy Thomas, of Cardiff, who are the architects for the new technical institute; and the authors of the third and fourth designs receive respectively £50 and £25.—The Parks Committee recommend the construction of an open-air bath in Llandaff Fields. It is proposed that the pond should be 150 ft. long by 50 ft. wide. Mr. W. Harpur, the city engineer, has been instructed to prepare a plan and submit an estimate of the cost.

Chester-le-Street R.D.C.—The Lumley Bridge Committee report that at a joint meeting between that body and the representatives of the urban district council, it was decided to recommend that the tender of Messrs. Brims & Co., Newcastle, at £9,916, for the building of the new bridge over the Wear at Chester-le-Street, should be accepted. The tenders, it was reported, were all in excess of the estimates, and the engineer, Mr. D. Balfour, junr., stated that this was due to the increase in the cost of material and labour during the last two years. It has also been agreed that the tender of Messrs. Thompson & Son, of Chester-le-Street, at £4,597, for making the roads to the bridge, should be accepted.

Coventry T.C.—The tender of Messrs. Jones & Bacon, at £2,333, has been accepted for the extension of the market.

Dorking U.D.C.—The surveyor, Mr. W. A. Clegg, has been authorised to carry out necessary repairs and improvements at the council's stables.

Downham (Norfolk) R.D.C.—The common seal of the council has been affixed to the agreement with the county council for the rebuilding of Magdalen Bridge, on the terms agreed upon. These are that the county council undertake to rebuild the bridge, at an estimated cost of £6,000, the district council guaranteeing to contribute the difference between £2,000 and the sum provided voluntarily by the locality (said to be £500).

Edinburgh T.C.—Tenders, approximating to £7,000, have been accepted in connection with the erection of the new Portobello Town Hall.

Grimsby T.C.—The tender of Messrs. J. H. Thompson & Sons, of Grimsby, at £13,333, has been accepted for the erection of a new school in Victoria-street.

Kingston (Surrey) T.C.—Land in Richmond-road, with a frontage of about 60 ft. and a depth of 170 ft., is to be purchased for £1,000 for a site for the new fire station.

Wandsworth B.C.—The Public Health Committee recommend that a tuberculosis dispensary should be established in the borough. The cost of the apparatus and of furnishing and fitting up the rooms is put at £120, and the annual cost of maintenance at £880.

Whitby R.D.C.—The tender of Mr. A. Palframan, at £224, has been accepted for the construction of the new Wath Bridge.

Worcester T.C.—The Health Committee have unanimously passed a recommendation in favour of central baths, which will be available throughout the year. These will be in addition to the provision in the river Severn.—A school is to be built on the site of the skating rink in the Arboretum, at an estimated cost of £1,500. The plans are limited to Worcestershire architects.

HOUSING AND TOWN PLANNING.

Gosport U.D.C.—The surveyor, Mr. H. Frost, has prepared a town-planning scheme for the North Ward, which has been approved and forwarded to the Local Government Board.

Pembroke (Co. Dublin) U.D.C.—Certain areas have been declared unhealthy within the meaning of the Working Classes Act, and it has been agreed to promote an improvement scheme.

Portadown T.C.—The medical officer of health, Dr. Rowlett, last week reported that certain houses, streets and courts, by reason of sanitary defects, constituted an insanitary area, which could only be effectually remedied by the demolition of the houses and by the rearrangement and reconstruction of the streets. The area in question, Dr. Rowlett stated, containing 196 houses, having a population close on 1,000 persons, crowded together and breathing vitiated air, seriously affecting the health of the residents, and in the past serious epidemics of disease had only been allayed by the constant and untiring efforts of the council's responsible officers. The report is to be considered by the Sanitary Committee.

Selby U.D.C.—An offer is to be made for a plot of land in Armoury-lane for the building of about fifty artisans' houses, and the purchase of land in Flaxley-road for a similar purpose is also contemplated.

PARKS AND OPEN SPACES.

Bushey (Herts) U.D.C.—The surveyor, Mr. Ernest E. Ryder, has been instructed to prepare plans and estimates for bowling greens and pavilions at King George's and Bushey-grove recreation grounds.

Llanelly U.D.C.—Parc Howard, the gift of Sir Stafford and Lady Howard, was handed over to the town on Saturday last.

Southampton T.C.—A sub-committee of the Public Lands Committee has been asked to consider the question of providing bowling greens on public lands.

REFUSE COLLECTION AND DISPOSAL.

Oakham R.D.C.—The Local Government Board have written advising that the system of public scavenging already established at Greetham and Langham should be extended to all the larger villages in the district.

ROADS AND MATERIALS.

Darlington T.C.—It has been decided to relay the whole of the streets of the town, the total length of

which is over 12 miles, with tar-macadam. The work will be done as occasion for the repair of the streets arises.

Dorking U.D.C.—The tender of Mr. H. M. Blaker, at £675, has been accepted for surfacing 4,043 sq. yds. of London-road. The cost of the work will be repaid by the Surrey County Council.

Hastings T.C.—A scheme has been adopted for an extension of the Parade, seaward, at a point between the baths and Hastings Pier, to provide accommodation for about 2,000 people, at a cost of about £13,000.

Maldens and Coombe U.D.C.—The owners of the Fitzgeorge Coombe estate are arranging with the Highways Committee for a boulevard scheme in Coombe-road, and the provision of ornamental gardens and paths in Coombe-lane, by the dedication of sufficient land for these purposes.

Morecambe T.C.—The borough surveyor, Mr. F. W. Hipwood, has prepared a comprehensive improvement scheme, which Mr. J. H. Brown, a councillor, stated recently he should like to see proceeded with. At present, he said, Morecambe was doing nothing in the way of improvements, and it was high time that more money was spent to remove the reproach so often levelled that the town was not progressive. He contended they should spend another £50,000 on widening the Promenade at the east end, and so prove to outsiders that Morecambe meant to be in the forefront of holiday resorts.

Swansea T.C.—The borough surveyor, Mr. G. Bell, at the last meeting of the Parks Committee, submitted a proposal for a proposed pier and promenade and a winter garden in the Victoria Park, which he prepared some years ago, and suggested that it would prove a good thing for the town and prove an attractive feature to visitors. The matter was referred to a sub-committee with instructions to report at once.

SEWERAGE AND SEWAGE DISPOSAL.

Ashby U.D.C. The profits on the working of the sewage farm for the year exceeded £97.

Kingston (Surrey) T.C. The tender of Messrs. Stewart Brothers for the supply during the ensuing twelve months of 8,000 yds. of press cloth for the sewage works at 5⅞d. per yard has been accepted; and 100 tons of charcoal have been purchased from Messrs. Cowburn, Limited, at 26s. 6d. per ton.

Preston R.D.C.—A communication has been received from the Local Government Board with reference to the council's sewerage scheme in connection with the township of Longton and Little Hoole, drawing the council's attention, as regarded the difficulty experienced in obtaining easements, to the provisions in secs. 16 and 308 of the Public Health Act, 1875, from which it would be seen that the laying of necessary sewers was not in any way dependent upon the consent of owners being obtained. It appeared to the board that, having regard to the admitted necessity for a proper scheme of sewerage and sewage disposal for these areas, no avoidable delay should be allowed to occur in carrying such a scheme into execution. The letter has been referred to the Sewage Committee.

Poole R.D.C.—One of Messrs. Merryweather's vacuum cesspool exhausters, to take 350 gallons, is to be obtained, at a cost of £276.

Southampton T.C.—The borough engineer, Mr. J. A. Crowther, has submitted a scheme, which has been approved, for the treatment of the sewage in Bitterne Park district. It is proposed that half the sewage be run into the tanks by gravitation, and that the remainder be pumped. The estimated cost, including engine-house, engines and pumps, is £5,670.

Tiverton T.C.—The borough engineer, Mr. J. Siddalls, in a report, stated that before long some improvements in the older portions of the sewerage system must be made. It may be possible, however, by the construction of manholes and provision of flushing apparatus to keep the old sewers going for many more years without detriment to the sanitary well-being of the town. Disposal of house refuse, he adds, gives greater difficulty than ever.

WATER, GAS, AND ELECTRICITY.

Fifeshire C.C.—The district committee recommend the scheme of Messrs. Bruce & Proudfoot, engineers, for a new reservoir at Largs, at an estimated cost of £4,570.

Hastings T.C.—A scheme has been adopted for the development of Forewood waterworks, at a cost of £32,109.

Lexden and Winstree (Essex) R.D.C.—The council have instructed Messrs. Taylor & Walling (Mr. Harry W. Taylor, ASSOC.M.INST.C.E.), of Newcastle-upon-Tyne and Birmingham, to prepare a scheme and report upon the waterworks for the parishes of Abberton, Peldon, Little Wigborough, Great Wigborough, Virley and Salcott.

Totnes R.D.C.—A scheme for a water supply for Bittaford, Ugborough, has been approved.

Uckfield U.D.C.—The question of applying for a Provisional Order for the supply of electricity at Crowborough, is under consideration.

MISCELLANEOUS.

Kenilworth U.D.C.—Nine tenders have been received for fencing the proposed new cemetery, and the contract has been divided between Messrs. Bayliss, Jones & Bayliss, of Wolverhampton (£308), and Messrs. Hill & Smith, of Brierley Hill (£308).

Leicester T.C.—The council have approved the proposals of the Tramways Committee for extending and linking up the present tramway routes, and establishing a motor bus service to Thurmaston. The total cost of the extensions for which powers are to be sought will be about £100,000, but the work will be proceeded with in sections when the time is considered ripe.

Maldens and Coombe U.D.C.—The council recently decided to pay the contributions of their employees under the Insurance Act. The Local Government Board, however, have now informed the council that they have no power to sanction such payments.

Montgomery C.C.—It has been decided to increase the wages of the roadmen and other labourers from 16s. to 17s. per week, with a weekly allowance of 3d. for providing tools.

Otley U.D.C.—It has been agreed to support the Leeds Corporation in their effort to obtain Parliamentary powers for the extension of their tramway system from the present terminus at Guiseley to Otley. Since the extension of the route from Horsforth to Guiseley this line has proved very popular with Leeds people who desire to get out into the country, and several suggestions of a continuation have been made.

Rowley U.D.C.—The Local Government Board have given their approval to the provision and use of the land at Powke-lane, Black Heath, for burial purposes, on condition that the council gave an undertaking that burials should not take place within 100 yds. of any dwelling.

PERSONAL.

Mr. D. Munro, burgh surveyor of Nairn, has resigned.

Mr. J. H. Clarke, assistant surveyor to the Romford Rural District Council, has been appointed surveyor to the Haverhill Urban District Council.

Mr. F. C. Hodgkinson, surveyor of Birkdale, whose area has been amalgamated with Southport, is to receive £1,550 as compensation for loss of office.

Mr. J. W. Liversedge, surveyor to the Leigh Urban District Council, has had his salary increased by £25 per annum, to be followed by a similar increase next year.

Mr. A. M. Ker, assistant surveyor of Warrington for ten years, was on Monday appointed to succeed the late Mr. T. Longdin as borough surveyor of Warrington at a salary of £450 a year.

Mr. C. T. Fulcher, for three years and a-half draughtsman in the Shoreditch borough surveyor's department, has been appointed assistant surveyor at a salary of £160, rising to £200.

Mr. Stanley Llewellyn, deputy surveyor to the Ogmore and Garw Urban District Council, has had his salary increased from £104 to £120, rising by annual increments of £10 to £150 a year.

Mr. T. de Courcy Meade, M.INST.C.E., as will be seen from the present issue, was the author of one of the papers presented at the recent Congress of the Royal Institute of Public Health in Berlin. It is not, perhaps, generally known that Mr. Meade, shortly after receiving the invitation to contribute to the proceedings of the congress, was unfortunate enough to be involved in a cab accident, which resulted in his

receiving such severe injuries to the face and head that he was incapacitated from work for many weeks, and obliged to proceed to a nursing home in London for treatment. The absence of diagrams and statistical information which Mr. Meade had proposed to include in the paper is one of the consequences of the accident, but while they will regret that he should have been prevented from doing proper justice to the important subject with which his contribution deals, all who are privileged to know him will, we are sure, experience feelings of the liveliest satisfaction at his providential escape from more serious disaster.

FOR OTHER ADVERTISEMENTS

See End of Paper.

TO CONTRACTORS AND OTHERS.

The Council of the Metropolitan Borough of Wandsworth is prepared to receive Tenders for Executing necessary Works of Repair upon the following Carriage Roads—*viz.*:—

(*a*) That part of Wimbledon Park-road, Southfield, which lies between the south-west side of No. 365 Wimbledon Park-road and Prince's-road.

(*b*) That part of Viewfield-road, Southfield, which lies between Granville-road and Melrose-road.

The Specifications and Drawings may be seen, and Forms of Tender obtained, of the Borough Engineer, Mr. P. Dodd, M.INST.C.E., at the office of the New Streets Department, No. 56 East-hill, Wandsworth, S.W., between the hours of 10 and 4 (Saturdays 10 and 12), upon payment of a deposit of Five Guineas in each case.

Tenders, enclosed in separate sealed envelopes, and endorsed "Tender for Repairing ——," must be delivered at the Council House, East-hill, Wandsworth, S.W., and may be placed by the person tendering in the box provided for the purpose, not later than 4 o'clock in the afternoon of Monday, the 14th October next.

Persons tendering must in the case of all workmen employed by them in and about the execution of the contract, pay wages at not less, and observe hours of labour not greater, than the rates and hours recognised by the Associations of Employers and Employees, and in practice obtained in the district where the work is to be executed. No Tender will be received unless it be made upon one of the forms provided for the purpose. The Council does not pledge itself to accept the lowest or any Tender. If required, the contractor must provide two sureties for the due execution of the contract.

D. A. NICHOLL,
Town Clerk.

Council House,
Wandsworth, S.W.
September 25, 1912.

METROPOLITAN BOROUGH OF ISLINGTON.

Wanted, in the Borough Engineer and Surveyor's Department, an Assistant. Must have had experience in the office of an Engineer and Surveyor, and be able to survey, level, and prepare plans. Selected candidates will be examined as to their professional knowledge.

Salary to commence at £90 per annum, rising by annual increments of £7 10s. to £120 per annum.

Applications, in the handwriting of the candidates, stating age, present employment and past experience, accompanied by copies of not more than three testimonials of recent date, and endorsed "Engineer's Assistant," must be received by the undersigned not later than 12 noon on Tuesday, the 8th October, 1912.

WM. F. DEWEY,
Town Clerk.

Town Hall, Upper-street,
Islington, N.
September, 1912

SURVEYOR and ARCHITECT, Junior Assistant, re-engagement required; working and detail drawings; good draughtsman; well up in surveying, levelling, and assist quantities; first-class testimonials; moderate salary.—G. R. G., office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

SINGAPORE, STRAITS SETTLEMENTS. MUNICIPAL ENGINEER'S DEPARTMENT.

The Municipal Commissioners of the Town of Singapore require an Assistant, under 32 years of age, and of sound constitution, chiefly for their new sewage scheme. He must have received a good technical education, a regular training as a Civil Engineer, and including a practical knowledge of surveying, levelling and estimating. He must also have had special experience in designing and constructing sewerage and sewage disposal works and waterworks, and their maintenance. Preference will be given, other things being equal, to applicants who have passed the Examination of the Institution of Civil Engineers—Associate Members—or that of the Institution of Municipal and County Engineers. The engagement will be for three years, and each applicant is to state the earliest date upon which he could be free to leave for Singapore. The selected candidate must pass a medical examination. A second-class passage will be provided by mail steamer, or a first-class passage by other steamer, with half-pay during the voyage out. The salary will be 350 dollars per month, paid monthly in dollars, the currency of the Colony, the value of the dollar being two shillings and fourpence sterling. Such local transport allowance as may from time to time be sanctioned by the Commissioners will be paid. Applications, stating age and place of birth, and giving details of education, training, and experience generally, and referring to the above requirements seriatim, accompanied by copies (only) of testimonials, and also personal references, are to be lodged with C. C. Lindsay, Esq., M.INST.C.E., 180 Hope-street, Glasgow (who will give further particulars if requested), not later than Tuesday, 8th October next.

METROPOLITAN BOROUGH OF STOKE NEWINGTON.

TENDERS FOR CREOSOTED DEAL PAVING.

The Council of the above Borough invites Tenders for Supplying and Laying 4-inch Creosoted Deal Blocks, and for all Works in connection with the Concrete Foundation in Lordship Park.

Specification and Form of Tender may be obtained on application to the Borough Surveyor.

Tenders, endorsed "Tender for Wood Paving, Lordship Park," to be delivered to the undersigned not later than 4 o'clock p.m. on Tuesday, 8th October, 1912.

The Council does not bind itself to accept the lowest or any Tender.

GEORGE WEBB,
Town Clerk.

Town Hall,
Milton-road,
Stoke Newington, N.

CITY OF MANCHESTER.

The Rivers Committee invite applications for the position of Outdoor Engineering Assistant on the Main Drainage Works. Salary £200 per annum.

Applications, in writing, stating experience, with copies of three recent testimonials, to be sent to the Chairman of the Rivers Committee, Town Hall, Manchester, not later than 10 a.m. on Saturday, the 5th October, 1912. Canvassing, directly or indirectly, will be a disqualification.

THOMAS HUDSON,
Town Clerk.

Rivers Department.
September 25, 1912.

SUPPLY OF CAST-IRON PIPES OR STEEL TUBES.

Alternative Tenders are invited for the Supply of about 50 lineal yards of 15-in. diameter Vertically Cast-Iron Pipes, Bank Pipes, or Steel Tubes. For full particulars apply W. Quest, Surveyor, Town Hall, Wombwell. Tenders, endorsed "Tenders for Pipes," to be delivered to P. M. Walker, Esq., Town Hall, Wombwell, on or before Tuesday, the 8th prox., at 5 o'clock.

P. M. WALKER,
Clerk to Council.

ASSISTANT, 7 years' experience municipal office, seeks appointment, surveyor, leveller, good draughtsman; excellent credentials, and experience roads, water supply, sewerage and sewage disposal, private street work, buildings, &c.—Wilson, 14 Belgrave-avenue, Victoria Park, Manchester.

Institution of Water Engineers.

VISIT TO LLWYN-ON RESERVOIR WORKS (CARDIFF CORPORATION).

On Saturday last, the 21st inst., a party of members of the Institution of Water Engineers, numbering in all about forty, paid a visit to the Llwyn-on reservoir works now being carried out by the Cardiff Corporation to the designs and under the supervision of Mr. Chas. H. Priestley, M.INST.C.E. (past-president of the institution), in the Cwm Taff Valley some 30 miles from the city. The appended description of the works by Mr. Priestley will give all the important details of the scheme, but the interest of the visit was greatly enhanced by the fact that it took place at a most interesting stage in the progress of the undertaking.

The party assembled in force at the terminus of the contractors' railway at Cefn, 1 mile out of Merthyr Tydfil, and were first conveyed to the stone quarries from which the materials required for the construction of the dam are obtained. These having been inspected under the guide of the contractors' agent, Mr. Buchner, the party were conveyed to the works, where, in addition to Mr. Priestley himself, the visitors had the chief resident engineer (Mr. H. W. B. Cotterill, ASSOC.M.INST.C.E.) and his staff of assistants to act as guides, and supply all information asked for.

Having inspected the screening chamber, the most advanced part of the permanent works, and the concrete-mixing machine (in operation), most of the party went down the trench and were able to inspect the face of the excavation so far as the timbering allowed, and particularly the nature of the rock forming the watertight base of the whole structure. The engineer was congratulated upon the very favourable character of the strata, and the important and hearing power nature of the rock, which represented such important features in the successful and economical carrying out of the scheme. Concreting was in progress, and the excellence of the materials, design and workmanship was the subject of general comment. Returning to the surface, the members then inspected the temporary timber channels carrying the stream across the trench, and were able to appreciate the strain put upon this during the heavy rains in August last, when the water rose to within a few inches of the top of the channel timbers. The permanent discharge tunnel was then seen under construction, and the large dimensions and the solid nature of the lining were both commented on. Climbing the hill to the engineer's offices, the members were invited to inspect the plans of the work and a fine model showing a section of the embankment.

At this stage the programme announced the provision of lunch, but, owing to some misunderstanding on the part of the caterers, this proved to have gone astray, and the chief engineer and his staff were faced with a problem which for novelty and unexpectedness was quite equal to many met with in the course of their normal duties. In solving this, however, they proved their ability to "direct the forces of Nature for the use and convenience of man," and a very welcome and sufficient makeshift meal was quickly forthcoming. The members then drove up the valley to the Cantreff reservoir, completed in 1892, which afforded a striking contrast with the Llwyn-on reservoir in its present condition. Returning to the engineer's offices, the luncheon previously missing was found to be waiting attention, and this having been disposed of the president (Mr. J. S. Pickering, M.INST.C.E., borough and water engineer of Cheltenham) took the opportunity of expressing thanks and congratulations to Mr. Priestley, to the Water Committee of the Cardiff Corporation represented by the chairman, Alderman W. P. Bird, J.P., and to the engineer's staff, for the unusually favourable opportunity afforded to those present of inspecting such a fine example of modern reservoir embankment work.

The weather being exceptionally fine, in pleasant contrast to the occasion when the association visited the Beacons and Cantreff reservoirs in 1900) the members were able to inspect the works, and to appreciate the natural beauties of the Taff Valley under the most favourable conditions, and all present will retain pleasant recollections of a most successful function.

The council of the institution are contemplating the arrangement of other visits of this nature between the usual half-yearly meetings, and the success of this visit will no doubt afford them encouragement in repeating the experiment.

THE "LLWYN-ON" RESERVOIR.

By CHAS. H. PRIESTLEY, M.INST.C.E.,
City Water Engineer, Cardiff.

Under the Cardiff Corporation Act of 1884, powers were obtained for the construction of three reservoirs in the Taff Fawr Valley in Brecknockshire, over 30 miles distant, for the supply of the town and compulsory area. This was an entirely new source of supply, determined upon after careful consideration by the council, upon full and exhaustive reports prepared by their engineer, Mr. J. A. B. Williams, M.INST.C.E., who had been instructed to examine all available sources which would be likely to give a pure, ample and sufficient supply for the fast-growing needs of the district, the existing sources being insufficient to meet increasing demands, and also of somewhat doubtful quality.

The "Cantreff," or No. 2, reservoir was first constructed and opened in the year 1892, the aqueduct to Cardiff having been laid in the meantime. The "Beacons," or No. 1, reservoir was then built and opened in the year 1897.

From the time the Cantreff reservoir was put into operation, water from the Taff Fawr source was conveyed to the storage reservoirs near Cardiff and supplied after filtration throughout the district. The requirements of the city and district of supply continued to increase, and reports were made showing the necessity of constructing the third reservoir of the series in the Taff Fawr Valley, but a long continuation of wet summers did not bring home to the council the urgency of being prepared for a prolonged drought, and it was not until after the author had presented to the council, at the request of the Waterworks Committee, an exhaustive report in the spring of 1908, that any active steps were taken to proceed with the further reservoir, the last of the series authorised under the scheme sanctioned in 1884. After full discussion and consideration of a number of alternative schemes, the report above mentioned was adopted by the council in the autumn of 1908, and instructions given to proceed with the Parliamentary deposits and prepare a Bill for the session of 1909.

Although sanction had been obtained for a reservoir on the site of "Llwyn-on" under the Act of 1884, and a certain portion of the land had been purchased for it, it was deemed desirable, having regard to the favourable character of the site, considerably to enlarge the capacity of the reservoir; the borrowing powers having also been exhausted, it was necessary to go to Parliament for further sanction, which was obtained, after considerable opposition, by the Act of 1909.

The "Llwyn-on" reservoir is being constructed of the full capacity and size allowed under the Act.

AN UNUSUAL CLAUSE.

It may be of interest to mention that by the Act of 1884, confirmed by the Act of 1909, a somewhat unusual clause was inserted. Before proceeding with the making of any of the reservoirs, notice had to be given to the Board of Trade, accompanied by drawings and specifications of the proposed works, a copy being deposited in the office of the town clerk; notice had also to be given to the Merthyr Corporation and a number of the other riparian owners. These drawings and specifications were to be open to inspection by the parties interested, who had the right to make objection to the proposed materials or mode of construction or any part thereof to the Board of Trade, who, after due consideration, might alter or amend the same if they thought fit. In this instance no objections were lodged with the Board of Trade, but before approving thereof the board instructed a well-known firm of independent engineers to make an inspection of the site, and to examine the plans and specification, making such suggestions as they thought desirable in connection therewith. One or two slight modifications were suggested with regard to the specification, but no alterations whatever were made in the plans. The amendments were accepted, after which the Board of Trade gave their formal approval.

The principal dimensions of the reservoir are given herewith:—

DIMENSIONS OF RESERVOIRS.

—	No. 1, or "Beacons," reservoir.	No. 2, or "Cantreff," reservoir.	No. 3, or "Llwyn-on," reservoir (in construction).
	a. r. p.	a. r. p.	
Water area T.W.	51 2 34	42 3 17	144 acres
T.W. level above O.D. ...	1,340 ft.	1,073 ft	854 ft.
Greatest depth of water for compensation and supply	54 ft.	73 ft.	63 ft.
Length of embankment from side to side of valley	1,200 ft.	600 ft.	1,200 ft.
Height from bed of river	65 ft.	90 ft.	81 ft.
Greatest width at base ...	400 ft.	600 ft.	500 ft.
Width at top	30 ft.	30 ft.	8 ft.
Inside diameter of discharge tunnel	10 ft.	13 ft.	16 ft.
Length of tunnel	530 ft.	580 ft.	520 ft.
Length of overflow weir	160 ft.	160 ft.	300 ft.
Width of by-wash ...	20 ft.	30 ft.	50 ft.
Capacity of reservoir ...	345 mil. gal.	323 mil. gal.	over 1,200 mil. gal.
Drainage area	2,000 ac.	2,000 ac.	6,400 ac.

Height of watershed, 2,910 ft. above O.D. at Brecon Beacons.

The reservoir is situate about 5 miles north of the county borough of Merthyr Tydfil, Brecknockshire, well above the outcrop of the mountain limestone and in the old red sandstone formation. The gathering ground comprises 10,400 acres of land, reaching to the foot of the Brecon Beacons, the highest mountains in South Wales. The amount of compensation water to be discharged daily to the river Taff Fawr on the completion of this reservoir will be at the rate of 861 cub. ft. of water per minute (approximately 7,750,000 gallons daily). This quantity was fixed by the Act of 1884, and no alteration made therein under the Act of 1909.

The average rainfall on the gathering ground varies from 76·96 in. at the "Beacons" reservoir to 60·31 in. at the "Llwyn-on" reservoir. The highest register at the "Beacons" reservoir was in 1903, being 113·16 in.

The contract for the construction of the "Llwyn-on" reservoir was let in November, 1910, to Mr. Louis P. Nott, of Bristol, the amount being £201,077. This did not, of course, include the purchase of land, road diversions, removal and rebuilding chapel and other contingencies in connection with the work, all of which are additional thereto.

The contractor's railway from the Cefn station of the Brecon and Merthyr line was first put in order for the conveyance of plant and material to the site of the works. The excavation of the trench and other parts of the reservoir actively commenced in the spring of last year, and considerable progress has been made since that date.

The corporation have erected offices, staff quarters, mission room, school for the children of the employees, &c., the contractor under the terms of the specification building huts for the housing of a number of the men employed upon the works, with offices, &c.

The time for the completion of the whole of the works under the contract is December 31, 1916, subject to any period which may be allowed by the engineer for unforeseen circumstances that may arise during construction.

Tramways in the City of London.—The Corporation of the City of London have received a letter from the London County Council stating that it has been decided to renew in the next Session of Parliament the application for authority to extend the existing tramways in Farringdon-street as far as Ludgate-circus, and expressing a hope that the corporation will co-operate by giving the consent required by the Standing Orders to enable the council's bill to be proceeded with.

A Remarkable Recovery. Ten years ago (the *Surrey Comet* reports) a well-known professional gentleman, still residing in Hampton, accidentally dropped his gold-framed spectacles down a sewer manhole which he was inspecting. The spectacles were in a case, but the lid was open. He was informed by one of the district council officials that they would be found in due course at the disposal works. In a few days the case turned up there, but minus the spectacles. A fortnight ago the latter were recovered at the same place, and although the lenses were lightly scratched the frame was in the main intact, in spite of its long immersion in the sewer.

DAMAGE TO ROADS BY MOTOR 'BUSES.

CONFERENCE OF LOCAL AUTHORITIES.

The increasing cost of road maintenance as a result of heavy motor traffic was the subject of an important conference held at Richmond on Thursday, the 19th inst. All the local authorities on the western fringe of London were invited, and twenty-three were represented, in addition to the county councils of Surrey and Middlesex. The delegates numbered nearly 100, among those present being Messrs. H. T. Wakelam, county engineer, Middlesex; E. F. Morgan, borough surveyor of Croydon; R. H. Clucas, borough surveyor of Kingston-on-Thames; C. H. Cooper, borough engineer of Wimbledon; J. H. Brierley, borough surveyor of Richmond; C. Jones, borough engineer of Ealing; J. Stevenson, surveyor to the East and West Molesey Urban District Council; H. C. Fread, surveyor to the Esher and the Dittons Urban District Council; S. H. Chambers, surveyor to the Hampton Urban District Council; R. W. Hindhaugh, surveyor to the Ham Urban District Council; P. Taylor, surveyor to the Hampton Wick Urban District Council; R. H. Jeffes, surveyor to the Maldens and Coombe Urban District Council; H. Mather, surveyor to the Surbiton Urban District Council; M. Hainsworth, surveyor to the Teddington Urban District Council; and F. W. Pearce, surveyor to the Twickenham Urban District Council.

Alderman R. W. SIMPSON, J.P. (Mayor of Richmond), presided over the gathering. In opening the proceedings the roads, he said, had never been made for heavy motor 'buses, and they desired an equitable share of the petrol tax or powers to license for local and highway purposes heavy omnibuses, with powers to regulate their speed, and to define the routes which the 'buses used. The Road Board should disgorge the £2,000,000 they appeared to be hoarding for some purpose. Last year it cost Richmond a 1d. rate over the ordinary rate in order to keep the roads in fair order, and they were spending £20,000 on wood paving in one particular road. While that was being done they found that other roads were requiring to be put in order, and a large sum of money would have to be spent. The 'buses were shaking the foundations of houses, and there were bitter complaints of injury to health and damage to property. Although motor-'bus traffic was comparatively recent in Richmond, a census taken on the previous Sunday showed that 1,646 motor vehicles passed a given spot, and of these 919 were motor 'buses.

The first resolution, moved by Alderman EDGAR (Richmond), was that, in view of the enormously increased cost of road maintenance due to heavy motor traffic, those conducting such traffic should contribute substantially. At present, he said, motor 'buses paid nothing to local rates except where garages were situated. He pointed out that the Road Board had a large sum of money in their possession, but not a cent was given for ordinary road maintenance; they were hoarding it in order to make great roads to Brighton and the West.

In the course of the discussion Mr. J. J. BISCOOE (Richmond) said that every mile travelled by a motor 'bus paid three-fourteenths of a 1d. tax, and the sum was not adequate, nor would it pay half the cost of road repair. Each 'bus earned £1 16s. 8d. per day, or £540 nett profit a year for the company, on a capital outlay not exceeding £400, so that they could well afford to pay more.

The MAYOR OF KINGSTON, in supporting the resolution, advocated some restriction in the case of the heavy traction motors, which, he believed, were capable of causing even more damage to the roads than the 'buses. The traffic of these huge engines was much on the increase.

Alderman EDGAR disclaimed anything like hostility to the motor 'buses, but it seemed that they were practically running at less than cost price, while non-passengers and those who positively objected to them had to pay what should be included in the fares.

The resolution was carried.

Approval was also given to a resolution: "That a proviso be introduced into next year's Finance Act that in future the proceeds of the petrol tax or any other charges levied in connection with 'buses be returned to the local authorities in proportion to the use made of the roads."

Mr. H. J. SAUNDERS, clerk to the Twickenham Urban District Council, the mover, said he followed other speakers in his views on Road Board policy, which was certainly not to make any grant for road mainten-

ance. He pointed out that the tramway companies constructed a large portion of the roads they travelled over, and paid considerable sums to the rates, and if the 'bus owners contributed towards the upkeep of a quarter of the road area the local authorities would no doubt be content.

THE QUESTION OF ROUTES.

A third resolution, which was also carried, suggested that local authorities should be given power, subject to appeal to the Local Government Board, to limit and define the routes to be taken by motor 'buses in the districts surrounding the metropolis and other large trade centres. It was pointed out that as things were at present the companies could select the shortest and most remunerative routes without any regard to the nature of the road or the wishes of the inhabitants. Another thing to be considered was that many local authorities were preparing town planning schemes under which roads were to be graded. Roads in purely residential parts were to be of lighter construction, but if motor 'buses were to be allowed along such roads the work of the local authorities would be rendered of no account.

Mr. J. H. Salmons, clerk to the Teddington Urban District Council, expressed the view that it would be more reasonable to have a central tribunal, and not leave the matter in the hands of the local authorities.

Mr. C. H. Cooper, borough engineer of Wimbledon, said it was erroneous to state that the Road Board had £2,000,000 in its possession; all it had to deal with was £633,000, and it had done very well with it. He pointed out also that in many localities the authorities owned the tramways, and it was hardly fair for them to legislate for owners of the 'buses.

Mr. H. T. Wakelam, county engineer of Middlesex, suggested that the word "local" should be left out of the resolution and "highway" substituted, but the mover of the resolution replied that he had given this matter a good deal of consideration, and preferred to have in the word "local," as he felt that it included all authorities.

The resolution was carried unanimously.

WEIGHTS OF MOTOR VEHICLES.

The final resolution, moved by Councillor Bisgood (Richmond), was as follows: "That the weight on each wheel and the speed of heavy motor vehicles are excessive, and should be subjected to stringent restrictions; and further, that the speed should be kept within the legal limit of twelve miles an hour by mechanical means." Councillor Bisgood said that what they wanted to put before the conference was that there was no road surveyor and no borough engineer who could make a road to withstand the impact of the rear wheels of motor 'buses as at present designed. He had taken the trouble to have the figures calculated by a very eminent engineer, and it came to this: each rear wheel of a motor 'bus was carrying 2½ tons of dead weight when the 'bus was loaded to its capacity. The front wheels carried very little weight, and the reason was that Mr. Beaumont, the technical adviser to the Commissioner of Police, said that they must put added strength in the rear wheels, as a disaster to the rear wheels was a more serious matter than disaster to the front wheels. The dead weight when the vehicle was at rest was 2½ tons per wheel, but when the vehicle began to move at a speed of 5 miles an hour there was added to that weight the pressure due to the momentum, which increased the weight to 3 tons a wheel. At 10 miles an hour the weight was 4¼ tons a wheel, and at 15 miles—the average speed of motor 'buses—the pressure per rear wheel was 7 tons. That was equivalent to a blow on the road surface of 7 tons, and he was told that to make a road to stand a pressure of 7 tons required 22 in. of concrete and wood, or other material. It was not right and fair to expect the ratepayers to construct such roads. He felt that this was the true basis, and unless they could get a limitation of the blow, no pavement could compensate an authority for the damage.

The resolution was passed.

At the suggestion of the chairman it was decided that each council should appoint a delegate to an executive committee to urge the Government to consider the demands of the conference.

ACTION BY BOROUGH COUNCILS.

The General Purposes Committee of Kensington Borough Council are about to challenge the right of persons to use the streets for heavy and noisy motor traffic. The council have been receiving complaints for some time of the annoyance caused by motor omnibuses and other heavy motor vehicles, and the committee have now given instructions to its solicitors to take proceedings against offenders.

A notice of motion with reference to motor traffic appeared on the agenda for last Wednesday's meeting of Wandsworth Borough Council. It expressed concern about the falling receipts of the London County Council tramways owing to motor omnibus competition, and urged the London County Council to endeavour to obtain power to prohibit the use of any roads in the County of London by motor omnibuses without the joint consent of the governing bodies—the London County Council and the borough councils concerned.

SEWAGE EFFLUENT STERILISATION AT POLK STATE, PENNSYLVANIA.

A scheme for the purification and sterilisation of 564,000 gallons of sewage daily is described in the *Engineering Record*. The works are designed for the Pennsylvania Institution for Feeble-minded at Polk. They consist of settling tanks, sprinkling filters, humus tanks, dosing apparatus for treating the effluent with hypochlorite of lime, and a straining filter for sludge from the various units. The sewage is first screened, and then passes into the settling tanks. Each tank consists of four departments, and they are of such a size that with three tanks in use a settling period of twelve hours is given. These tanks are constructed of reinforced concrete, and are roofed with the same material.

The filters are filled with broken sandstone of a grade of from ¼ in. to 1 in. They are 6 ft. deep, and are capable of dealing with the sewage at a rate of about 200 gallons per cubic yard per day.

The humus tanks consist of two rectangular compartments, one to each filter, having an average width of 30 ft., an average length of 52 ft., and an average depth of 4 ft. Each has a capacity of 47,000 gallons, or holds two hours' flow.

The sludge bed is 135 ft. long by 100 ft. wide by 2 ft. deep. It is filled with coarse sand. It will be observed that the area allowed for the sludge bed is in the proportion of about 1 sq. yd. for every 350 gallons of the daily flow. The liquid from the sludge bed is pumped into the settling tanks for further treatment. It is not clear from the description given whether the sterilising agent is added to the effluent while it is in the humus tanks or later. The effluent is sterilised by means of chemical hypochlorite.

Institute of Sanitary Engineers.—The opening sessional meeting of this body will take place at Caxton Hall, Westminster, on Wednesday, October 2nd, at 8 p.m.

Workmen's Cottages.—In last week's issue there appeared an inquiry from a correspondent for the names of any medium-sized towns (say of between 15,000 and 20,000 inhabitants) where cottages for the working classes have been erected by the local authorities. In reply to this Mr. Percival T. Harrison, Assoc.M.Inst.C.E., borough engineer of Chelmsford, writes: "This council is completing thirty-eight cottages, and have decided to erect a further 105. The population of Chelmsford is nearly 24,000."

Dusseldorf City-Planning Exhibition.—Although the congress arranged on city planning concludes to-morrow, the exhibition on that subject and on city operation and city administration functions remains open to October 31st. The first group of exhibits in connection with it consists of general ground plans, traffic systems (such as railways; local and express facilities; elevated, subway, suspension and street railways), aviation stations, city embellishment, bridges, docks, parks, lawns, forests and real estate polities. Under city operation are grouped: Gasworks, waterworks, electric central-stations, sewage systems, street cleaning, refuse disposal, cemeteries and crematories. Under the third group (administrative functions) are exhibited plans and models of hospitals, rescue homes, poor-houses, lodging-houses, orphan asylums, homes for widows and the aged infirm, schools, churches, museums, art galleries, libraries, concert halls, &c. Dusseldorf, known as the "Park City," is the most modern city in western Germany, the centre of the industrial empire, and reputed to be the most beautiful city.

CHLORINE OR HYPOCHLORITES?

By Eric K. Rideal.

At the present time, when many waters are being treated with electrolytic bleach, with bleaching powder, or with magnesium hypochlorites, in order to produce a sterile water supply, it is important to investigate whether the purifying agency of the added substance is chlorine or not. For if it is chlorine that is the potent germicide in the water we have at first to investigate the action of dilute chlorine water on the human system, for which the water is intended, and, secondly, to discuss whether chlorine gas *per se* would not be a more economical form of treatment.

Pettenkofer and Lehmann say that 1 to 5 parts of "free" chlorine per 100,000 parts of air affect the respiratory organs, while 6 parts per 10,000 soon prove fatal. Koch also spoke firmly against the use of free chlorine, showing that it was poisonous in a similar manner to bromine and iodine, two other well-known halogens.

Various authors from time to time have shown that chlorine itself in the gaseous state forms only a fair disinfecting or sterilising medium, while solutions of bleach are comparatively strong, strengths such as 1 to 5 parts of "available" chlorine per 1,000,000 usually sufficing to sterilise contaminated waters. The differences noticed between these two "chlorine" disinfectants are accounted for by their different mode of working. The action of chlorine on water containing traces of organic matter and also organisms is threefold.

A part of the chlorine attacks the organic matter and liberates substituted chloramines; these, as my father has shown, are very strong germicides, and are consequently of great utility in the water. Some of the chlorine acts directly on the organisms as a toxic agent, while the greater part of the chlorine (in the case of a water that does not contain large quantities of organic matter) is only slowly decomposed by the water into hydrochloric and hypochlorous acids. This occurs more rapidly under the influence of light.

Since hydrochloric acid is a strong acid, it will replace the carbonic acid in the carbonates that are probably already present in the water, setting free carbonic acid at the same time. If, on the other hand, the quantity of carbonates in the water is low, such as is the case in very soft waters, the hydrochloric acid formed by the chlorine will give the water a marked acidity, which, in course of time, will affect the water conduits and pipes. The hypochlorous acid remains free and liberates oxygen when in contact with organic matter.

This hypochlorous acid is a strong disinfectant and steriliser, it possesses the advantage shared only by ozone and the peroxides (including nascent hydrogen peroxide liberated from the "per" salts)—namely, that it only liberates oxygen in the nascent state.

In the case of hypochlorites, such as bleaching powder or electrolytic hypochlorites of sodium or magnesium, the only salts in solution are, firstly, neutral chlorides, that at such dilutions possess no physiological action whatever. The effect of adding calcium or magnesium hypochlorites to a hard water will be merely to increase slightly the hardness of that water. This may be obviated by using electrolytic sodium hypochlorite, which will not increase the hardness, but, in certain cases, will, in fact, soften it.

Secondly, calcium or sodium hypochlorite; these, if treated with strong acids, will liberate chlorine, which, as has already been shown, possesses marked toxic properties. If, however, they are treated with dilute weak acids (such as carbonic or humic), they liberate hypochlorous acid. This substance will sterilise the water by means of its oxygen liberating capacity. Thus, sterilising by hypochlorites in normal waters, which contain free carbonic acid, is equivalent to sterilising by means of oxygen, the mere traces of chlorine that may be evolved are at once fixed by the substituted ammonias of the organic matter to form chloramines. There is at no time in the water a large quantity of free chlorine, as is the case in waters which have been treated with chlorine water.

Again, it is to be remembered, when the suggestion of treating water supplies with chlorine or hypochlorites is made, that one has to face the possibility of an overdose occurring through some accident or neglect. In the case of the chlorine treatment, the effect might prove disastrous, while with hypochlorites a slight increase in the salinity of the water would be the only result.

Another point in favour of the hypochlorite treatment, whether the hypochlorites of sodium, magnesium or calcium be used, is that the crude chemicals do not exert that powerful destructive effect both on the human system and on the vessels with which they come in contact, which is the characteristic of the halogens. Very special precautions, indeed, would be required if liquid chlorine in bombs were to be used as a disinfectant for waters or effluents.

Although the price of chlorine falls considerably below the market value of any form of hypochlorites, from these considerations it may be perceived that the employment of free chlorine for water supplies has its grave disadvantages, which are not shared by the hypochlorite treatment.

Vacuum Cleaning Extraordinary.—A machine combining two modern inventions, the electric car and the vacuum cleaning apparatus, has been applied in Strassburg to clean the tramway tracks of that city. In the operation of the machine the road bed is sprayed with water, then the dirt is loosened by a scratcher and drawn up into the car by the suction apparatus. With this machine (says *Scientific American*) one man can clean 25 miles of track a day, replacing the labour of seventeen men working in the ordinary way.

Whinstone Setts and Portsmouth.—At a recent meeting of the Portsmouth Corporation, in the course of a discussion on the expenses of "a flying squadron" of aldermen and others which visited Leicester, Croydon, Southend, Southampton, and Cheltenham in quest of setts which will not become slippery under wear, it transpired that whinstone setts were decided upon, and duly laid. It was stated that "whinstone, as it is called, is quarried in Scotland. It is hard, almost like granite, and has been dressed with a level surface, but it would not wear smooth so as to be slippery in wet weather."

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. Thomas, M.Inst.C.E., County Surveyor, Buckinghamshire.

EAST MIDLAND DISTRICT MEETING AT ILKESTON.

District Chairman—Mr. E. G. Mawbey, M.Inst.C.E., Leicester.

An East Midland District meeting will be held at the Town Hall, Ilkeston, to-morrow (Saturday).

Programme.

10.45 a.m.—Reception by the mayor, Councillor S. Shaw, J.P., at the town hall.

11 a.m.—Special cars to Hallam Fields for Stanton Ironworks.

11.30 a.m.—Visit Stanton Ironworks.

1 p.m.—Lunch (kindly provided by the company) at the Stanton Ironworks Company's Hotel.

1.45 to 2.30 p.m.—Formation of District Executive Committee. Discussion on papers (which will be taken as read): "Ilkeston Sewage Disposal Works," by Mr. H. P. Raikes, engineer; "Twenty-eight Years' Municipal Work at Ilkeston," by Mr. H. J. Kilford, borough surveyor; "Ilkeston Tramways and Electricity Supply," by Mr. H. P. Stokes, borough electrical engineer.

3 to 4 p.m.—Inspection of the new sewage disposal works. The party will be conducted over the works by the engineer, Mr. H. P. Raikes.

4.10 p.m.—Special cars to the town hall, where tea will be provided.

Should time permit, a visit will be paid to the car sheds, police station, free library, cemetery chapels, lodges, gasworks, &c.

R. A. MacBrair, M.Inst.C.E.,
Hon. District Secretary,
Lincoln. City Engineer.

EXAMINATION.

The October, 1912, examination will be held in Birmingham on the 10th, 11th and 12th of that month.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. E. A. Stickland, assoc.m.inst.c.e., Borough Surveyor, Windsor.

President-Elect—Mr. Frank Latham, m.inst.c.e.i., f.s.e., Borough Engineer and Surveyor, Penzance.

ANNUAL GENERAL MEETING.

The fourth annual general meeting of the Institution of Municipal Engineers will be held in London on Friday and Saturday, October 11th and 12th next.

Programme.

Friday, October 11th.

11 a.m.—Meet in the council chamber, No. 4 Southampton-row, London, W.C.

11.15 a.m.—Annual general meeting:—
Minutes of last meeting.
Election of council for the year 1912-13.
Presentation of annual report of council.
Announcement of result of ballot.
Presidential address.

1 p.m.—Adjourn for lunch.

2 p.m.—Reassemble in council chamber.

2.15 p.m.—Discussion on the following papers to be presented to the meeting:—
"The Modernising of Building By-laws," by F. W. Platt (member).
"The L.G.B. Report on Intercepting Traps," by H. C. H. Shenton (member).
"The Influence of Town Planning upon the Public Health," by W. Louis Carr (member).
"Superannuation and Security of Tenure," by A. Winter Gray (Member).

(The papers will be taken as read, and advance copies may be obtained on application to the secretary, and will be forwarded as soon as the papers are in print.)

5 p.m.—Close of meeting. Ladies return to council chamber.

Ladies' Meeting.

(Held concurrently with General Meeting.)

11 a.m.—Meet in the council chamber, No. 4 Southampton-row, London, W.C.

11.15 a.m.—Leave council chamber and proceed to the stores of Messrs. Selfridge & Co., Oxford-street, W.

11.30 a.m.—Meet at the Duke-street entrance of the stores, where visitors will be met by a representative of the firm and conducted round the building.

1 p.m. Lunch.

2.30 p.m.—Meet at the showrooms of Messrs. Doulton & Co., Limited, Lambeth, S.E., who have kindly arranged to conduct the visitors through their works and showrooms.

4.30 p.m.—Leave Messrs. Doulton's works.

5 p.m.—Arrive at council chamber, Southampton-row.

6.45 p.m.—Reception by the president at the Holborn Restaurant, followed by (7 p.m. to 11.30 p.m.) social evening, with musical programme, at the invitation of the president. Morning dress.

Saturday, October 12th.

10.30 a.m.—Visit to Shakespeare's England, Earl's Court. Meet in booking hall, Earl's Court Station.

12.30 p.m.—Adjourn for lunch.

2.30 p.m.—Visit to the London Hippodrome, at the request of a number of country members.

EASTERN DISTRICT MEETING, CODMANCHESTER.

(Tuesday, October 15th.)

Programme.

11.30 a.m. Meet at Godmanchester Station and inspect Roeman road.

12.30 p.m.—Call at council's depot, where methods of sewer flushing will be shown.
Inspect reinforced concrete bridges.

1 p.m. Lunch at the Horseshoe Temperance Hotel.

2 p.m. Reception at the town hall by his Worship the Mayor (Mr. J. P. L. Durrell Stables, J.P.).
Inspect old charters, books and records.

3 p.m.—Walk round town, viewing sixteenth century architecture, tarviated roads, reinforced concrete posts, new system of constructing cheap cottages and "exhibition" of cheap cottages.

4 p.m.—Tea at the Horseshoe Temperance Hotel.

Philip S. Bennett,
Hon. District Secretary.

Council Offices,
Ramsey, Hunts.

NORTHERN DISTRICT.

At a meeting of this district, held at the Town Hall, Newcastle-on-Tyne, on Saturday last, arrangements were made for holding a joint meeting with the Yorkshire District at Harrogate on October 19th. Full programme of the meeting will be announced later, and at the meeting the question of the partition of Yorkshire among the neighbouring districts will be brought up for discussion.

COUNCIL MEETING.

At a meeting of the Council held on September 18th the following applicants were recommended for admission.

To Membership: Messrs. R. L. Price, surveyor, Dawley Urban District Council; T. Robinson, surveyor, Southport, Birkdale and West Lancashire Water Board; and H. Plewes, surveyor, Thorne Rural District Council.

To Associate Membership: Messrs. S. F. Deacon, chief assistant, St. Mellons Rural District Council; R. E. Miles, assistant engineer and surveyor, Horbury Urban District Council; H. E. Morris, surveyor's office, Hendon Rural District Council; F. J. Felts, borough surveyor's office, Cambridge; and G. H. Thomas, assistant surveyor, Llanelly Urban District Council.

Transfer to Membership: Messrs. F. Britton, surveyor, Dore Rural District Council, and G. E. Mathews, engineer and surveyor, South Holland Drainage Trust.

(Under the new by-laws these elections will be ratified at the next council meeting if no written objections are lodged within fourteen days.)

New Members, &c.—From the applicants recommended for admission at the last meeting four members and seven associate members were elected, and one transfer was made to the membership class.

International Road Congress, 1913.—The secretary reported that the president of the institution had been added to the list of honorary vice-presidents of the congress.

Annual Meeting.—The programme of the annual meeting to be held on October 11th and 12th was finally approved.

N.A.L.G.O. Dinner.—The annual dinner of this association is to be held in London on October 12th. Full particulars may be obtained of the secretary.

Subscriptions, 1912-13.—Members and others are requested to note that annual subscriptions for 1912-13 are now due.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*

ASSOCIATION OF KENT SURVEYORS.

MEETING AT TONBRIDGE.

A meeting of the Association of Kent Surveyors was held at Tonbridge on the 14th inst., the following being present—namely: Messrs. H. P. Maybury (chairman, Kent), A. E. Nichols (vice-chairman, Folkestone), G. A. Butterworth (Birchington), T. A. Busbridge (Maidstone), J. Randerson (Sevenoaks Rural), J. Marshall (Malling Rural), J. L. Redfern (Gillingham), S. Towlson (Sevenoaks), W. L. C. Turner (Tenterden), A. Goldfinch (Whitstable), W. L. Bradley (Tonbridge), W. G. Cross (Tunbridge Wells) and Frank Harris (hon. secretary and treasurer, Tonbridge Rural).

The members were welcomed to Tonbridge by the chairman of the Tonbridge Urban District Council, Mr. L. J. Breeze, J.P., and visits were afterwards paid to various works in the neighbourhood, these including a tarviated granite road in the High-street, and the newly completed sewage works with electric pumping plant.

It was decided to hold the next meeting in London.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

President—Mr. JOHN D. WATSON, M.INST.C.E., F.R.S.I.

METROPOLITAN DISTRICT MEETING.

An inspection of the St. Albans sewage disposal works will be made by the members of the Association of Managers of Sewage Disposal Works to-morrow (Saturday), at 2 p.m.

The works comprise sedimentation tanks, sludge receiver, sludge distributing main, coarse contact beds, percolating filters, Fiddian travelling distributors, humus tank, final land treatment, &c. The pumping plant comprises a Teasdale suction-gas plant, two 12 h.p. gas engines, and two 6-in. centrifugal pumps.

PROGRAMME.

Assemble at entrance to works near Park-street Station (L. and N.W. Rly.).

The party will be conducted over the works by Mr. A. Eade, the manager, who will explain the system of treatment.

A paper will be read by Mr. H. Howard Humphreys, Westminster.

His Worship the Mayor and other members of the corporation have promised to be present.

JAS. CRAIG,
Hon. District Secretary.

68 Empress-avenue,
Manor Park, E.

ROYAL SANITARY INSTITUTE.

PROVINCIAL SESSIONAL MEETING, LEWES.

At a meeting of the Royal Sanitary Institute, to be held at the Town Hall, Lewes, on Friday, October 4th, at 7 p.m., Mr. D. Roberts, the borough surveyor of that town, will open a discussion on "The New Sewerage System for Lewes, with Special Reference to the Discharge of Effluents into Tidal Streams," among those who are expected to take part in the proceedings being Messrs. John H. Blizard, ASSOC.M.INST.C.E., Southampton, A. J. Martin, M.INST.C.E., Westminster, and A. E. Prescott, borough engineer and surveyor, Eastbourne.

The chair will be taken by Mr. H. Percy Boulnois, M.INST.C.E., chairman of council of the institute.

On the following morning the members will visit the Phœnix Ironworks and the Lewes Portland Cement and Lime works, and in the afternoon inspect the Lewes Victoria Hospital, the borough isolation hospital, the fire brigade station, and the waterworks.

SOCIETY OF ENGINEERS.

At a meeting of the Society of Engineers to be held on Monday, October 7th, at the Institution of Electrical Engineers, Victoria Embankment, W.C. (south end of Savoy-street, near Waterloo Bridge), a paper on "Town Planning from an Engineering Aspect" will be read by Mr. E. R. Matthews, ASSOC.M.INST.C.E., F.G.S., the following being a synopsis: Town planning in a residential area—Direction, width and construction of main arterial, secondary and subsidiary streets—Building line in such streets—Sites for public buildings, &c.—Open spaces for recreation grounds and parks—Sewerage and sewage disposal—Water supply and lighting—Widening of existing roads—Bridlington's town planning scheme. Town planning in an industrial area: Comparison between the planning of a residential and an industrial area, and a consideration of the various points which arise in planning an industrial area.

The chair will be taken at 7.30 p.m. precisely.

A. S. E. ACKERMANN,
Secretary.

17 Victoria-street, S.W.

"THE SURVEYOR" BOOK DEPARTMENT.

In response to suggestions from numerous readers, resident in remote districts at home and abroad, who find it difficult to procure the books they require, we have decided to establish a department for the supply of technical and scientific books, a selected classified list of which will shortly be published in our advertisement pages.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* **THE SURVEYOR** *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

INSPECTOR OF NUISANCES.—September 28th.—Corporation of Bradford. £85 per annum.—Mr. F. Stevens, town clerk.

CITY ARCHITECT AND SURVEYOR.—September 28th—November 1st.—Corporation of Calcutta. £90 per month.—The Hon. S. L. Maddox, C.S.I., I.C.S., chairman of the Corporation of Calcutta, East India United Service Club, 16 St. James's-square, London, S.W., or (up to November 1st) Mr. C. C. Chatterjee, secretary, Corporation of Calcutta.

DRAUGHTSMAN. — October 2nd. — Shoreditch Borough Council. £100—£140.—Mr. J. A. D. Milne, town clerk.

CLERK OF WORKS.—October 2nd.—Hayes Urban District Council. £3 per week.—Mr. C. D. Lewis, clerk.

CLERK OF WORKS.—October 3rd.—Corporation of Huddersfield.—Town Clerk.

SANITARY INSPECTOR.—October 7th.—Corporation of Bournemouth. £100—£130.—Mr. H. Ashling, town clerk. Application to be endorsed "Sanitary Inspector."

CHIEF ENGINEER AND COUNTY SURVEYOR.—October 7th.—London County Council. £2,000.—Sir Laurence Gomme, clerk.

HIGHWAYS SUPERINTENDENT.—October 12th.—Corporation of Huddersfield. £120 per annum.—Mr. K. F. Campbell, borough engineer and surveyor.

HIGHWAY SURVEYOR.—October 14th.—Truro Rural District Council. Mr. Coulter Hancock, solicitor.

DEPUTY CITY SURVEYOR.—October 19th.—Corporation of Manchester. £500 per annum.—Mr. Thos. Hudson, town clerk. Applications to be endorsed "Deputy City Surveyor."

COUNTY SURVEYOR.—October 19th.—County of the Soke of Peterborough. £200 per annum.—Mr. Walter J. Deacon, clerk, Cross-street, Peterborough. Applications to be endorsed "Application for County Surveyorship."

CHIEF ENGINEER.—October 28th.—Municipality of Karachi (India). 500—750 rupees per month.—Mr. Measham Lea, chief officer and chief engineer, Municipal Office, Karachi.

CLERK OF WORKS.—September 29th.—Rivers Committee of the Corporation of Manchester. £3 3s. per week.—Mr. Thomas Hudson, town clerk.

ASSISTANT ENGINEER.—Government of Sierra Leone. £300 a year.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W. Quote M 5,538 on left-hand top corner of application.

ASSISTANT ENGINEER.—Government waterworks on the Gold Coast. £600—£650. Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W. Quote M 5,605 on left-hand top corner of envelope.

MUNICIPAL COMPETITIONS OPEN.

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RANGOON.—September 28th—February 1st.—The date in the conditions in Clause 28 has been altered from August 31st to September 28th and in Clause 14 from January 1st to February 1st, 1913. The latest date for posting letters to reach Rangoon by February 1st will be by the Indian mail of January 10th.

SLIGO. September 30th. For a scheme of electric lighting, for the corporation.—Mr. J. McGoveran, town clerk. Tenders to be endorsed "Electric."

LLANELLY.—September 30th.—Competitive designs and estimates for school buildings for over 1,000 children, also domestic subjects centre, for the Education Committee.—Mr. G. E. Halliday, F.S.A., F.R.I.B.A., Castle-street, Cardiff, will act as assessor and award premium. Mr. I. W. Watkins, clerk, Education Offices, Coleshill-terrace, Llanelly.

WANDSWORTH.—October 14th.—Competitive designs for public swimming bath at Balham.—Mr. P. Dodd, borough engineer, 215 Balham High-road, S.W.

GLASGOW.—October 29th.—Preliminary sketch designs are invited by the corporation for the extension of the municipal buildings. Honorariums of 100 guineas to five selected designs.—Mr. John J. Burnet, A.R.S.A., 239 St. Vincent-street, Glasgow, is assessor.—Applications to the clerk, Mr. J. Lindsay, town clerk.

LLANDUDNO.—October 31st.—Designs for laying out about 20 acres, for the urban district council. A premium of 50 guineas is offered.—Mr. A. Conolly, clerk.

HUDDERSFIELD.—October 31st.—Designs for laying out certain areas as a town planning scheme, for the corporation. Premiums of 100, 50, and 25 guineas. —Mr. J. Henry Field, town clerk.

ROSCREA.—November 1st.—Plans, specifications, and estimates of a sewerage system, for the Roscrea No. 1 Rural District Council. £21 to be awarded to the best plan. Mr. T. Hooley, clerk, The Workhouse.

ORSETT (Essex). January 1st. For the construction of a sewerage and sewage disposal scheme in the parish of South Ockendon, for the Orsett Rural District Council. Premiums of £50 and £25 are offered. Mr. James Beck, clerk, 2 Orsett-road, Grays.

MUNICIPAL CONTRACTS OPEN.

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Buildings.

NELSON. September 28th.—For the construction of a bridge, for the corporation. Mr. W. Shackleton, borough engineer.

HARROGATE.—September 30th.—For the erection of boundary walls to cemetery, for the corporation. —Mr. C. E. Rivers, borough engineer and surveyor.

STOCKPORT.—September 30th.—For taking down one of the bays of the covered market and other work, for the corporation.—Mr. J. Atkinson, borough surveyor.

TIPTON.—September 30th.—For the erection of sanitary conveniences, drains, and paving of playgrounds, for the Education Committee.—Mr. E. Richards, secretary.

GREAT YARMOUTH.—September 30th.—For extensions to the fire brigade and police stations.—Town Clerk.

ENFIELD.—October 1st.—For the erection of a school and cottage, for the Education Committee.—Mr. N. Hepworth, clerk.

LONDON. October 1st. For the erection of training college and hostel, and adapting existing house for a hostel, for the county council.—Sir Laurence Gomme, clerk.

NORTH RIDING.—October 2nd.—For the erection of a cookery and manual instruction room, for the Education Committee.—Mr. J. C. Wrigley, secretary, County Education Offices, Northallerton.

GREENOCK. October 2nd. For the erection of a school, for the School Board.—Mr. A. F. Niven, clerk, Municipal Buildings, Greenock.

SOUTHEND-ON-SEA. October 2nd. For the erection of pumping station and destructor buildings, inclined roadway, two cottages, and other works at the sewage disposal works, for the corporation.—Mr. H. J. Worwood, town clerk.

BUCKINGHAM.—October 3rd.—For the erection of six cottages, for the rural district council.—Mr. T. R. Hearn, clerk.

HERTFORD.—October 3rd.—For the construction of a bridge, for the Highways Committee.—Mr. Urban A. Smith, county surveyor, Hatfield.

WEST RIDING. October 4th. For alterations at a public school, for the Education Committee. Mr. Francis Alvey Darwin, clerk, County Hall, Wakefield.

LEICESTERSHIRE. October 4th. For the erection of handicraft centres, for the county council. The Architect, 33 Bowling Green-street, Leicester.

BIRKENHEAD.—October 7th.—For the construction of a gallery in the swimming bath, for the corporation.—Mr. J. Fearnley, town clerk.

ALTRINCHAM.—October 7th.—For the erection of a public convenience, for the Sanitary Committee.—Mr. H. E. Brown, surveyor.

CORNWALL.—October 12th.—For alterations to a school, for the Education Committee.—Mr. F. R. Pascoe, secretary, County Hall, Truro.

HERNE BAY.—October 16th.—For the erection of a pavilion and concert hall, for the urban district council.—Mr. G. H. Beetenson, clerk.

WEST RIDING.—October 18th.—For alterations to a school, for the county council.—The Clerk, County Hall, Wakefield.

HENDON.—October 21st.—For the erection of fifty artisans' dwellings, for the urban district council.—Mr. H. Humphris, clerk.

HENDON. October 21st. For the erection of a fire station, for the urban district council.—Mr. H. Humphris, clerk.

Iron and Steel.

BRIDLINGTON. September 30th. For carrying out a water main extension, for the rural district council.—Mr. Geo. Hankinson, clerk.

HARROGATE.—September 30th.—For the extension of the royal pump-room, for the town council.—Mr. C. E. Rivers, borough engineer.

LEEDS.— September 30th—October 7th.—For the erection of steel and corrugated-iron building, and constructing surface-water drainage, for the Tramways Committee.—Chairman of the Tramways Committee.

GLASGOW.—September 30th.—For the supply of penstock valves, cast-iron pipes, cast-iron columns and joists, for the corporation. Mr. J. Lindsay, town clerk.

DUNDEE. October 1st. for the supply of cast-iron pipes, for the Water Commissioners. Mr. W. H. Blyth Martin, clerk, City Chambers, Dundee.

ROTHERHAM.—October 12th.—For excavating, laying, jointing, and filling in 21 miles of cast-iron spigot and socket pipes, the sizes ranging from 8 in. to 3 in., for the rural district council.—Messrs. Oxley and Coward, clerks.

ROTHERHAM.—October 12th.—For the supply of 1,330 tons of cast-iron spigot and socket pipes with special castings, for the rural district council.—Messrs. Oxley and Coward, clerks.

Roads.

COCKENZIE.—September 28th.—For the construction of macadam roads, for the town council.—Mr. R. Tulloch, burgh surveyor.

KNUTSFORD.—September 30th.—For making good certain roads, for the urban district council.—Mr. E. L. Ashworth, clerk.

FAVERSHAM.—September 30th.—For the supply of granite or basalt, and chippings, for the corporation. —Mr. G. Tassell, town clerk.

SHREWSBURY.—September 30th.—For making up Water-street, for the corporation.—Mr. W. Chapple Eddowes, borough surveyor.

WARRINGTON.—September 30th.—For laying concrete flags, for the corporation.—Borough Surveyor.

COWES.—September 30th.—For the supply of gravel and road material, for the urban district council.—Mr. J. C. W. Damant, clerk.

CAERPHILLY.—October 1st.—For private street works in three thoroughfares, for the urban district council.—Mr. A. D. Harpur, surveyor.

MALDENS AND COOMBE.—October 1st.—For works of kerbing, channelling and widening, for the urban district council.—Mr. R. H. Jeffes, engineer and surveyor.

EALING.—October 1st.—For making up a road, for the corporation.—Mr. G. E. Brydges, town clerk.

LLANDAFF AND DINAS POWIS.—October 1st.—For works of street improvement, for the rural district council.—Mr. M. Warren, clerk, Park House, Cardiff.

SWANSEA.—October 1st.—For the execution of private street works, for the corporation.—Mr. H. L. Coath, town clerk.

CHICHESTER.—October 1st.—For the supply of 1,000 tons of 2-in. broken granite, basalt, or other approved material, for the corporation.—Mr. J. W Loader, town clerk.

LITTLEHAMPTON.—October 2nd.—For taking up old paving, and laying indurated flagging, kerbing and channelling and steam rolling, for the urban district council.—Mr. Arthur Shelley, clerk.

LIMERICK.—October 2nd.—For laying 12,000 sq. yds. of footways with mineral rock mastic asphalt, for the corporation.—Mr. W. M. Nolan, town clerk.

TANGIER.—October 3rd.—For the construction of a road 1½ miles long, for the Committee of Public Works.—Specifications may be obtained at the Intelligence Branch of the Board of Trade, 75 Basinghall-street, E.C.

SWANSEA.—October 3rd.—For works of road widening, for the rural district council.—Mr. E. Harris, clerk.

LAMBETH.—October 3rd.—For laying creosoted deal paving blocks, for the borough council.—Mr. T. F. Garnish, deputy town clerk.

ARGYLL.—October 3rd.—For works of widening, bottoming and metalling, for the Lorne District Committee.—Mr. W. Ironside, district clerk, Oban.

RHONDDA.—October 4th.—For laying 770 yds. of 10 in. water main, for the urban district council.—Mr. O. Thomas, engineer.

TEDDINGTON.—October 5th.—For making up three roads, for the urban district council.—Mr. G. H. Salmons, clerk.

HUYTON.—October 5th.—For the supply of macadam and granite chippings, for the urban district council.—Mr. G. W. Swift, clerk.

WHITLEY AND MONKSEATON.—October 7th.—For the reconstruction of footways, for the urban district council.—Mr. Augustus Whitehorn, clerk.

STANLEY.—October 7th.—For making up roads and surface-water drainage, for the urban district council.—Mr. John G. Ridley, clerk.

HORNSEY.—October 7th.—For making up with tarred bituminous or asphalt certain roads, for the corporation.—Mr. E. J. Lovegrove, borough engineer.

HARROW-ON-THE-HILL.—October 12th.—For making up private streets, for the urban district council.—Mr. J. Strachan, clerk.

SHEERNESS.—October 15th.—For the supply of basalt or granite, Kentish ragstone, hoggin and Thames ballast, for the urban district council.—Mr. V. H. Stallon, clerk.

Sanitary.

NELSON.—September 28th.—For the construction of sewers and sewage works extensions, for the corporation.—Mr. W. Shackleton, borough engineer.

SOUTHWICK.—September 28th.—For the construction of surface-water drains and outfall sewer, for the urban district council.—Mr. G. W. Warr, surveyor.

CAIRO.—September 30th.—For sanitary installations, for the Office of Public Works.—Administrative Service, Public Works Ministry, Cairo.

WATFORD.—September 30th.—For the supply of concrete tubes of 36 in., 30 in., and 21 in., for the urban district council.—Mr. W. Hudson, clerk.

BLEAN.—September 30th.—For the construction of sewage disposal works, for the rural district council.—Mr. F. A. Ward, Roseneath, Eddington, Herne Bay.

WATFORD.—September 30th.—For the construction of storm-water drainage and sewerage works, for the urban district council.—Mr. D. Waterhouse, engineer and surveyor.

TIPTON.—September 30th.—For the erection of public conveniences, for the Education Committee.—Mr. W. H. Jukes, surveyor.

BALLINROBE.—September 30th.—For laying pipe sewers, for the rural district council. Mr. J. Walsh clerk.

THRAPSTON.—September 30th.—For the construction of a sewer, for the rural district council. Mr. T. Lloyd, surveyor.

STALYBRIDGE AND DUKINFIELD.—September 30th.—The Joint Sewerage Board notify that the time for the receipt of tenders for the extension of the Bradley Hurst works has been extended to September 30th.

DRIFFIELD.—October 1st.—For laying sanitary pipe drains, for the rural district council. Mr. T. Cawser Pennyman, surveyor.

EAST GRINSTEAD.—October 2nd.—For the construction of sewage disposal works, comprising detritus tanks settling tanks, storm water, standing tanks, filter-beds, humus tanks, laying sewers and the construction of manholes, for the rural district council.—Mr. Francis S. White, clerk.

BRAILA (Roumania).—October 3rd—7th.—For work of drainage and laying conduits, at the estimated cost of £16,000, for the corporation.—Primaria Orasulni Braila, Roumania.

RUGBY.—October 4th.—For the removal of refuse, and cleansing closets, for the rural district council.—Mr. J. W. Pendred, clerk.

BLAYDON.—October 8th.—For removal of contents of ashpits, for the urban district council.—Mr. H. Dalton, clerk.

BRADFORD.—October 9th.—For the construction of circular outfall sewer in tunnel, and two shafts, for the corporation.—Mr. Frederick Stevens, town clerk.

POOLE.—October 9th.—For emptying cesspools, for the rural district council.—Mr. P. E. L. Budge, clerk.

KIRKBY-IN-ASHFIELD.—October 15th.—For laying 4,378 yds. of iron and stoneware outfall sewers, with manholes and other works, for the urban district council.—Mr. E. Bertram Hibbert, clerk.

BLYTH.—October 15th.—For scavenging work, for the rural district council.—Mr. F. Hopkinson, surveyor, 66 Bridge-street, Worksop.

Stores.

GELLYGAER.—September 30th.—For the supply of oilskin suits, pavings, kerbs, channels, cast-iron goods, smithwork, Portland cement, hydraulic lime, ironmongery, drain pipes, and street brushes, for the urban district council.—Mr. J. P. Jones, surveyor, Council Offices, Hengoed, *vid* Cardiff.

ABERDEEN.—October 1st.—For the supply of steel and iron, ironmongery, timber, chandlery, plumber work, brass and copper, and bricks and drain pipes, for the Harbour Commissioners.—Mr. R. G. Nicol, harbour engineer.

Miscellaneous.

KINGSTON-UPON-THAMES.—September 28th.—For the supply of sulphuric acid, for the corporation.—Mr. Harold A. Winser, town clerk.

Rural Housing Reform.—The Local Government Board have made a concession to Norfolk district councils according to which part of the annual cost of cottages to be erected by the Swaffham Rural District Council and owned by them may be paid for by loan from the Local Government Board. In this way agricultural labourers will obtain more reasonable rents.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BIRMINGHAM.—For the erection of a special school, for the corporation.—Mr. J. A. Palmer, secretary of the education committee, Council House:—

F. H. Smith, Birmingham.
B. Whitehouse & Son, Birmingham.
E. Crowder, Birmingham.
T. Elvins & Sons, Birmingham.
W. Harvey Gibbs, Birmingham.
J. Dallow & Sons, Birmingham.
H. H. Crump, Birmingham.*

BUSHEY.—For making up two roads, for the urban district council.—Mr. E. E. Ryder, surveyor:—

Judge & Son, Watford	£3,003
F. P. Bass, Bushey	2,659
Free & Sons, Maidenhead	2,631
Bracey & Clarke, Watford	2,408
The Surveyors (Mr. E. E. Ryder), Council Offices, Bushey	2,363
Bailey & Sons, Bushey Heath*	2,269

CHESTER-LE-STREET.—For the construction of a new road, for the rural and urban councils.—Mr. W. Ayton, highway surveyor:—

J. & R. Wood, Brandon Colliery	£6,471
W. Kennedy, Jarrow-on-Tyne	5,800
J. W. Henderson, South Gosforth	5,647
W. Morley & Son, Keighley	5,512
G. Armstrong, Whitley Bay	5,098
R. Hudson & Son, Sunderland	5,016
G. E. Simpson, Newcastle-on-Tyne	4,900
G. Dyson, Felton Lane Ends	4,850
A. Stark & Son, Glasgow	4,752
J. Cawkell, Durham	4,700
Jas. McLaren, junr., Gosforth	4,682
Thompson & Son, Chester-le-Street*	4,597

CHESTER LE-STREET.—For the construction of a bridge, for the rural council:—

R. Hudson & Son, Sunderland	£10,250
Head, Wrightson & Co., Thornaby	10 050
A. Findlay & Co., Limited, Motherwell	10,497
Cleveland Bridge Co., Limited, Darlington	10,300
Brims & Co., Newcastle-on-Tyne*	9,916

COLWYN BAY.—For laying a 15-in. sewer in Cliff-road, Old Colwyn, for the urban district council.—Mr. W. Jones, Colwyn Bay, engineer:—

R. S. Leech, Bawtry, Yorks	£812
Mitchell & Son, Manchester	689
R. L. Roberts, Llandudno	667
M. H. Boswell, Wolverhampton	540
Graham & Son, Halifax	519
Anderton & Co., Colwyn Bay	447
R. Rowlands, Colwyn Bay	441
P. S. Trentham, Birmingham†	428

Engineer's estimate, £445.

ITCHEN.—For work in ten roads, for the urban district council.—Mr. T. A. Collingwood, surveyor:—

A. Streeter & Co., Guildford	£1,685
F. Osman & Co., Southampton	1,641
Grounds & Newton, Bournemouth*	1,587

Surveyor's estimate, £1,672.

KEIGHLEY.—For the supply of 615 tons of cast-iron pipes and special castings, for the town council.—Mr. M. R. Barnett, engineer:—

Clapham Brothers, Limited, Keighley	£4,575
R. Maclaren & Co., Limited, Glasgow	4,455
D. Y. Stewart & Co., Limited, Glasgow	4,415
Macfarlane, Strang & Co., Limited, Glasgow	4,356
The Staveley Coal and Iron Company, Limited, Chesterfield	4,382
The Sheepbridge Coal & Iron Company, Limited, Chesterfield	4,368
The Clay Cross Company, Clay Cross Chesterfield	4,368
Cochrane & Co (Woodside), Limited, Dudley	4,355
The Stanton Iron Works, Limited, Nottingham	4,361
J. Oakes & Co., London	4,341
The Holwell Iron Company, Limited, Ashfordby	4,333
Cochrane & Co. (Cochrane Grove Branch), Limited, Middlesbrough-on-Tees*	4,253

MALDON.—For laying 2,000 yards of cast-iron water mains, for the rural district council:—

Godfree & Co., London	£1,247
G. P. Trentham, Birmingham	676
Hanney Brothers, Swansea	654
May & Butcher, Heybridge	640
G. Porter, Hackney	631
Staveley Coal & Iron Company, Chesterfield	598
A. Farley, Glamorgan	591
A. T. Arnold, Hatfield Peverel	520

TREDEGAR.—Accepted for the construction of subsidiary sewers, comprising about 2¾ miles of 6-in., 9-in., 12-in. and 18-in. pipe sewers, with 800 manholes, for the urban district council.—Mr. W. L. Roach, surveyor:—

W. Waring & Sons, Huddersfield, £21,279.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

SEPTEMBER.

28.—Institution of Municipal and County Engineers: East Midland District Meeting at Ilkeston.

OCTOBER.

2.—Institute of Sanitary Engineers: Opening Sessional Meeting, Caxton Hall, Westminster. 8 p.m.

4-5.—Royal Sanitary Institute: Meeting at Lewes. Mr. D. Roberts, borough surveyor, on "The New Sewerage System for Lewes, with Special Reference to the Discharge of Effluents into Tidal Streams."

7.—Society of Engineers: Mr. E. R. Matthews on "Town Planning from an Engineering Aspect," Institution of Electrical Engineers, Victoria embankment, W.C. 7.30 p.m.

11-12.—Institution of Municipal Engineers: Annual General Meeting in London.

15.—Institution of Municipal Engineers: Eastern District Meeting at Godmanchester.

19.—Institution of Municipal Engineers: Joint Meeting of Northern and Yorkshire Districts at Harrogate.

26.—Royal Sanitary Institute: Meeting at Alton; Discussions on "Housing Problems in County Areas" and "Municipal Work in Alton." Town Hall, 11.15 a.m.

APPOINTMENTS OPEN.

CITY OF MANCHESTER.

The Corporation of Manchester invite applications for the position of Deputy City Surveyor. Salary £500 per annum. Candidates must have had practical experience in all the duties of a Borough Surveyor, and must be full Members of the Institution of Civil Engineers.

The gentleman appointed will be required to devote the whole of his time to the duties of the office, to become a contributor to the Manchester Corporation Officers' Thrift Fund, and to execute their Deed of Service.

Applications, stating particulars as to age, health, and professional attainments, qualifications, &c., and accompanied by copies of four testimonials, and in addition the names of three referees, must be delivered to me endorsed "Deputy City Surveyor," on or before October 19th, 1912.

Printed copies of the application and testimonials are not required, and canvassing is prohibited.

PHILIP S. HUDSON,
Town Clerk.

Town Hall, Manchester.
September 12, 1912.

ADMINISTRATIVE COUNTY OF THE SOKE OF PETERBOROUGH.

COUNTY SURVEYOR.

The County Council are desirous of obtaining at the end of the current year the undivided services of a thoroughly competent Surveyor and Draughtsman to undertake the duties—(*a*) of maintaining, &c., the Rural Main Roads and Bridges of the County; (*b*) pertaining to the adaptation of land and the erection and supervision of buildings for Small Holdings; (*c*) relating to the inspection of and additions or alterations to School Houses and Buildings, and generally to render such services as may reasonably be required of him by this Council.

Salary £200 per annum, to include clerical and other expenses, except travelling, for which an allowance of £50 per annum will be made. The person appointed will be required to reside within the County and commence his duties on the 1st of January next.

Applications, accompanied by testimonials (not exceeding three in number), to be sent to me on or before the 19th day of October next, marked "Applications for County Surveyorship."

N.B.—Personal canvass will disqualify.

WALTER J. DEACON,
Clerk of the County Council.

Cross-street, Peterborough.
September 19, 1912.

THE RURAL DISTRICT COUNCIL OF TRURO.

The above-named Council invite applications for the appointment of Highway Surveyor for the North Division, which comprises 8 parishes with about 230 miles of highways. Candidates must have had practical experience in road work, be competent to perform all the duties appertaining to the office, and to keep the necessary books and accounts.

The person appointed will be required to reside in a central position in the district, provide his own means of locomotion, and devote the whole of his time to the duties. The Council will provide necessary books, stationery and postages.

The person appointed will be required to give a bond for £150 in some approved Guarantee Society. Three months' notice on either side to terminate the engagement.

Applications, in candidate's own handwriting, on foolscap paper, stating salary required, age, qualifications and experience, accompanied by copies of not more than three recent testimonials, to reach me, the undersigned, Clerk to the Council, not later than Monday, the 14th October, 1912. The envelope should be marked on the outside "Surveyor."

(By order)
COULTER HANCOCK,
Solicitor.

Truro.
Dated September 18, 1912.

COUNTY BOROUGH OF HUDDERSFIELD.

The Corporation require the services of an experienced Highways Superintendent, to take charge of a District under the Borough Engineer.

Applicants must have had practical experience in sewering, paving and macadamising of roads, and be competent to set out and measure up work, and keep daily accounts of all labour and materials used.

The person appointed must have had previous practical experience in a similar situation, and be prepared to reside within his district.

For statement of duties apply to the Borough Engineer.

Salary £120 per annum.

Applications, in the handwriting of candidates, giving full particulars of present and previous occupation, age, &c., accompanied by copies of not more than three testimonials of recent date, endorsed "Highway Superintendent," must be addressed to me not later than 10 a.m. on Wednesday the 9th October, 1912.

Canvassing will be useless.

K. E. CAMPBELL, M.I.C.E.,
Borough Engineer and Surveyor.

1 Peel-street, Huddersfield.
September 24, 1912.

MUNICIPALITY OF KARACHI (INDIA).

Applications are invited for the appointment of an Engineer as Assistant to the Chief Engineer.

2. Applicants must have a thorough experience in water and drainage works, the construction, maintenance of roads with various materials, the design of buildings and their construction and maintenance, and the preparation of drawings, estimates and reports. They must also be capable of supervising efficiently the Public Works Department of the Municipality.

3. Applicants must hold a diploma of some recognised Civil Engineering College, or have passed the examination qualifying for Associate Membership of the Institution of Civil Engineers, and preference will be given to applicants who also hold the diploma of the Institution of Municipal and County Engineers.

4. The selected candidate will be required to furnish a medical certificate of sound health and constitution prior to his engagement, and when appointed will be required to sign an agreement for three years, and to subscribe to the Municipal Provident Fund, according to the By-laws in force from time to time.

5. The salary of the post is Rs. 500 per month, rising by annual increments of Rs. 50 to Rs. 750 per month, with a conveyance allowance of Rs. 40 per month.

(NOTE.—15 rupees = £1 sterling.)

6. The salary will commence from the date of joining the appointment in Karachi, but a single first-class steamer or rail fare to Karachi will be paid by the Municipality.

7. The leave regulations are those provided for in the Rules and By-laws, and are similar to the uncovenanted leave rules of the Government of India.

8. Applications, stating age, qualifications and experience, together with copies of testimonials, should be addressed to the Honourable Mr. Harchandrai Vishindas, B.A., LL.B., President, Karachi Municipality, and should reach the Municipal Office not later than 28th October, 1912.

MEASHAM LEA, A.M.INST.C.E.,
Chief Officer & Chief Engineer,
Karachi Municipality.

Municipal Office, Karachi.
August 15, 1912.

TENDERS WANTED.

URBAN DISTRICT COUNCIL OF KIRKBY-IN-ASHFIELD, NOTTS.

The above-named Council invite Tenders from responsible Contractors for Sewerage and Extensions to the Sewage Disposal Works.

The works comprise about 4,378 yds. of 15-in., 12-in., and 9-in. diameter Iron and Stoneware Outfall Sewers, &c., together with Manholes and other appurtenant Works, and taking up and relaying certain Sewers, also alterations and extensions at the Outfall Works, including Bacterial Filters, Circular Tanks, and sundry alterations to existing Works, also erection of small Engine-house and 554 yds. of 4-in. Pumping Main, &c.

Plans and Specifications can be seen at the Offices of the Engineers, Messrs. Elliott & Brown, A.MM.INST.C.E., Burton Buildings, Parliament-street, Nottingham, and copies of the Bills of Quantities and Form of Tender may be obtained after September 24th on deposit of Three Guineas (by cheque), which will be returned on receipt of a *bonâ-fide* Tender, not afterwards withdrawn, and the return of all documents sent to the Contractor for the purpose of making up his Tender within fourteen days of the notice informing him a Tender has been accepted.

Sealed Tenders, endorsed "Tender for Kirkby Sewerage Works," to be delivered to the undersigned not later than the first post on Tuesday, the 15th day of October, 1912.

The lowest or any Tender will not necessarily be accepted.

The Engineer will notify applicants of a date when the Plans may be inspected at Kirkby, and the [illegible] Work proceeded with.

By order,
T. BERTRAM HIBBERT,
Solicitor and Clerk to the Council.

Public Offices,
Kirkby-in-Ashfield.
September, 1912.

TO ROAD CONTRACTORS AND TAR-PAVIORS.

HIGH-STREET, TWICKENHAM-ROAD AND MANOR-ROAD IMPROVEMENTS.

The Urban District Council of Teddington are desirous of receiving Tenders for the following Works in connection with the Making Up and Improvement of the above—*viz.*:—

134 super. yds. Roadway Formation.
364 lin. yds. 12-in. by 8-in. Norwegian Granite Kerb.
58 lin. yds. Granite Channel and Laying.
580 super. yds. 2½-in. Artificial Stone Paving.
134 super. yds. Tar Paving and Laying.

Plans and Specifications may be seen, Bills of Quantities and Forms of Tender obtained (on payment of £2 2s., which will be returned on receipt of a *bonâ-fide* Tender), on application to Mr. M. Hainsworth, Surveyor, Council Offices, Teddington.

Sealed Tenders, endorsed "Road Works," must be delivered to me, the undersigned, at the Council Offices, Teddington, not later than noon on Saturday, the 5th day of October, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
G. H. SALMONS,
Clerk.

Council Offices,
Teddington.
September 16, 1912.

BOROUGH OF EALING.

The Town Council of this Borough hereby invites Tenders for the Making Up of Temple-road.

The Drawings and Specification may be seen, and Forms of Tender, together with Bill of Quantities and other particulars, may be obtained from Mr. Charles Jones, M.INST.C.E., Borough Engineer, Town Hall, Ealing, W., any day during office hours, upon payment of a deposit of 10s. 6d., which will be returned upon receipt of a *bonâ-fide* Tender.

Sealed Tenders (in the envelopes provided), endorsed "Tender for Making Up," must be delivered at my Office not later than 9.30 a.m. on Tuesday, the 1st day of October, 1912.

The Council does not bind itself to accept the lowest or any Tender.

The tenderer whose offer is accepted shall be held to have bound himself to an agreement, and may be compelled to carry out the obligation arising from his Tender even though he may not have signed a formal contract.

Dated this 16th day of September, 1912.

(By order of the Council)
GEO. E. BRYDGES,
Town Clerk.

Town Clerk's Office,
Town Hall, Ealing, W.

COUNTY OF SOUTHAMPTON.

RECONSTRUCTION OF FORE BRIDGE, PETERSFIELD.

TO CONTRACTORS.

Persons desirous of tendering for the Reconstruction of a Small Bridge, known as Fore Bridge, can obtain copies of the Plan and Specification, General Conditions, and all other necessary information on application at the office of Mr. W. J. Taylor, County Surveyor, the Castle, Winchester, on and after Monday, the 30th September, 1912, between the hours of 8 a.m. and 4 p.m. (Saturdays 8 a.m. and 12 noon).

A deposit of Two Guineas will be required for a copy of the plan and specification, which will be refunded on receipt of a *bonâ-fide* Tender and the return of the document.

Deposits must be made by cheque, payable to the "Hants County Council," and crossed "Bank of England," or the particulars will not be sent.

Tenders must be on forms supplied by the County Surveyor, endorsed "Fore Bridge," and be delivered to me on or before 10 a.m. on Monday, the 7th October, 1912.

The County Council do not bind themselves to accept the lowest or any Tender.

H. BARBER,
Clerk to the County Council.

The Castle, Winchester.
September 24, 1912.

The Surveyor

And Municipal and County Engineer.

Vol. XLII. OCTOBER 4, 1912. No. 1,081.

Minutes of Proceedings.

Sewage Disposal in the United States.

Recent issues of our American contemporaries contain news of the progress of sewage disposal in that country. In Pennsylvania actions are being taken against a number of municipalities for discharging sewage into streams without preliminary purification. Fines of £100, and £10 for each day the injunction is disregarded, are provided by law, and it is stated that the State officials contend that vigorous steps must be taken to demonstrate that the Commonwealth intends to enforce the purity of streams in view of the increasing population and the demands for pure water supplies. The same number of *Municipal Engineering*, from which the foregoing information was obtained, contains an interesting editorial article upon the State Control of Sewage Purification. It appears that the question of the extent to which the State can control the sewage pollution of streams and enforce the purification of their sewage by municipalities has been an open question until recently. The States of Ohio and Indiana passed laws in 1908 and 1909 respectively placing these matters under the control of State Boards of Health, but little has been done so far, because one city in Ohio attacked the constitutionality of the law. This has, however, now been affirmed by the Supreme Court on appeal from two lower courts. Exceptions were allowed in the cases of some towns discharging into a river which formed the boundary between two States, and into which towns in another State, on the opposite bank of the river, were discharging unpurified sewage. As we read it, the exemption continues only so long as the towns in the other State continue to pollute the river water. The Ohio State Board of Health can now proceed with much work which has been delayed waiting for this decision, and it is anticipated that other States will soon follow suit, and adopt these laws as their advantages are demonstrated. Our contemporary utilises the opportunity to point out that it is necessary for efficiency that the State Board of Health and its activities should be kept out of politics, and we venture to express the hope, in the interests of public health, that this sound advice will be followed.

In another State we find that the United States Attorney-General, in an agreement with the Bronx Valley Sewer Commission, has gone so far as to define the quality of a sewage effluent which may legally be discharged into a lake or river. In this case it is to be 10 per cent better than that of the raw sewage "upon an absolute putrescibility scale." Our contemporary, in this case the *Engineering Record*, considers that "this is explicit enough, considered merely in a literal sense, but it is open to question just how closely the results of rival analysts, employed by the two parties to the agreement, will agree if the operation of the plant should ever be a matter of dispute. The inherent difficulty is the lack of any accepted standard test, by which is meant not only the general nature of the test, but also the details of making it." We agree, and if many such agreements are arranged we foresee a good time coming for consulting analysts, engineers, and lawyers.

Disposal by dilution is proposed for the treatment of the sewage from the town of Albany, N.Y., with a population of over 100,000, but in this case screening and settlement in Imhoff tanks is recommended for the purpose of removing the suspended solids from the sewage before it is discharged into the river. If the results from this preliminary treatment are as good as it has been claimed can be obtained by this system there should be no need for additional purification; but there is apparently some doubt on this score, as it is stated that the disposal works have been so designed that sprinkling filters can be added at some future date should it be found necessary to provide for a higher degree of purification. This proposed method of treatment as a preliminary to discharge into a large river for disposal by dilution is in accordance with the latest knowledge of the subject, and should prove to be the most practical and economical method suitable for the local conditions. The treatment of the sewage at Providence, Rhode Island, by chemical precipitation, which was continued during the year 1911, would, however, appear to be somewhat costly, particularly as the precipitation tank effluent was further disinfected by the addition of hypochlorite of lime, as much as 5·24 parts per million of available chlorine being used. As 83·43 per cent of the suspended organic matter in terms of albuminoid ammonia was removed from the sewage the desired result was probably attained, but it is open to question whether equally good results could not have been secured at a much lower cost for operation, seeing that the aim is the same as in the case of Albany. Particulars of the efficiency of the processes now so largely adopted in America for the disinfecting of

sewage effluents by hypochlorite in actual practice over a number a years are gradually coming to hand. In one case recently published, after the experience of six years' operation, it is found that the addition of two parts per million of available chlorine to percolating filter effluent does actually produce a practically sterile effluent. At any rate, it removes all B. Coli, a result which is considered quite satisfactory. Full details are also given in another article of the operation of an installation of septic tanks and contact beds, which was constructed in 1900, and which has been carefully tested in actual practice. Most of the suggestions made as the result of this experience for modifications in detail of the original design coincide with the experience gained in this country, particularly the recommendation that false bottoms and a greater slope on the floor would increase the life of the material, and that filling the beds from the bottom reduces the possibility of nuisance. Another interesting statement is that "minimum initial expenditure can be made to yield great efficiency." It is obvious that careful management is assumed in this connection, and, with this addition, it confirms what has been said on several occasions by engineers in this country.

* * *

Reinforced Concrete and Bridge Reconstruction.

Now that the disastrous floods to which a large portion of the county of Norfolk has been subjected have abated, the work of remedying the damage is calling for attention. The county road bridges have suffered most severely from the inundation, and a considerable number of them will require to be rebuilt. Doubtless in this work due regard will be had to the claims of reinforced concrete, a material which seems to be peculiarly adapted for structures that may be subjected to severe water pressure. Such strenuous endeavours have been made by the supporters of reinforced concrete to emphasise the cheapness of this form of construction, that comparatively little regard has been paid to two equally important characteristics—the very low maintenance charges, as compared with steel structures, and the possession of great transverse strength in every direction, strength which is practically non-existent in the case of masonry structures. This last-mentioned characteristic is one of very great importance in the case of small bridges, the supports of which, on occasions of flood, are subject to the action of a heavy stream of water. A masonry bridge when thus affected can oppose to the action of the water merely the weight of the mass of its materials, and the transverse or shearing strength of its cement or mortar joints. Neither of these is of very great value. The first is practically negligible in the case of the topmost courses of masonry, which have only their own weight to hold them in position; as regards the second, the strength of cement or mortar joints in an old structure is very slight. A reinforced concrete bridge pier or abutment can, however, be designed to act as an exceedingly strong vertical cantilever, and if its foundation is carried to such a depth as to provide a firm fixing, free from erosion by the water, the whole structure will offer a most stubborn resistance to any water pressure that may be brought to bear against it. This is only one of the many instances in which the great transverse strength of reinforced concrete is of value, and an engineer in comparing the value of a reinforced concrete structure with one of masonry should never omit to take into account the importance of this characteristic of the former work.

* * *

Stafford Corporation and the Housing Act.

The increased activity of the Local Government Board in the matter of sanitation and housing is a welcome fact as well as a sign of the times. How necessary this accelerated procedure is was strikingly illustrated recently at Stafford in the course of an inquiry before Mr. Edward Leonard into the reason why the corporation had failed to exercise their powers under Part II. and Part III. of the Housing of the Working Classes Act, 1890. A witness who was described as chairman of the Public Health Committee, while frankly acknowledging a lack of information with respect to sec. 17 of the Act of 1909 (which, of course, deals with inspection of working-class property), had also to admit that he had not attended a meeting of the town council or the committees for six months. In the circumstances it was, of course, unfortunate that this gentleman was called at all, for absenteeism in such a connection, while it may be quite excusable, must sadly discount the value of such a witness's evidence. As a matter of fact, the inspector appears to have been quite unable to extract any useful testimony from the witness; and presently he had also to confess that he was unable to understand why, after the Public Health Committee had determined "to take no action for the present in view of the lack of suitable accommodation" for people in the houses condemned by the medical officer of health, they suddenly took it into their heads to instruct an official to inspect other property. Naturally the condemned properties were becoming worse meanwhile, yet they were apparently to be regarded as non-existent. When self-deception takes such a form as this it is not surprising to find that the chairman of the Working Classes Housing Committee told the inspector that, "in his opinion," the majority of the forty-nine houses condemned by the medical officer could be made habitable. "Have you seen them?" inquired the inspector. "No," was the reply of the witness. Ineptitude could hardly go further than this. The outstanding fact of a not altogether creditable municipal performance was eventually elicited from Dr. Blumer, medical officer of health, and this was to the effect that in Stafford there are 500 houses which would come under sec. 17 of the Act, and that the corporation are not carrying out their duty under the Housing Act. It is manifest that such a deplorable state of things must be dealt with speedily and drastically if the law is not to be regarded as a dead letter.

* * *

Removal of Gas and Water Mains.

In the execution of street works which involve an alteration of level, as, for example, the conversion of a macadam road into a wood-paved one, with the consequent reduction of camber, a question frequently arises between a local authority and a gas or water company as to the necessity for lowering mains and as to the incidence of the cost of such work. Authorities acting under the Public Health Act, 1875, are invested, by sec. 149 of that Act, with statutory power to alter the levels of the streets vested in them. Sec. 153 of the same Act provides machinery for effecting any consequential alterations of mains, but it is specifically provided that the expenses of or connected with any such alteration shall be paid by the urban authority, except where the burden is laid on the owners of the main by any local Act of Parliament. It should be observed that if a local authority exercise the power of lowering the soil of a street under sec. 149, they are not under any *obligation* to alter mains at their own expense, merely because only a few inches of soil would be left to cover them (*Southwark and Vauxhall Water Company* v. *Wandsworth District Board of Works*, 1898, 2 Ch., 603). The power of lowering, however, must be exercised reasonably, and if it is so exercised, the local authority will be under no liability in an action for damages for injury caused to the property of private individuals (*Boulton* v. *Crowther*, 1824, 2 B and C., 703; see also *Bold* v. *Williams*, 1857, 21 J.P., 84). In such a case, however, the party suffering damage would be entitled to compensation under sec. 308. It should be noticed that sec. 98 of the Metropolis Management Act,

1855 (which deals with the question so far as the Metropolis is concerned), contains no provision at all as to the incidence of the cost of lowering mains, and in *Southwark and Vauxhall Water Company* v. *Wandsworth District Board of Works* (*supra*), the Court took the view that the company had the privilege of laying their mains under the streets without payment, and that they were not entitled to any definite depth of cover. The action, which was for an injunction to restrain the execution of street works in such a way as to leave insufficient cover, therefore failed.

* * *

Superannuation.

In emphasising the need for co-operation if the movement in favour of a superannuation scheme for local government officers is to succeed, Mr. J. L. Redfern, the borough surveyor of Gillingham, points out that it is almost hopeless to expect the Government to move in the matter unless there is an irresistible demand on the part of those most concerned. This very practical conclusion was arrived at by Mr. Redfern in a paper on "Superannuation, Security of Tenure and Mutual Protection," which he read at the first meeting of the South-Eastern District of the Institution of Municipal and County Engineers. There can be no doubt that the National Association of Local Government Officers has worked well for the cause of superannuation, and the substantial progress which has been made is reflected in the support of such representative bodies as the County Councils Association and the Urban District Councils Association. It would appear to be superfluous to urge every official to join the Association and so strengthen the hands of those who have undertaken a difficult task on behalf of the whole local government service. In view of the fact, however, that the Association, though a flourishing and increasing body, lacks the practical support of a large number of officials, it may not be inappropriate to point out that it is useless for municipal engineers, to whom we particularly address ourselves, to regard the superannuation question as one in which their claims can be considered apart from those of other branches of the service. It therefore behoves them, in addition to joining their distinctive professional institution, to afford practical support to the National Association.

Mr. Redfern's paper, which will be found elsewhere in this issue, also dealt with the questions of security of tenure and mutual protection. On these subjects our views have often been expressed and are well known. Suffice it to say that Mr. Redfern's observations on all three subjects should be read and digested by every municipal engineer who has the interests of his profession at heart.

* * *

Ilkeston.

At the East Midland District meeting of the Institution of Municipal and County Engineers, which was held last Saturday at Ilkeston, the members were officially received by the mayor, who attended at considerable personal inconvenience, inasmuch as he had not completely recovered from the effects of a recent operation. His presence was therefore specially appreciated, and Mr. R. J. Thomas, M.INST.C.E., the president of the Institution, suitably expressed the thanks of the meeting. Of the three papers which were read, one was contributed by Mr. Henry J. Kilford, the borough surveyor and water engineer, and dealt with the water supply of the town. Mr. Harry P. Stokes, the engineer and manager, read a paper on "The Ilkeston Tramways and Electricity Supply." Considerable credit is due to Mr. Stokes for the improvements which have been effected since he took up his appointment three years ago. During the intervening period the operating costs of the tramways have been reduced from 6·85d. to 6·02d. per car mile; the units purchased for lighting have increased from 283,000 in 1909 to 352,000 last year; and the losses in distribution during the same time have fallen from 16 per cent to 3·9 per cent. A paper descriptive of the new sewage disposal works which were opened on Wednesday last was contributed by Mr. Hugh P. Raikes, M.INST.C.E., of Messrs. Willcox & Raikes, the engineers. The electric current driving the distributors is taken from the corporation tramway system, and the most interesting part of the electrical equipment is the automatic control gear. It is believed that the Ilkeston sewage disposal works are the first at which the whole of the work of controlling sewage distributors is done automatically by the introduction of electricity. The meeting, which concluded with some interesting visits to works, was well attended and was a thoroughly successful function.

* * *

A Critic of Municipal Trading.

In the course of a signed article that appears under his name in the *Daily Telegraph*, Sir William Treloar makes himself responsible for a rather severe criticism, in general and sweeping terms, of municipal trading. He alleges that in every case where municipal trading shows a profit on an honestly constructed balance-sheet it is where it enjoys a monopoly. The same thing, of course, might apply to companies, such as gas and water concerns, where a monopoly has been established. Sir William has not a good word to say for the administration of the municipal undertaking, because, as he asserts, it is controlled by those who have no special knowledge. Whatever may be the merits or demerits of the committees to which are assigned the responsibility of controlling the various departments of municipal trading, it cannot, we imagine, be charged against them that they show either less ability or less zeal than are ordinarily displayed by company directors. The fact is that as to actual management the municipal undertaking, like the business of the private company, is directed by experts who are generally men of recognised and even high attainments. Most people who look at the matter dispassionately agree that the municipal concern is seriously handicapped when it has to compete with the private undertaking, because of its statutory obligations with respect to the repayment of loans. Neither can it be denied that in respect of certain services, such as water, gas, electricity and tramways, municipal trading has special claims to consideration, because such services are closely identified with the health and welfare of the people.

* * *

Town Planning and the Municipal Engineer.

In our "Correspondence" columns will be found a letter in which the writer points out the danger of the architect usurping the legitimate functions of the municipal engineer in regard to town planning. This question was the subject of more than one "Minute" in these columns shortly after the Act of 1909 became law. We then spoke very plainly as to the peculiar fitness of the municipal engineer, both as regards training and experience, to initiate and carry out town planning schemes. His special knowledge of existing evils, his practical experience with the design, construction and maintenance of roads and sewers, and his knowledge of building gained through his duty of supervising the plans and works of architects, alike specially qualify him to deal with questions of town planning. We take the present opportunity of reiterating the view which we then expressed, that town planning is eminently a matter in which those who are, by their daily work, experienced in town development are well qualified to take a leading part. We shall be glad to hear the views of our readers in regard to the questions raised in the letter referred to.

Ilkeston Sewage Disposal Works.

By HUGH P. RAIKES, M.Inst.C.E.

[The formal opening of the works herewith described took place on Wednesday afternoon, the ceremony being performed by the Mayor of Ilkeston (Councillor Samuel Shaw). It will be recollected that the inauguration of the undertaking was originally fixed for September 11th last, but was postponed on account of the Mayor's illness.]

The question of sewage disposal has for many years occupied the attention of the Ilkeston Local Board and Corporation, the waste water and sewage being discharged by means of ditches, pipes and stone drains into the Erewash canal and the river Erewash up to 1883, when the population of the town was about 15,000. In order to prevent the pollution of the canal and river the Ilkeston Local Board in January, 1883, adopted a scheme of sewerage and sewage disposal, prepared by Messrs. Brundell and Simonds, of Doncaster, comprising a main intercepting sewer about 3 miles in length, from Bridge-street, Cotmanhay, to the outfall works at Hallam Fields, this sewer being completed in January, 1884. In order to purify the sewage the local board also acquired about 41¼ acres of land situated on the western bank of the river Erewash, between Gallows Inn and Hallam Fields, 5½ acres being used for intermittent downward filtration and 36 acres for broad irrigation. The town was incorporated in 1887, and continued to grow very rapidly, large numbers of houses being built on land below the level of the main intercepting sewer.

In 1896 low-level sewers were laid by Mr. Kilford, the borough surveyor, from Awsworth-road to Potters Lock, and from Nottingham-road to Gallows Inn; but as the sewage from the latter could not be discharged on to the existing farm at Hallam Fields, three upward flow Ives tanks were constructed at Bridge-street, Potters Lock and Gallows Inn for precipitating the sewage, small areas of land at Potters Lock and Bridge-street being taken on lease from the Duke of Rutland, and about 15 acres were also purchased at Gallows Inn as sites for tanks and for treating the tank effluent by irrigation. Houses continued to be erected at Hallam Fields, adjoining the sewage farm, and owing to complaints from the inhabitants in this district irrigation on the farm was abandoned in 1900, and the sewage of the town [illegible] at the low-level outlets at Gallows Inn and Potters Lock where the Ives tanks had been installed. This resulted in the tanks [illegible] satisfactory effluent seriously contaminated the waters of the river Erewash.

[illegible] dealing with the sewage of the town in an efficient [illegible]

In 1908 the borough surveyor, Mr. Wilkinson, died, and the corporation appointed Messrs. Willcox & Raikes, of Westminster and Birmingham, consulting engineers, to report on the sewage disposal works at the extreme south end of the borough. They further recommended the purification of the sewage by bacteria treatment, consisting in liquefying tanks and percolating filters, for which purpose only a comparatively small area of land was required for constructing the works necessary to meet the requirements of the Local Government Board in regard to the treatment of the sewage before discharging the effluent into the river. The recommendations of the engineers having been approved by the corporation, it was finally decided to acquire a site about 1½ miles from the centre of the town, comprising an area of about 18 acres adjoining the Midland Railway to the east of the Stanton Ironworks on the property of the Duke of Rutland. This site is well adapted for the purpose, as it is readily accessible from the town and well removed from any dwellings, besides being close to the river into which the purified effluent must in any case be discharged, though special precautions have been necessary to prevent flooding. The site was purchased from the Duke of Rutland by agreement, and the engineers were then instructed to prepare a scheme for dealing with the whole of the sewage of the borough, the dry-weather sewage flow of 25 gallons per head for a population of 30,000 being estimated at 750,000 gallons per day.

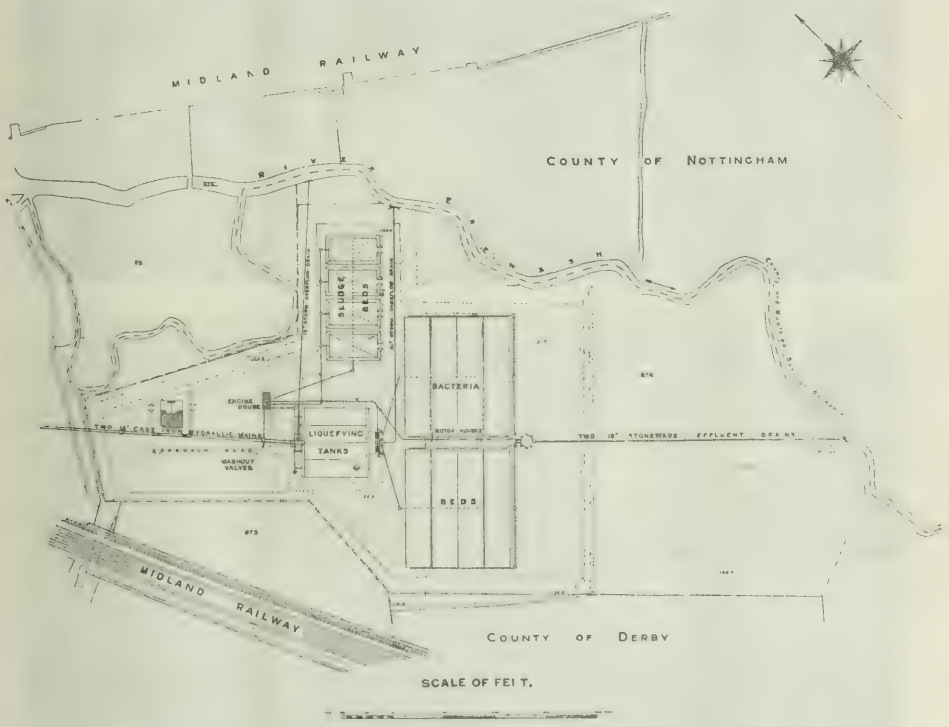
General View of Ilkeston Sewage Works looking East.

Complete plans and estimates were shortly afterwards submitted to the Local Government Board, together with an application for sanction to a loan of £32,600 to cover the cost of the scheme recommended by the engineers. The loan was duly sanctioned by the Local Government Board, and Messrs. Willcox & Raikes were then instructed to prepare the detailed specifications and the other particulars necessary for the purpose of obtaining tenders and carrying out the work. The tender of Messrs. George Bell & Sons, Limited, of Tottenham and Manchester, was accepted for the whole of the structural work, which was commenced in June, 1909. Mr. F. W. Wright being appointed to the position of resident engineer.

[illegible] through the old intercepting sewers to a point on the Hallam Fields Sewage Farm north-west of the Erewash Canal, and from this point it is now taken for a distance of 926 yds. through two new 15in. cast-iron pipes laid in the form of an inverted syphon, under the Erewash Canal and the Midland Railway to a point at the north end of the site of the outfall works. On reaching the outfall works the sewage is first treated in settling tanks and is then [illegible] worked on the percolating system, provision being also made for passing the effluent through a filtering tank before it [illegible] the river. The general arrangement of the works is [illegible] the tanks and engine-house are constructed at the [illegible] the latter beds, which are

rectangular, being immediately to the south of the tanks, and the humus tank still further south. The whole site is surrounded by artificial banks formed out of the surplus excavated material, as a protection against flooding, the banks being planted with shrubs and enclosed by an iron fence all round. The tanks are four in number, each 120 ft. by 31 ft. inside, with an average depth of 8 ft. and a total capacity of 750,000 gallons; but as it is desirable to completely empty the tanks as seldom as possible, a portion of each is cut off by a cross-wall 15 ft. from the inlet end, so that the heavier solids deposited in this portion can be removed without disturbing the rest of the sewage in the tank, the top of the cross-wall being just below the water level, thus forming a weir, over which the sewage passes in a uniform stream when the tank is in use.

The rate at which the sewage reaches the tanks is regulated by means of a weir orifice fixed in the inlet chamber, and so designed that, when the rate of discharge exceeds three times the dry-weather flow, any excess will pass through the settling tank re-



General Plan of Works

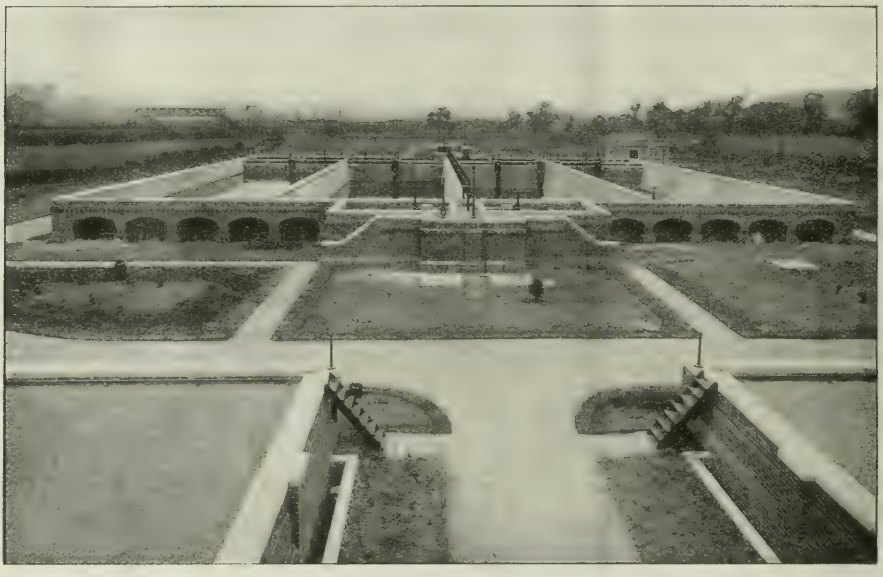
served for storm water, and thence direct to the river. Provision is also made for measuring the sewage which passes to the bacteria beds by means of Messrs. Glenfield & Kennedy's automatic recording instrument.

For the purpose of emptying the tanks, special decanting valves are provided, by which the supernatant water can be drawn off as required and pumped back into one of the other tanks, the sludge being pumped into lagoons, which are described later. The tanks are constructed of cement concrete faced with brickwork on the outside and finished with granolithic coping, the whole of which has been made on the works by the contractors. The floors are also formed with granolithic paving on a concrete foundation, with a shallow channel down the centre of each tank to facilitate the removal of sludge. The effluent from the tanks flows over a weir, and is received in an effluent channel, from which it passes through two 15-in. cast-iron pipes to the bottom of two sedimentation tanks, constructed somewhat on the lines of a Dortmund tank, each 12 ft. square and 15 ft. deep, the bottom of each tank being formed in the shape of a cone. The effluent from these tanks flows over a weir and passes into a channel containing rough-graded granite, to act as a strainer, by which any suspended matter may be removed before it is discharged on to the bacteria beds. The two bacteria beds are rectangular in shape, each 226 ft. long by 200 ft. wide, and 5 ft. deep, with a total area of 10,000 sq. yds., each being divided into four sections for convenience of working. The outer walls are constructed of cement concrete with a brick facing, the concrete floor being finished with granolithic paving in which there are half-pipe effluent channels covered with slotted tiles, the floor and the channels having a 6-in. fall from the centre of the beds to the outside. For the purpose of discharging the sewage on to the rectangular bacteria beds, a special type of distributor was designed by the engineers for use at Hanley, where they have proved very successful, and a similar system has therefore been adopted in this case, so a short description of their construction may be of interest.

The sewage distributors have been manufactured by Messrs. Hartley & Co., engineers, Stoke-upon-Trent, and are shown in one of the illustrations, being arranged to discharge over ½ acre units, each 226 ft. long by 100 ft. wide. An open steel trough, 1 ft. 10 in. wide and 1 ft. 11 in. deep, is provided between each ½-acre unit, and the troughs are fixed perfectly level, the bottom being 6 in. above the surface of filtering material, and they are carried on two rows of 6-in. by 6-in. reinforced concrete pillars fixed in the floor of the bed. The sewage is drawn from each trough and discharged into the perforated distributing arms by means of travelling syphons, each distributor forming one complete arm extending on either side of the trough. The arms travel backwards and forwards the whole length of the bed, meeting and passing each other when at the middle of each journey, the motive power being provided by electric motors and wire ropes. The distribution of sewage takes place when travelling in one direction only, thus giving a uniform interval of rest between each dose of sewage as well as a uniform rate of discharge.

The construction of distributing pipe is shown in the illustration, the sewage passing into the nozzles from the main pipe at the top, so that this pipe is never emptied, and the discharge of the sewage

therefore commences and stops along the whole length of the pipe almost instantaneously, and any deposit in the bottom of the main pipe cannot obstruct the outlets to the nozzles. The top of each nozzle pipe is closed by a plug, and when this is withdrawn the greatly vary the amount of sewage distributed by increasing the time of the flow journey and decreasing the time of the idle journey, and the periods of rest can also be adjusted and controlled until the best results are obtained.



Settling Tanks looking West.

apertures can be easily cleaned, while a baffle plate beneath each nozzle sprays the sewage and distributes it over the filtering medium, so that when the nozzles are discharging there is a continuous film of sewage falling on the whole width of the bed. Between the syphon and the main distributing pipe is a valve

The main distributing pipes are drawn along the rails by wire ropes, and as they would require considerably more power during high winds if independently driven, they are connected together by a balancing rope, which passes round grooved pulleys at each end of the bed. When wind adversely presses against

Bacteria Beds looking North.

operated by levers, so that the distribution of sewage is automatically stopped or started when one of these levers encounters a stop fixed in the end of the trough. As both main pipes distribute on one journey and are idle on the succeeding journey, it is possible to

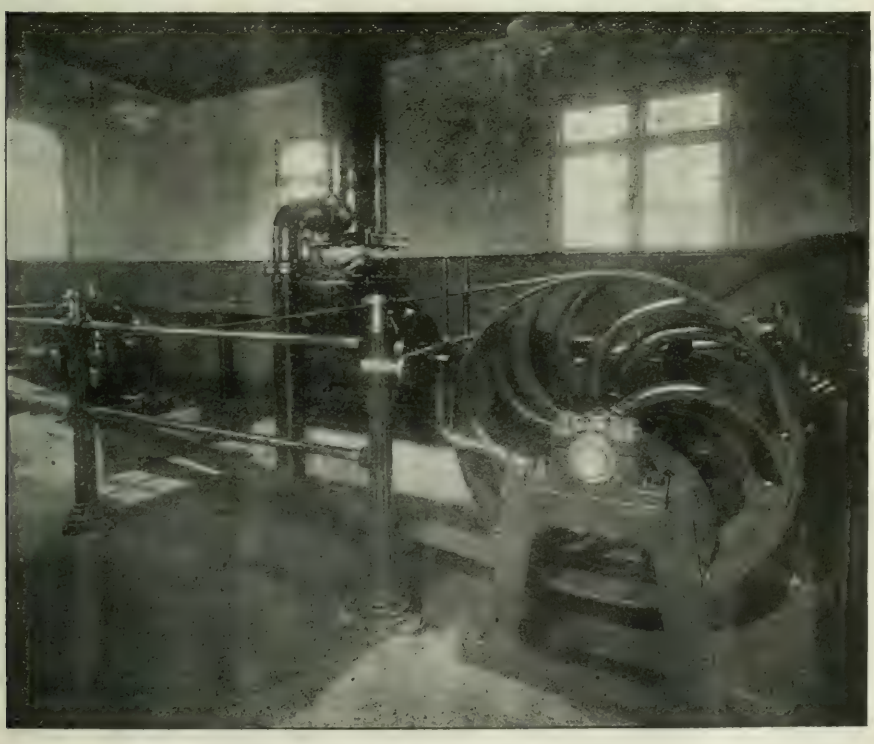
one distributor, its effect is largely counterbalanced by the wind pressure against the distributor on the opposite side of the trough, so that a very small electric motor is sufficient for the work, only 1½-horse power being required to drive each ¼-acre distributor.

The ends of the wire ropes are secured to and bound upon a revolving drum, so that one end of the rope winds up as the other unwinds, and when the arms reach the end of the bacteria bed the direction of the revolution of the drum is automatically reversed, the distributors then proceeding upon the succeeding journey, and on its completion the motion of the drum is again reversed. The reversal of the winding drum at the end of each journey is accomplished by a screw which revolves with the drum, there being a nut on the screw which travels along its axis until the required number of revolutions have been made, when the nut encounters a pedant lever and throws over the belt-striking gear, thus reversing the motion of the drum and arms. The nut then travels in the opposite direction until the end of the succeeding journey, when it engages in a second pedant lever, so that the motion is again reversed.

The distributors have been designed so that they can uniformly distribute a dose of sewage of from 1 to 2 gallons per yard over the area they cover at intervals varying from five to ten minutes as desired, and each ¼-acre distributor on working twenty-four hours consecutively is capable of discharging 500,000 gallons during that period. The whole of the rails on which the distributors run are supported by 6-in. by 6-in. reinforced concrete piers built into the floor of the beds, and finished by means of a cast-iron cap with bolt holes, to which the rails are attached.

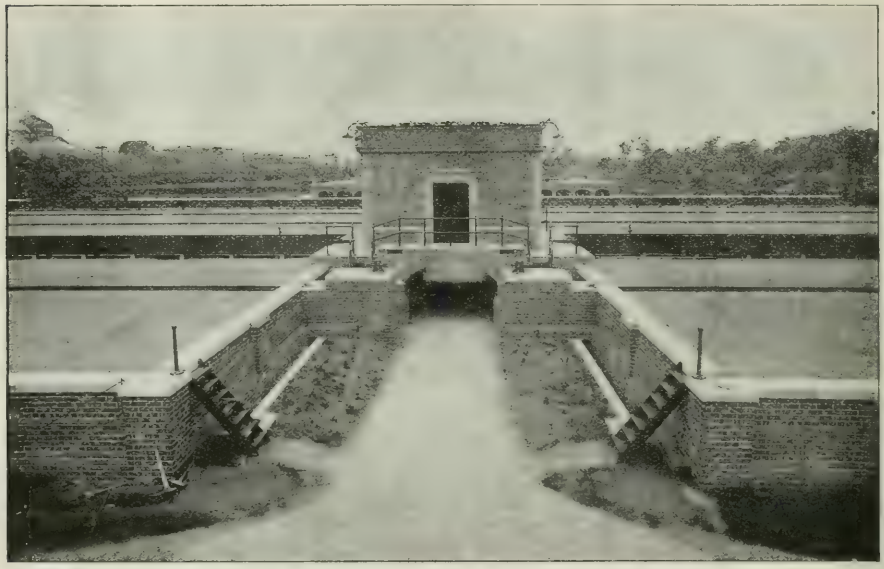
The electric current driving the distributors is taken from the corporation tramway system (voltage

Sewage Distributors looking East.



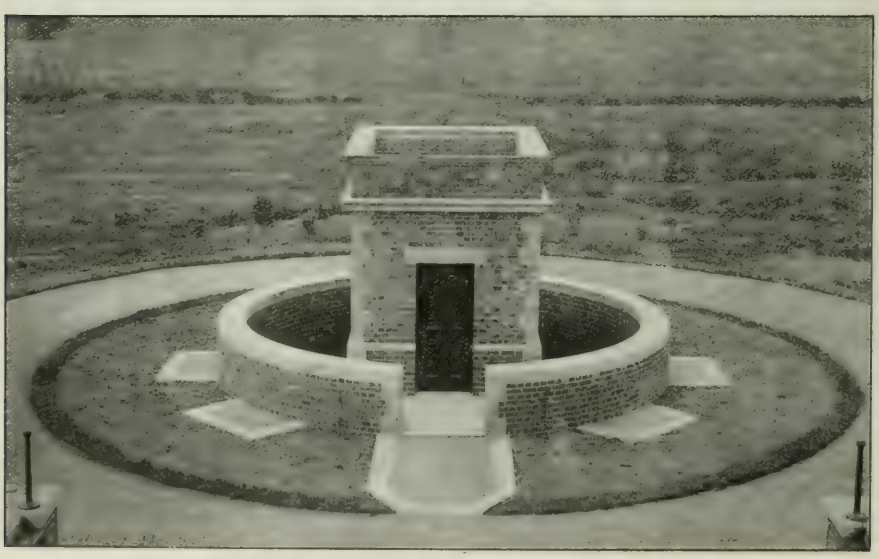
Interior of Engine-House.

500 d.c.), the cables being brought underground from the tramway terminus at Hallam Fields to the sewage works for a distance of about ½ mile. The motors are 3 b.h.p., and are capable of being used on any voltage from 450 to 550, being provided with resistance strips across the ends of the series winding, which can be altered on the site to suit the actual line voltage. When the ordinary power mains of the corporation are extended as far as Hallam Fields the electric current will be taken from these instead of the tramway, and the motors will then be altered to work with the 460-volt current. The whole of the motors with two loose and one fast pulley on the reduction train, the motor, running in one direction only, is enabled to drive the drums carrying the haulage ropes of the distributor alternately first in one direction and then in the other, so that the distributor travels backwards and forwards over the bacteria bed, without requiring any manual control, in the manner already described.



Motor-House looking North-West.

The most interesting part of the electrical equipment is the automatic control gear, and this is believed to be the first occasion where the whole of the work of controlling sewage distributors is done automatically by the introduction of electricity. At the outlet end of the liquefying tanks there are two chambers from which the tank effluent is conveyed direct to the distributor troughs by means of 15-in. cast-iron pipes; and in each of these chambers there is a special



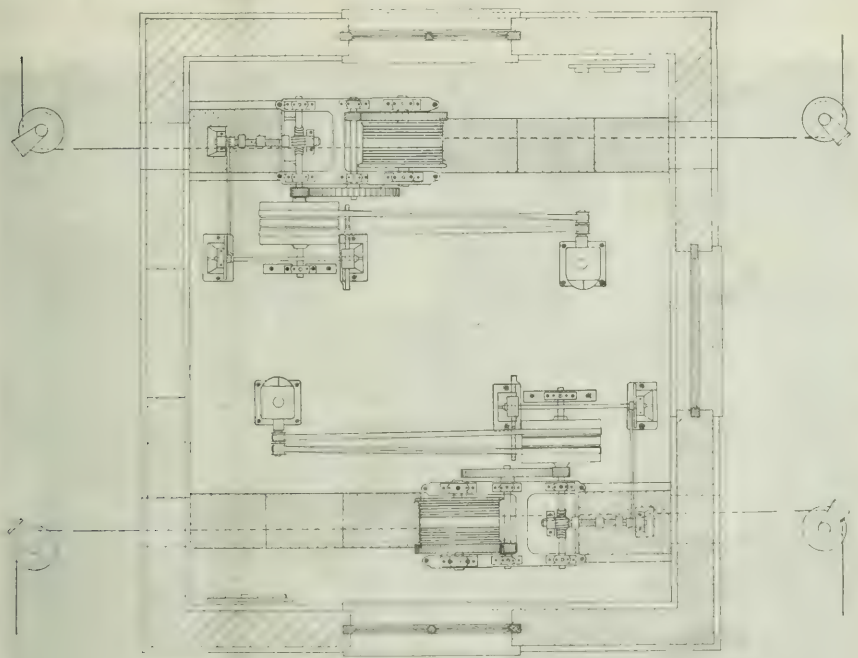
Motor-House and Humus Tank

used in connection with the sewage disposal works are identical in design and interchangeable, so that repairs can be made without involving the stoppage of the plant for any length of time. By means of straight and crossed belts from the motor pulley,

float switch which controls the supply of tank effluent to the troughs. When the water in the chamber rises 3 in. above a certain level the float is lifted, at the same time pushing up a brass rod which engages and throws in a quick break-knife switch. At each succeeding 3-in. rise in the water level the same operation is repeated, and as the water level in the chamber falls the reverse action takes place. The two switch boxes are interconnected, so that when the pair of beds connected with either switch is not in use the other switch box will still be in operation; and should any defect occur in one, the other will continue to operate the motors. From these boxes pilot wires are run on to the main switchboard in the first motor-house, on which there is a selector switch so designed that by turning a brass pointer travelling over a numeral plate attached to the front of the switch the number of the distributor to which the pointer is set will first come into operation. As the float continues to rise the distributors will come into use automatically in correct sequence, and as the water falls they will also automatically fall out of operation. The distributors themselves are numbered 1, 2, 3 and 4, and if it is assumed that No. 3 distributor is the one which is first required to come into operation, then the order of starting up would be 3, 4, 1, 2, and they would fall out in the sequence 2, 1, 4, 3; but no matter which motor is started first, the sequence is always the same, so the attendant only has to set the selector switch to the number of the distributor which he requires to be first operated.

The method of starting up the motors is as follows: The current passes from the main supply through the float switch, then through the selector switch to a magnetic coil on the motor starter. As soon as this coil is magnetised it pulls up the arm of the switch, gradually starting the motor until it is up to full speed, when the main switch is closed and the motor continues running until the float switch goes off; the magnetic circuit is then broken, allowing the starting switch of the motor to fall down, thus stopping the motor. In order to ensure that the distributor will always stop on the non-distributing journey an auxiliary switch has been provided on the "throw-over lever," which is brought into operation by the belt striking gear, so that the motor is always kept running when the distributor is actually distributing sewage on the beds. Each motor-house is provided with its own starting gear and distributing panels but none of this gear will be operated by hand except in case of repairs, when, by pulling out the switch controlling any particular bed, the corresponding motor is put out of operation. Pilot lights have been fixed on the top of each motor-house (one for each motor), so that the man in charge of the works at night can always see from any point which beds are at work and which standing.

In order that each bed may do approximately the same amount of work, an automatic electrical recorder is also provided in connection with the float gear to show the number of hours that each motor is actually working. The charts from this instrument will enable the manager to work the beds uniformly and give each its required period of rest, as he can readily ascertain the quantity of sewage treated on each section. The electric motors, pumps, and switchboards have been supplied by the Rees Roturbo Manufacturing Company, while the automatic gear has been supplied by the Adams Manufacturing Company to the specification of the borough electrical engineer, Mr. H. P. Stokes, in order to meet the special requirements of Messrs. Willcox & Raikes' scheme. The winding gear, motors, and switchboards previously described are erected in two motor-houses (two sets of machinery in each), which are built on arches carried between the two bacteria beds, as shown in the illustration No. 8. These motor-houses are 17 ft. by 15 ft. inside and 10 ft. from floor to roof, the walls being constructed of brickwork with York stone plinth, cornice, and coping. Inside, the walls are finished to a height of 6 ft. with brown glazed brickwork, and above this they are plastered and distempered. The roof is composed of cement concrete carried on joists and finished with a ¾-in. coat of asphalt, the floor of the house being finished with red tiles, and the gangways round the house are paved with 2-in. granolithic paving.



Plan of Motor-House.

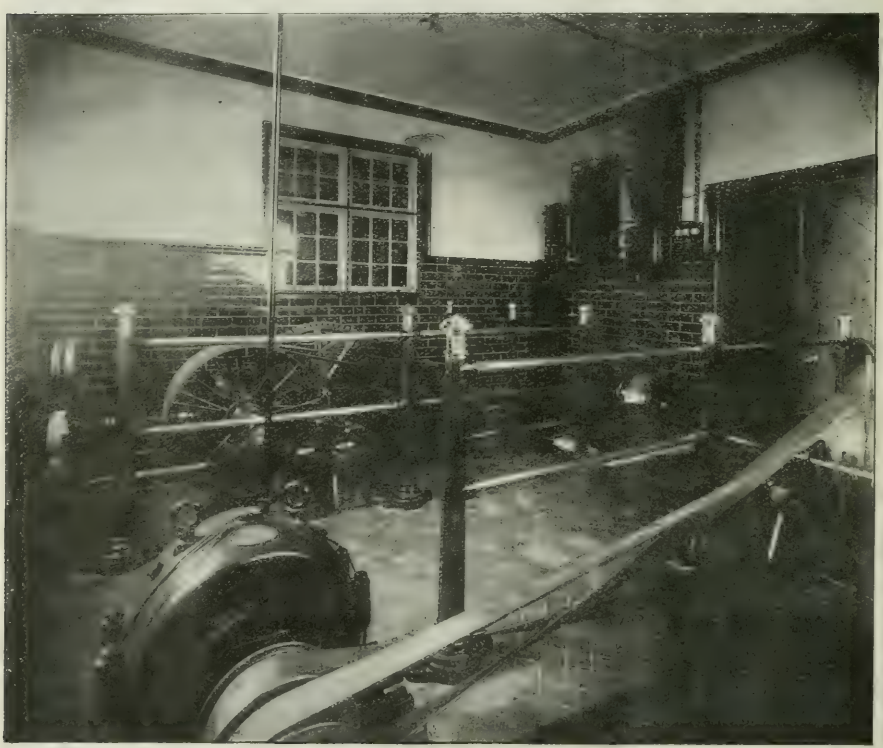
The efficiency of a percolating filter not only depends on the uniform distribution of the sewage over the surface of the bed, but also on the selection and grading of a suitable filtering material. Very exhaustive inquiries were therefore made in the surrounding district to determine the most suitable materials available for filling the beds, an experimental filter being also put down on the old sewage farm and worked for approximately twelve months for the purpose of comparing the results obtained with granite, clinker, coggar, and slag or furnace

cinder. It was found to be practically impossible to obtain the whole of the 16,000 cub. yds. of material required from any one source within a reasonable time, so it was finally decided to have 1 acre of granite, ½ acre of clinker, and ½ acre of slag. The granite was supplied by the Croft Granite Company, the clinker by Mr. Frank Keep, and the slag by the Stanton Ironworks Company, the sizes of the material varying from 2½ in. to ¼ in., the smaller size being placed at the top of the filters and the larger at the bottom. The whole of the filtering material has been most carefully crushed and screened by specially constructed machinery in order to remove dust and secure uniformity of size, in accordance with the specification. The sewage, after being distributed by the nozzles of the distributors over the surface of the beds, percolates through the filtering material to the underdrains and from these into the main effluent channels, which discharge into the circular humus tank. This tank is 21 ft. diameter and 28 ft. deep, of the Dortmund type, with a cone-shaped bottom; the cone is constructed of concrete reinforced with ½-in. indented steel bars, and the walls are built in brickwork finished with York stone coping carried about 3 ft. 6 in. above ground level.

The filtered effluent is delivered into this tank by means of an 18-in. steel tube, which is carried down vertically to within 8 ft. of the bottom of the cone; the final effluent then rises upwards, and passes out of the tank over a series of weirs into the main outlet chamber, from which it flows direct to the river Erewash. A house is built over this tank, similar in construction to the motor-houses, in which a vertical spindle Rees-Parker enclosed motor is erected, developing 4 b.h.p. at 1,000 revolutions per minute on 500 volt continuous current. This motor is directly coupled by means of a vertical shaft, 10 ft. long, to a Rees Roturbo self-regulating centrifugal pump for emptying the tank or removing the deposit therefrom, and capable of delivering 10,000 gallons per hour against a total head of 33 ft., this pump being fixed on girders built into the walls of the tank with the suction pipe carried to the bottom of the cone.

The sludge from all the tanks is delivered to a pump well, which is constructed underneath the engine-house shown in the illustration No. 10. This pump well is 29 ft. long by 14 ft. wide, and about 14 ft. deep, built on a concrete foundation, with the walls constructed of brickwork in cement, backed with clay puddle. The well is divided into two by a brick wall, the compartments being connected at the bottom by a 12-in. pipe and penstock valve. Built over this pump well on concrete jack arches and steel joists are the engine-house and store-room; the former is 20 ft. by 14 ft., and 8 ft. 6 in. to the underside of the roof, and similar in construction to the motor-houses already described, except that it has a slate roof instead of concrete. In this engine-house there is a double-acting horizontal sludge pump, capable of delivering 16,000 gallons of sewage per hour, against a total head of 27 ft. when running at a speed of 23 revolutions per minute. For driving this pump a 6½ b.h.p. Rees-Parker enclosed motor is provided, similar in every respect to those previously described for driving the distributors.

The sludge from all parts of the works is delivered into one of the compartments of the pump well and pumped to the sludge lagoons, which consist of four beds, each 97 ft. long by 47 ft. broad, so constructed that the liquid matter drained out of the sludge is collected by the drains and discharged into the second compartment of the pump well, from which it can be pumped back into the tanks through a 5-in. rising main. The solid sludge will be left on the lagoons until it is sufficiently dry to be carted out on to the land at the south end of the works. The electric current for lighting is provided from the ordinary lighting mains, and is connected up at the Hallam Fields terminus, overhead aluminium wires being taken to the works, where a disconnecting pillar is fixed for isolation and testing purposes. This pillar is fitted with a main switch, fuses and meter, and the current is distributed where required on the works by twin wires laid underground, insulated with paper and lead covered. Lighting standards and lanterns have been supplied by Messrs. Lucy & Co., of Oxford, and carry four 50-candle power metal filament lamps, and each of the outside fittings is controlled by separate



Interior of Motor-House.

double pole switches and fuses attached to the standard itself, which are operated by means of chains. A manager's house and workman's cottage are to be erected near the entrance to the works at the north-east corner of the site, where provision will be made for telephonic communication with the corporation's electricity station. A good supply of water is provided by a 1-in. service pipe connected with the town water main. The whole of the above works have been carried out and completed under the immediate supervision of Mr. F. W. Wright, without incurring any extra expenditure beyond the amount of the original contract, which was well within the engineer's estimate of £32,600, submitted to the Local Government Board in January, 1909. Practically all the work has been executed within the time specified, including the various subsidiary contracts for machinery, &c., as well as the main contract undertaken by Messrs. Bell & Sons.

SURFACE TARRING.

COUNTY ENGINEER ON ITS LIMITATIONS.

Mr. H. T. Wakelam, M.INST.C.E., county engineer of Middlesex, states in his fourteenth annual report that extensive tar-painting was carried out in the summer of 1911 on the main roads under his control, "which work," he says, "no doubt prevented disintegration of the carriageway surfaces. The latter, owing to the excessively hot and dry weather experienced last year, would undoubtedly have suffered to some extent otherwise. The exceptionally wet autumn which followed the dry period, and the sharp winter weather, caused much damage everywhere to water-bound macadam roads, and their tar-painted surfaces went quickly to pieces, rendering scavenging operations somewhat difficult."

Mr. Wakelam adds: "It would not perhaps be misplaced if I first mentioned that it is I think generally understood and accepted that surface tarring is intended only as a palliative for the dust nuisance from motor-car traffic, and that it is not meant to be in any way a permanent surfacing. Its life is only expected to last through the "dust" season, in which connection (if the work be properly carried out) its efficiency and results need no comment.

"With the extension and increased traffic of motor cars, motor omnibuses, and other heavy motor and mechanically propelled vehicles, tar painting must more than ever be considered to be of a temporary character only. But, even so, it will, to my mind, be the best palliative for dust until some kind of surfacing is discovered which, from a point of view of efficiency and economy, will recommend itself for common use to provide for the various classes of traffic now on the roads."

Royal Institute of British Architects.—The second examination of Licentiates desiring to qualify for candidature as Fellows will take place in December next. Full particulars of the examination may be obtained on application to the secretary.

The Ventilation of Sewers.—The arguments in favour of omitting the house trap for the purpose of increasing the ventilation of sewers are stated by Mr. R. L. Fox, of the Batavia (New York) Sewer Commission, in the *Cornell Civil Engineer*, as follows: (1) Omission of the house trap permits a better discharge of house sewage and prevents solid matter from settling in the soil pipe. The air from house plumbing is usually worse than sewer air. (2) It simplifies and reduces the expense of plumbing. (3) It obviates the frequent clogging of the house connection which usually occurs at this trap. (4) It reduces the danger of illuminating gas from leaky mains reaching the house, as the omission of the trap allows the gas to pass freely up the stack and be harmlessly dissipated into the air. (5) Scientific examination in Paris, London, Boston, and several of the largest cities in the world proves conclusively that the air in the trapped soil pipe is more dangerous to health than the sewer air, and free circulation of air throughout is the best remedy for both sewer and soil-pipe air, as they are harmlessly dissipated into the air above the roof, and the fact that there is a free circulation of air throughout the system prevents the formation of dangerous gases in quantity, for the reason that as rapidly as made they are dissipated.—From *Engineering and Contracting* for September.

SOME RECENT PUBLICATIONS.*

Transactions of the Institution of Water Engineers. Vol. xvi. 1911. Edited by Percy Griffith, M.INST.C.E., F.G.S., Secretary. London: The St. Bride's Press, Limited.

The papers included in this volume are of great interest, and include "The Geology of Dam Trenches," by H. Lapworth; "The Filtration of Public Water Supplies and their Sterilisation by Ultra-Violet Rays," by W. Clemence and Dr. Max de Recklinghausen; "The Water Supplies of the River Basins of England and Wales," by W. R. Baldwin-Wiseman; "Portland Cement on Public Works," by G. T. Edwards; and "Waterworks Management," by E. Devonshire and W. Matthews. All these papers have already been noticed individually in the columns of The Surveyor. In addition to a record of the "Proceedings" of the Institution, the volume contains a library catalogue, a digest of legal cases, a summary of contents and subject index of Vols. i. to xvi., and much other matter which will be appreciated by water engineers.

"Southern England Coast and Countryside" (London: The Homeland Association, Limited. Price 1s.). "Where to stay, what to see, and where to live" comprehensively suggest the problem this attractive volume is well calculated to solve. It is, in brief, a topographical survey, in word and picture, of the coast from Herne Bay to Swanage, including the cathedral cities in its area. An excellent feature is its special articles, in which E. W. Harvey Piper deals with these cathedrals, A. H. Anderson with "The South Country" generally, and others with the bibliography of the district, and its motoring, golfing, angling, educational and other facilities. The present reviewer would have been pleased if his own works on Surrey and Kent (one of which is published by the Homeland Association) had been included in the bibliography, and he would have welcomed the inclusion on p. 67 of many other Surrey golf links, on p. 82 of the excellent Kursaal Theatre at Bognor, and in pp. 201-207 of the Schools of Surrey. On the whole, however, the volume is remarkably well conceived and carried out, and is a marvel of cheapness.

The Salon: A Review of Architecture and the Allied Arts. Vol. I., No. I. (Sydney: Weston, Wilson Co. Price 1s.).—This is the title under which, in future, will appear the official journal of the Institute of Architects of New South Wales. It will not be a technical journal only, but will aim at fostering the interests of cultured readers, and generally encouraging and assisting those who desire to increase their knowledge of the fine arts. Meanwhile, the first issue is a sumptuous production worthy of the journal's high aim, well printed and illustrated. Articles on the "Federal Government House, Sydney," and the "Federal Capital Competitive Designs," are conspicuous features of its literary matter. We would suggest that a "Table of Contents" be somewhere included in future issues, and that title and details as to date of issue be printed on the back edge of each part.

A Hong Kong Appointment. The secretary of the Royal Institute of British Architects is requested to invite applications for an appointment at Hong Kong. Candidates should be Associates of the Royal Institute, between twenty-five and thirty years of age, experienced in steel construction, and with some knowledge of quantities. A good salary is offered. Applications, with references and qualifications, should be forwarded to 9 Conduit-street, W.

Workmen's Cottages.—Mr. W. Bevan, borough surveyor of Haverfordwest, writes: "In reply to your note under this heading in last week's Surveyor I beg to say the Haverfordwest Town Council have erected fourteen houses for the working classes under my designs and supervision. The population of the borough is only about 6,000, but should your correspondent be desirous of having further information regarding my housing scheme, I shall be pleased to furnish it on hearing from him." It will be recollected that in our issue of September 20th a correspondent asked for the names of any medium-sized towns (say of between 15,000 and 20,000 inhabitants) where cottages for the working classes have been erected by the local authorities.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

Superannuation, Security of Tenure and Mutual Protection.*

By J. L. REDFERN, Borough Surveyor of Gillingham.

It seems almost superfluous to discuss the desirability of superannuation; every one is so familiar with the arguments in favour of it. The principle has been recognised by railway and other companies to be fair and just and advantageous from a commercial point of view. Several municipalities have adopted schemes; but of the staffs in the national and local government services, those employed by county, municipal, and similar authorities, if we except the police and elementary teachers, are alone unprovided with an official scheme of superannuation; yet in character and quality of work, in status and class, they are equal to their colleagues in the other services.

The great advantage of a superannuation scheme to employers is that they are provided with a means of gracefully dispensing with the services of old and exhausted officials who have given their best to the commonweal, but whose emoluments in the smaller towns and districts are so small that they are sorely tried in their efforts to provide for old age, and usually find it impossible to do so if they are to maintain their position and bring up their families respectably. With approaching old age and impaired powers for service on the part of officials difficult situations arise owing to the need of employers for the services of younger men. These situations are bridged sometimes by retaining old officials in nominal but paid capacities; but this is the exception. Thus we have, on the one hand, employers desirous of getting rid of old and worn-out employés and, on the other hand, old employés who, having borne the burden and heat of the day, are anxious for some means of escape from duties grown too arduous for their declining strength.

Contributory superannuation meets such cases splendidly, for, while compelling thrift on the part of officials, it provides the solution which the employers desire. At the appointed age the old employé retires honourably on his deferred pay, the employer obtains the services of younger men who are more up-to-date because more recently equipped, and every one is satisfied. Fortunately there is a superannuation scheme for Local Government officers now within the region of practical politics. The provisions contained in the draft Bill of the National Association of Local Government Officers are very fair, being based on a scale of contributions ranging from 3 per cent to 6 per cent.

We must all agree that this scale of contributions appears very ample when we compare it with that of poor-law officials, whose scale ranges from 2 per cent to 3 per cent. We are told that the actual cost of the scheme of the latter (that is, the difference between contributions and the amount paid out) is equivalent to a rate of only 1-10th of a 1d. in the £, and it is estimated that the charge on the rates of the National Association of Local Government Officers' scheme would amount to rather less than 1-12th of 1d. in the £, which ought not to frighten anybody.

But superannuation is not yet attained, although the National Association of Local Government Officers continues its efforts vigorously. That body, which in [illegible] years has obtained a membership of 30,000, and [illegible] is busy trying to strengthen its organisation by [illegible] the active support of every Association connected with county, municipal, urban, and rural authorities, has devoted an immense amount of time to the Superannuation Bill.

[illegible] has deputations promised its support to the Bill, while suggesting certain [illegible] The Urban District Councils Association [illegible] to the Bill and the Association of Municipal Corporations [illegible] the question to its Law Committee. The National Association [illegible] deputation [illegible] Labour [illegible] Members ready to deal with it and has furnished them with information; but for the moment we must work and wait.

[illegible]

The impression prevails in some quarters that it is only necessary to ask for benefits and they will forthwith be obtainable, and a little restlessness is shown sometimes at the apparent delay, the fact being overlooked that superannuation has to be fought for as well as paid for.

What is wanted is greater co-operation among members and a ceaseless campaign, because it is almost hopeless to expect Government to render assistance until there is an irresistible demand, notwithstanding the fact that it has recently dealt with the question of superannuation for teachers by assisting them to the tune of £200,000.

Until recent years there has been a singular lack of combination among local government officers, who outside their official duties have had as few dealings with each other as Jews with Samaritans. The Trade Union movement has taught some useful lessons which we are slowly but surely absorbing, the chief one being that only by combined and persistent effort can an improvement in the conditions of any branch of service be attained.

Until the principle of National Old-age Pensions was established it was generally thought that the Government could not be induced to favour any more special schemes of superannuation, as it would savour of class legislation, and the official classes can hardly be described as the bottom dogs. Now, however, there cannot be any reason why we should not fight for it and obtain it.

It cannot be expected, of course, that superannuation and security of tenure can be obtained solely for municipal and county engineers and surveyors, and isolated action on our part would probably prove abortive. There is the other alternative however—namely, the co-operation of every member of the local government services. Parliament, municipal authorities, and the public must be educated, and the assistance of the Press sought and obtained. Municipal officers must arouse themselves out of the apathy which has been a stumbling-block in the past, and wage a ceaseless campaign throughout the country.

Powerful support should be given to the National Association of Local Government Officers which, because it is representative of every grade of local government officer, is more likely to achieve the end desired than any other organisation, provided it is possessed of adequate funds. Our own Institution contributes £6 6s. per annum to the National Association's funds (equal to about 1½d. per member), and sends two representatives to its meetings. To me this support appears to be ridiculously small, although it is all that has been asked for; but surely the contribution should be increased very considerably.

Every member of our Institution who has not joined should become a member of the National Association of Local Government Officers.

Every local authority in the kingdom should be petitioned for support to the superannuation scheme. This is a necessary prelude to any advancement with the proposal, because it is the local councils who, when superannuation is granted, will have to pay the difference between the contributions and the benefits, and it is quite clear that the Government will never be inclined to place any further financial burdens upon local authorities unless it can be shown that the local authorities themselves are generally agreeable. Members of local authorities are, in the main, sympathetic at the present time, though they do not care to say so.

[illegible] of local authorities

There was a time when the question of security of tenure and mutual protection scarcely needed to be [illegible] by municipal officials. In those days the character of public authorities was wholly different to what it is to-day. The members of them were largely people of the leisured class who had time at their disposal to give to the public affairs of their locality. Their tenure of office was considerably longer than now, so that officials could rely, year after year, on the continuous support of elected employers while prosecuting the various schemes for the benefit of the public. But a great change has taken place in the composition of

* A paper read at the [illegible] meeting of the South Eastern District of the Institution of Municipal and County Engineers, held at Maidstone on Tuesday, September 24th.

public bodies, particularly in industrial centres, and it has destroyed to some extent continuity of office and policy. The class of member before referred to is gradually disappearing, and is being succeeded by men with less respect for tradition. This metamorphosis causes a good deal of friction, and in the clash the lot of officials is not always improved.

The rate at which the constitution of public bodies changes is remarkable, a few years sufficing to replace most of the members. The consequence is that the good work that officials may have done is often lost sight of by those who come fresh upon the scene. In a word, the modern official has continually to educate recruits to public bodies, and there is no finality to the task.

No official need be too thin-skinned if he can always count on the support of the public body he serves should he be harassed by any one in the discharge of his duties. But we are often hearing of cases where an official, besides having to bear the embarrassment of attacks from outside, cannot rely on the council to defend him or see him through.

OPPRESSED OFFICIALS.

Moreover, a cheap and entertaining sport has arisen known as "official baiting," indulged in by those foolish members of public bodies who delight to take advantage of an official's inability to retaliate. It is comforting to know that those who indulge in it do not, as a rule, achieve success, though they please a certain class of the gallery ratepayers; but they can, while the sport continues, afford a considerable amount of exquisite pain to a sensitive official.

The harassing of officials is as unprofitable as it is senseless, because it tends to sap all enthusiasm for work and quenches the spirit of endeavour in an official. The general public who read reports of official baiting think that they too are justified in abusing the officials, and mud thrown in this way has a tendency to stick unless some effort at repudiation is made. It is not to be wondered at, therefore, that most of us believe that the time has arrived when some measure of security and protection should be obtained.

We are all glad to see that our own Institution of Municipal and County Engineers has awakened to the necessity for taking active measures towards securing for its members the benefits of superannuation and security of tenure, and is alive to the great need of mutual aid and protection. The Council of the Institution, finding that the new memorandum, as amended by the Board of Trade, precluded the use of the institution's funds to defray costs incurred by a member in a libel action, did the next best thing—namely, at once to start a subscription-list in aid of a surveyor who has been a victim of persecution and who finds himself, after having won his case and vindicated his character, with a heavy bill to pay.

THE INSTITUTION DEFENCE FUND.

At their last meeting the council took into consideration the appointment of a Mutual Defence Fund Committee, and the matter has been referred to the Constitution Committee. The proposal is to create a fund independent of the finances of the institution available for the defence of oppressed officials. The suggestion has been made that it should be started on the basis of a voluntary contribution of 5s. per annum per member, which it is thought may prove sufficient for the purpose.

That there is great need for such a fund is very certain, because the council has a number of times been approached by some member who has sought financial aid in making his defence. Again, the council has often been asked to help an official by making a remonstrance to his authority when the official in question has been warned (for no apparently good reason) that his services would be dispensed with. But the council has not hitherto been able to do much except sympathise. It is true that, in some instances, the institution has deputed one or more of its members to interview the authority on behalf of the official, but with little result.

There is a certain amount of security of tenure involved in superannuation itself, and this defence fund is very good in its way, and better than nothing at all, but most of us feel that since we have to administer Acts of Parliament we ought to be protected by Act of Parliament.

The duties thrust on officials in these days are very numerous when Acts of Parliament succeed each other with bioscopic rapidity. The application of these Acts gives rise to a good deal of public irritation, which often finds vent on the officials.

NEED FOR PARLIAMENTARY PROTECTION.

Officials are of necessity continually treading upon the toes of members of their own public bodies, and of the ratepayers at large, in carrying out the duties which Parliament thrusts on the authorities and requires the authorities to carry out through their officials. Those members of the general public who feel themselves aggrieved by the requirements of these Acts do not hesitate to attack the unfortunate officials who have to carry out the Acts. It is not too much therefore to expect that a Government which imposes upon officials the carrying out of duties which prove so repugnant to those for whom the Acts are framed ought to protect officials and thus enable them to discharge their duties fearlessly, without respect of persons, and without the haunting fear that their bread-and-butter is at stake.

Now, for one official who will go to the trouble of defending himself against an offender who slanders or libels him there are numbers of others who feel that they dare not, because of the insecurity of their position and the risk of having to pay costs themselves, and it would be a tremendous support to officials if they had superannuation and security of tenure, and could in addition rely on the moral and financial assistance of our Institution.

What one cannot understand is why security of tenure is good for officials in some branches of public service but not in ours.

It is well that officials of all classes have banded together and formed such an Association as the National Association of Local Government Officers where interests which affect all will be pushed as vigorously as possible, and it is important that every institution and society which deals with the welfare of local government officials of any class should bear this important question of superannuation and security of tenure well in mind, and let it occupy the first place in its considerations.

SECURITY OF TENURE.

If the situation which occurs when dealing with old servants who find they are unable to carry out their duties as formerly is suitably and profitably compassed by a scheme of superannuation at very little expense to local authorities, so that they are in the position of being able continually to have the services of able and fit men, would it not also pay every authority for its officials to have security of tenure, because then the authorities would know that their officials could more fearlessly carry out all the duties imposed upon them?

It is believed that there is considerable opposition at the Local Government Board to the proposal to give security of tenure to surveyors, the very board which ought, of all, to be readiest to give support, because it is that department which is responsible for most of the work that is thrust on the surveyor.

And what is the objection to security of tenure? Is it that the authority would not be able to get rid of undesirable officials? Now, this is not true, because under any system of security of tenure, when an official did not carry out his duties satisfactorily complaint would be made to the Local Government Board, and sufficiently good grounds for his dismissal would free the authority from his service. Does poor-law administration suffer through poor-law officials having the advantages that we desire? Whether it is because, as a body, we have no charter or not, one cannot say, but why the Local Government Board should approve of the principle of security of tenure for a medical officer of health and not a surveyor passes one's comprehension. The fear that it might establish a few unscrupulous officials is groundless, when any unscrupulous act would of itself be a justification for the removal of that official under any system of security of tenure. A strong representation should be made to the President of the Local Government Board on the subject, to hear his views and let him know ours about this matter.

Our organisation must be strengthened, the authorities and members of Parliament must be invoked to support the principle of superannuation and security of tenure, and we must not let our efforts flag until we have achieved what poor-law officials enjoy. This is a very vital subject, which ought to commend itself to every member of our institution and be thoroughly ventilated at the district meetings.

Sewage Disposal by Oxidation Methods.

By JOHN DUNCAN WATSON. M.INST.C.E., Birmingham.

[The subjoined paper was read last week before the members of the 15th International Congress on Hygiene and Demography, Washington. We defer our comment on the contribution until next week, when we propose to reproduce a companion paper submitted to the congress by Dr. Gilbert J. Fowler, Manchester.]

In using the words "sewage disposal," sanitary engineers have more in their minds than merely conveying an objectionable liquid beyond the reach of the masses, and when they speak of "purification of sewage" they think of something less than a complete elimination of those substances from potable water which when added to it gives the liquid the designation of sewage. Complete elimination is prohibitive, inasmuch as it is beyond the limits of a reasonable rate on the public purse. The word "purification" as it is employed in this paper should therefore be understood in this restricted sense.

There must, of course, be some standard to guide the designer of a sewage purification plant, but what that something should be it is difficult to say. It is not difficult, however, to say that it should not be 1 part per 100,000 albuminoid ammonia and 1 part per 100,000 oxygen absorbed as in Lancashire and Yorkshire. A standard should be more or less of a movable quantity, high where the river into which the effluent to be discharged is pure, and not so high where the river is impure and of great volume.

On the whole, the condition of the river below the point where the effluent joins it is a safe guide, and should be the ruling factor in determining the degree of purification desirable. I suggest that the designer of the plant should aim at producing—

(1) A sewage effluent that will not putrefy on being kept for seven days at a uniform temperature of 80 deg. Fahr.
(2) That it should be the result of natural processes.
(3) That it should not contain more than 3 parts per 100,000 of suspended solid matter.
(4) That it should not absorb oxygen from the stream into which it flows.

ELIMINATION OF SOLIDS.

In purifying sewage by oxidising methods it is essential first to separate the solid from the liquid impurities, not because it is impossible without nuisance to purify crude sewage on oxidising beds, but because such a course is far from economical. The sludge question is to be introduced by Dr. Imhoff; it is therefore unnecessary here to discuss it, beyond emphasising its importance in every scheme of purification. The success of every oxidising process is more or less dependent upon the efficiency of the methods adopted to eliminate solids; the most perfect design of oxidising filters may be rendered abortive if the sewage is not suitably prepared before it is applied to the surface of the medium.

The evolution of the Emscher tank has given a fillip to the consideration of the sludge question which will bring us nearer the solution of the sludge problem. Care should be taken, however, not to clothe the tank with virtues which it does not pretend to possess. It has been designed to retain and digest solids, and render them at once inoffensive and capable of being readily dried at moderate cost, and I can bear testimony to its ability to do all this, but it does not follow that the Emscher tank will be a suitable medium for [illegible] sewage for the bacteria bed. It does not take the place of the settling tank, whose function is to equalise the quality of sewage arriving at the outfall works, nor does it pretend to eliminate colloidal or ferruginous matter, which, if run on to a filter in excessive quantity, would certainly impair its usefulness. The tank, however, has succeeded in keeping sewage from fermenting when that course is desirable, while the solid organic matter is at the same time resolved by the septic process into an inodorous and easily dried substance, incapable of giving rise to nuisance. I tried hard to make this [illegible] in 1901, but failed, after an effort extending over the whole year.

In a paper read in 1903 at the annual conference of the Institution of Municipal and County Engineers, I stated that the irreducible residuum of the septic process was an [illegible] which had been used at Birmingham since 1903 to fill up land depressions in the neighbourhood of the septic tanks. Thanks to the excellent work of Dr. Travis and Dr. Lovett, this work has been still further developed.

When the sewage has been properly prepared by settlement, chemical precipitation, septic action, or a combination of them all, it should be exposed to the action of the friendly microbe, and if that action is sufficiently prolonged, the constituent matters of the sewage, such as albumen, are practically destroyed, or more correctly converted into carbonic acid, free ammonia and nitrates. When everything is taken into account, I believe it will be found that this can be best done on what are termed percolating filters, but contact beds are also capable of doing somewhat similar work, and if the production of a consistently good effluent were the only desideratum, land irrigation, and intermittent filtration, which is a form of the same thing, are capable of doing even better work.

One of the reasons assigned for the appointment of the Iddesleigh Commission in 1898 was the difficulty of obtaining suitable land in England for sewage purification. As everyone knows, the interim report issued by the commission in 1903 stated that it is practicable to produce by artificial processes alone effluents which will not putrefy, and may be discharged into a stream without creating a nuisance.

At no time has the efficiency of good land as a vehicle for sewage purification been impugned. When land has been found to be unsuitable in quality, inadequate in area, or too dear in price, it has been condemned. A notable instance of this is to be found at Birmingham, where the District Drainage Board acquired 5 or 6 miles of the valley of the Tame at a cost of £400,000. Much of this land was unsuitable in quality, and the constant increase of population rendered it necessary to adopt other methods of purification; but, so far, this is the only example of a great sewage farm having been abandoned in favour of a biological purification plant. There appears to be a prospect of Paris following the same course. A paragraph on p. 92, Vol. 2, of the report of Dr. Calmette and four colleagues to the Minister of Public Instruction, after describing what Birmingham has done, says: "This is exactly the solution which we are convinced will be forced on the city of Paris."

PERCOLATING FILTERS *v.* CONTACT BEDS.

Some years ago a well-known English expert, in speaking of the relative merits of percolation and contact beds, stated that contact beds were dead. His remark was somewhat premature, as Sheffield has since laid down 40 acres of those beds; at the same time he voiced an opinion which is being strengthened daily, and it may now be assumed that percolation beds are being constructed in England in preference to contact beds wherever the conditions are suitable. A notable case to the contrary is Oldbury, where, after a series of experiments extending over a considerable time, Prof. Frankland and Mr. Silvester came to the conclusion that triple contact beds were more suitable than percolating beds for the purification of a sewage containing large quantities of acid, of which sulphocyanide formed a prominent feature.

In their Fifth Report the Royal Commission state that, taking into account the gradual loss of capacity of contact beds, a cubic yard of material arranged in the form of a percolating filter will generally treat satisfactorily nearly twice as much tank liquor as a cubic yard of material in a contact bed. Percolation filters are better adapted to variations of flow than contact beds. The effluents from them are usually much better aërated than the effluents from contact beds, and, apart from suspended solids, are of a more uniform character. The risk of nuisance from smell is greater from percolating beds than from contact beds. The commission also found that with percolating filters there is nuisance from flies.

No one has attempted to upset the decision of the commission, and where contact beds are adopted in future there will probably be found to exist special local and physical reasons for their preference.

The cardinal principle which has always influenced me in preferring percolation beds to contact beds is the belief that the oxidising process is dependent upon the free admission of air into the heart of a

bed. It is obvious that the air supplied to this form of purifying agency is restricted to the volume of sewage treated, whereas it may be equal to many times that volume in a well-constructed percolation filter.

That we have succeeded in constructing the best possible filter should not be taken for granted lest progress be unduly fettered, but whatever advance the future may bring with it, the percolation bed as we now know it is not likely to be improved out of recognition.

FILTER CONSTRUCTION AT BIRMINGHAM.

A brief description of the percolating filter most recently constructed on the Birmingham works may be taken as an indication of what I consider an oxidising bed should be for the treatment of strong sewage. The filter area referred to is 6·6 acres, and is nearly equally divided into two portions. The floor is laid with concrete, 4 in. thick, on a foundation inclined at a gradient of 1 in 100 towards the effluent channels. The concrete floor is covered with semi-circular aërating tiles. These are carried through the enclosing walls, so that the air may pass without hindrance from side to side of the bed. The enclosing walls are 5 ft. in height, and are built of rubble stone (Croft granite), laid without mortar. The thickness of the base is 2-ft. 6-in. battering, 5 to 1 on the outside face, and where the walls are built transversely to the line of aërating tiles, the latter are carefully bedded and levelled on top with cement mortar to form a foundation for the walls. The top course is levelled up with stone bedded in cement mortar. The medium, which has an effective depth of 6 ft., consists of hard stone or ball slag of best quality, broken as uniformly as possible to pass a 2-in. ring, and be rejected by a 1-in. ring. The main supply pipe, 21 in. in diameter, is laid alongside the eastern walls of the block, from which branch pipes, 10 in. in diameter, are led to the beds and extended on the opposite side, where they are connected up to the washout pipe. These branch pipes are laid across the beds in parallel lines, and at right angles to them 3-in. distributing pipes are laid, in which spray jets are inserted. The pipes are made of cast-iron, and weight 6½ lb. per foot; the thickness is not more than $\frac{5}{8}$ in. since the maximum head is only 10 ft. or 12 ft. They are laid on the bacteria bed without special support, but Jones's expansion joints have been employed to couple them together.

The actual cost of constructing Block D, exclusive of any work or plant connected with the supply to the walls was £39,555. On a net area of 6·6 acres this is equivalent to £4,620 per acre.

The filters first constructed at Birmingham cost £5,900 per acre, owing chiefly to the smallness of the unit area; as, however, each advance in size gave an equally well oxidised effluent at less cost, the area has increased with the construction of each block of beds, and the latest now under construction is 7 acres. Engineering and economic questions alone should determine the unit area.

FILTERING MEDIA.

Purification depends on various factors, but mainly upon the extent of bacterial surface—as Mr. Rudolph Hering has called it—over which the tank liquor is made to trickle, and the time it occupies in percolating from top to bottom. The question of the size of medium and depth of bed must have a direct bearing upon the volume and strength of liquor to be oxidised.

Theoretically, a fine medium should be preferred to a coarser one. Dr. Reid has studied the virtues of small medium, and as the result of his study and experience has consistently advocated its use. He can point to Hanley and other places where fine medium is used successfully; he can show that there is eight times the bacterial surface available for purification in ¼-in. cubes as compared with 2-in. cubes, and he can show consistently good effluents from fine grain shallow filters. The Dorking experiments confirmed the main points of Dr. Reid's contention. At Birmingham and other places medium of a large size, approximating to 2-in cubes, is used.

Since it is admitted that with fine grain medium less depth is required, and a more brillant effluent obtained, the question naturally arises, Why not adopt fine medium? Chiefly because large medium of greater depth to do the same work is not more costly, and it provides greater security against pooling and clogging.

DESIGN OF WORKS.

In large manufacturing districts sewage varies in composition, and an engineer in designing a purification plant should see that it is capable of giving that elasticity which is invariably demanded from purication plants in exceptional weather, and when unexpected rushes of trade waste arrive at the works.

The designer of oxidising beds should not rely upon the infallibility of preliminary tank processes to free the filters of all unnecessary work. Mistakes take place in management, the composition of the sewage may permanently alter, and the colloids permanently increase, as at Manchester, where the albuminoid ammonia figure has in recent years gone up nearly 100 per cent. A town's manufactures may change entirely, as at Coventry, where silks and watches have given place to the motor industry. Aëration is often impaired by unfavourable climatic conditions; for instance, at Birmingham, where unsepticised sewage was applied to the bacteria beds, in cold weather it was found that the surface rapidly became "mackintoshed" over with a thick gelatinous fungoid growth. No doubt this is a condition capable of prevention, but the designer of the works may have no control over the management, and should see that a sufficient margin of safety is secured by constructing a filter which readily recuperates; otherwise the design is unjustly blamed.

Anxiety on the part of the public bodies to keep down initial expense in constructing bacteria beds should be met firmly, and if possible with figures to prove that cheap beds are not profitable. A medical friend, who holds a distinguished public position, once complimented me on the appearance of the massive masonry walls round the Minworth bacteria beds, but proceeded to question whether the expense was justifiable, and added that medium should be allowed to slope on a natural angle from the top of the bed. He was astonished when I gave him figures to show that his untidy method would cost double what the massive walls had cost. Later, he suggested that the nitrifying organism would do as good work on a heap of unscreened clinker as on a well prepared oxidising bed, and he pointed to a case where beds had cost less than £2,000 per acre. I told him that I had constructed several acres of beds in this way at a cost of only £800 per acre. I was not able then, but I can now give the cost of treating 1,000,000 gallons of sewage on those "cheap" beds, compared with the cost of treatment on the beds already described:—

—	Slag and coarse medium.	Furnace ashes.
Volume to be treated	1,741	308
Capital cost per acre	*£7,100	£800
Interest on capital cost at 3½ per cent. per annum	£1 16s. 5d.	1s. 1½d.
Working cost per 1,000,000 gallons	9s. 1d.	9s. 9d.
Total cost per million gallons	£1 11s. 7d.	£1 8s. 8d.

* This figure includes a proportion of the cost of supply and effluent channels, storage separating tanks, carriage, wharf, &c.

The initial cost of the "dumped" furnace-ashed bed, it will be observed, is low, and the maintenance charges high as compared with the carefully constructed stone and slag bed.

The furnace ashes bed—as might be expected from 6 ft. of fine medium—produced a very good effluent, but the surface, being dosed with strong Birmingham sewage, clogs readily. Washing and replacing are not attempted, as this work would amount to 1s. 6d. per yard, or much more than new material would cost. Periodical scraping and removing the top layer is found to be sufficient.

It is urged against large medium that another process is necessary to separate the humus from the filtrate before it is fit to enter a river, but as this can be done in separating tanks for 2s. per 1,000,000 gallons, the objection is of comparatively small moment. A fine medium bed has advantages where a brilliant effluent is a desideratum, where it would be difficult to get rid of humus from the filtrate, where a high cost for maintenance is not prohibitive, and where a temporary stoppage of the whole plant would not be a very serious matter, but it not suitable for installations of any magnitude.

DISTRIBUTION.

Unless where the upper layers of a percolating bed consists of very fine medium, as in Dr. Dunbar's filter at Harzburg, the sewage in its passage through a healthy bed passes through the bottom immediately under where it drops upon the surface. The establishment of this fact emphasises the desirability of

feeding a percolating bed in such a way that each particle of material receives an equal quantity of liquor.

Engineers have had varying success in their efforts to design appliances capable of fulfilling this important condition. Some excellent devices have been brought to the notice of the public by their makers, and a good deal might be said in favour of each, but the best are costly, and the worst are cheap only in name. It may be assumed that moving distributors are all liable to be prejudicially affected by wind, frost and snow, unless when they are power driven, in which case they are more costly. On the other hand, wind, as it influences the spray jet—and it is rarely perfectly calm in this changeable climate of ours—tends to equalise the distribution when this type is used.

Absolute uniformity of distribution there cannot well be. Even the Scott-Moncrieff distributor, the most uniform distributor I have known, which rotated round Bed C at Minworth with all the regularity that an electric drive could give, dropping as it travelled sewage so equal in volume that test trays 12in. square, placed close together in a straight line, from centre to circumference, resulted in collecting the same quantity in each tray, was no exception to this rule. Now compare the results of six months' working of this distributor with similar work by spray jets on adjacent beds dealing with the same tank liquor, and after both beds had been at work for about two years:—

—	Scott Moncrieff distributor.	Spray jets.
Volume treated during six months	29,500,000 galls.	72,000,000 galls
Rate per square yard per day while working	154·6 galls.	169·3 galls.
Capital cost of beds per acre, including all subsidiary works...	£11,148	£7,170
Interest on capital cost per 1,000,000 gallons	£2 6s. 10d.	£1 4s. 7d.
Working cost per 1,000,000 gallons	12s. 2d.	12s. 10d.
Total cost per 1,000,000 gallons	£2 19s.	£1 17s. 5d.
	Parts per 100,000.	
Oxygen absorbed in four hours (filtrate)	2·784	3·018
Ditto (separating tank effluent)	2·041	—
Percentage of purification (filtrate)	84·3	83·0
Ditto (separating tank effluent)	88·5	—
Albuminoid ammonia (filtrate)	·274	·370
Ditto (separating tank effluent)	·239	—
Percentage of purification (filtrate) ..	73·6	71·1
Ditto (separating tank effluent)	81·4	—
Nitrates and nitrites as nitrogen	2·208	2·0·9
Suspended solids (filtrate) ..	4·9	8·8
Ditto (separating tank effluent)	1·7	—

When it is borne in mind that the Scott-Moncrieff distributor rotated on a bed 7 ft. deep, and the spray jets were fixed on a bed only 6 ft. deep, the resultant effluents do not appear to justify the conclusion that the one is much better than the other.

My contention is that the total effluent must necessarily be compounded of volumes which have undergone varying degrees of purification on different parts of a filter. If for mechanical or meteorological reasons the spray is not distributed uniformly certain portions of the filter get more work to do than others, but this is got over to a large extent by changing the position of the jets periodically, and, of course, change in the direction of the wind constantly brings about minor changes automatically, which tend to even up the distribution. So long as these conditions obtain, and waterlogging is avoided, the practical result is not unsatisfactory. Nor should it be forgotten that even although the intermittency is irregular, that part of the bed which for the time receives no sewage may be recuperating and adjusting itself to bear a strain later on. Assuming for a moment the worst possible case, namely, that a certain portion of the filter never received any sewage—the effect would be that a larger volume of filtering material would be required to achieve the same result, and thus the true engineering aspect of the matter appeared—namely, the question whether it was better economically to spend money on extra filtering material or on extravagant methods of obtaining ideal distribution. This could be decided only by considering the total resulting purification of a given volume of sewage, in terms of the total cost of obtaining it, and not merely the cost of the distributing mechanism.

All forms of distribution on percolating filters are liable to give rise to nuisance from smell, if a strongly smelling liquor has to be dealt with. In the case of trays or tipping troughs, the smell is confined more or less to the immediate vicinity of the filter, and it may be largely done away with at small works by providing an inexpensive form of cover for the filter. The spray jet has been held to be the most liable to give rise to smell, but moving sprinklers are almost equally bad in this respect. This is bound to be more apparent during periods of prolonged heat, but the application of hypochlorite of sodium, as used at Ostend in Belgium, or hypochlorite of calcium, as used at Birmingham, Hanley, Burslem and Stratford-upon-Avon, although costly, is fairly effective when mixed with the tank liquor before its application to the oxidising filters. Care should be taken not to apply as much as will inhibit the life of the nitrifying organisms, or produce injury to the river into which the effluent enters. If it is applied before septic action is too far advanced, 1 part per 100,000 will probably be found to be sufficient, and this quantity will be more than enough to keep down the fly nuisance.

MANAGEMENT.

One word with regard to management. However well a plant may be designed, if it is not well and skilfully managed it will become a nuisance, and bring discredit on the engineer who designed it. The disposal of the liquid filth of a great community has an enormous potentiality for evil, and if a town authority believes it necessary to avert this by expending large sums of money on constructional work, it is their bounden duty to see that the plant is placed in the most competent hands. Local authorities are by no means sufficiently alive to this aspect of the question, with the result that too many works are left to the management of untrained men. Hitherto anybody has been deemed good enough to look after a sewage works, but the day has now come when the manager should be a highly trained technical expert, if a local authority hope to get full value out of the sensitive entity which we call a bacteria bed.

INSTITUTION OF MUNICIPAL ENGINEERS.

NORTHERN DISTRICT MEETING AT NEWCASTLE-ON-TYNE.

At a meeting of the northern district of the Institution of Municipal Engineers held in the Town Hall, Newcastle-on-Tyne, on September 21st, there were present Messrs. John Davison (in the chair), John W. Holbrook (Houghton-le-Spring), W. R. Plews (Sedgefield), W. B. Thomas (Southwick-on-Wear), Lionel Simpson (Barnard Castle), H. A. Strong (Gateshead), Geo. Gregson (Durham), Wm. Robson (Leadgate), H. G. Haines (Durham), R. E. Riddle (Bellingham), W. J. Coulson (Cramlington), J. W. Moncur (Sunderland), C. W. Hall (Felling) and John Robinson, hon. district secretary.

Mr. J. W. Moncur thanked the members for electing him chairman for the ensuing year.

The secretary introduced the question of securing grants from the Road Board for secondary or district roads, and explained the position in the county of Durham, at the same time pointing out that the probability of any council obtaining a grant for district roads was very remote unless councils and their surveyors protested very strongly against the Road Board allowing the county council to have entire control of monies allotted to that county. It was decided to take the application for a grant for Morton Palmsroad in the Darlington Rural District as a test case, and members present pledged themselves to see the county representatives representing their various districts before the county council meeting to be held in October, and endeavour to persuade them to vote in favour of giving a grant to this particular road.

It was agreed to hold a joint meeting with the Yorkshire division at Harrogate on October 19th.

A vote of thanks was passed to the Lord Mayor for the use of the committee room for the meeting.

Lower Thames Valley District Surveyors' Association.—The annual meeting of the above association, the president of which is Mr. E. Willis, Assoc.M.Inst.C.E., F.S.I., will be held at the Town Hall, Twickenham, to-morrow, the 5th inst., at 6.30 p.m., when the appointment of officers for the ensuing year will take place. In addition to this, the programme for the coming session will be discussed, and it is expected that a large number of useful and interesting papers will be read during this session. It is hoped that every member will make a special effort to attend.

CREOSOTED WOOD PAVING.*

By H. T. WAKELAM, M.INST.C.E.,
County Engineer of Middlesex.

Many experiments with bituminous and other materials have been and are being carried out, but up to the present time I have not seen anything that will satisfactorily sustain the heavy traffic of Middlesex at a resultant cost less than creosoted wood paving. I mean by this that if (as it is hoped will be the case) the Local Government Board from now onwards grant loans for the periods of ten years for creosoted deal blocks, and twenty years for the concrete beds, the annual repayments of principal and interest on the loans will be found in the end to be less than the cost to be incurred (at present prices) in connection with any bituminous material at present on the market—*i.e.*, when the life and cost of the latter is considered. These remarks, as I have pointed out, apply to roads which carry a heavy traffic.

Several lengths of creosoted deal paving which have been laid for periods extending from fourteen to eighteen years are now being relaid in Middlesex. This proves my point, and, in my opinion, it is difficult to find a material which will give the same benefits, from a financial point of view, as creosoted wood blocks give, where traffic is fairly heavy, unless sett paving, or possibly "Durax" paving, on concrete be adopted.

The following figures are applicable to loans raised on an assumed quantity of wood paving:—

	£ s. d.	£ s. d.
Area (say), 5,000 sq. yds.		
Cost, 11s. 9d. per superficial yard		
Wood, at 7s. 6d.	1,875 0 0	
Concrete, at 4s. 3d.	1,062 10 0	
		2,937 10 0
Half-yearly instalments on loan:—		
Wood, 10 years at £, per cent per annum	113 5 9	
Concrete, 20 years at £, per cent per annum	37 7 0	
		150 12 9
Annual repayment for wood 10 yrs.		226 11 6
" " concrete (20 yrs.)		74 14 0
Total repayment for wood	2,265 15 0	
" " concrete	1,494 0 0	
Total repayments for wood and concrete		3,759 15 0
	s. d.	s. d.
Cost per super. yard for wood (including interest) for period of loan (10 years)	9 0·756	
Cost per super. yard for concrete (including interest) for period of loan (20 years)	5 11·712	
Total cost of wood and concrete (including interest)		15 0·468
	d.	s. d.
Cost per super. yard per annum, for wood for period of loan	10·875	
Cost per super. yard per annum for concrete for period of loan	5·585	
Total cost of wood and concrete per square yard per annum for 10 years		1 2·460
		d.
Cost per super. yard per annum for wood for 14 yrs.		7·768
Add concrete		5·585
Add maintenance		2·500
Total cost per yard per annum for 14 years (including repayments of principal and interest)		13·854
	s. d.	
Cost of relay of wood (including interest) for second period of 14 years	9 0·756	
Balance of cost of concrete, 6 years at 5·585d. per yard per annum	1 9·510	
Total cost of relay (including interest)	10 10·266	
		d.
Cost per super. yard per annum for wood for 14 yrs.		7·768
Add concrete		1·536
Add maintenance		2·500
Total cost per yard per annum for second period of 14 years (including repayments of principal and interest		11·804

As compared with the above figures, a leading company undertake to lay and maintain macadam roads of a bituminous nature, for a period of five years, at a cost of 7s. per sq. yd. At this rate a fifteen years' life will cost 21s., equal to 1s. 4d. per sq. yd., as against 1s. 1½d. for creosoted wood paving for a fourteen years' period. These are actual results from present prices, and from which it will be seen that wood paving is the cheaper material over a given period.

The advantages of expedition in repair, and non-disturbances of surface (from a relay point of view) during long periods are well known in connection with creosoted wood paving.

The same consideration in regard to cost applies also, in a degree, to roads carrying a light traffic, and it is probably only the wealthier districts that can provide roads of a bituminous nature and afford the luxury of smooth surfaces on district roads at an enhanced cost. It is furthest from my wish that I should be misunderstood in the matter, or that I have any desire to decry a provision of roads with smooth, superfine surfaces, even at an increased cost. I only wish to present in these notes the commercial aspect of road upkeep.

Until I have more information before me, I personally am not disposed to advise any large expenditures or contributions in connection with bituminous coverings. . . .

What is badly wanted at the present time is something that will come (with a life commensurate with its cost) between an ordinary water-bound basaltic or granite road (tarpainted each year) and creosoted deal paving. I believe it will be found as time goes on that the something will be in the nature of asphalt, or an asphaltic material. If I am right, and it should be so, the damage from motor and other mechanical traffic, which is increasing so rapidly in Middlesex, should be to a great extent relieved.

* Extracts from Annual Report.

THE DUSSELDORF EXHIBITION OF CITY BUILDING.

We have already drawn attention to this exhibition (THE SURVEYOR, September 27th, p. 437), which remains open until October 31st, but, in view of its exceptional interest, add some supplementary details.

There are, it may be stated, about 600 exhibitors, showing nearly 4,000 different objects, grouped under City Building, Sanitary Arrangements, Hospital Management, Civil Engineering, and Industry. The department of City Building presents in thirty-seven rooms a number of solutions of town-planning problems, one scheme of universal interest showing the contemplated construction of a network of roads, 69 ft. in minimum width, to afford a connection as straight as possible between the various centres of industry, and to deal with street, tram, as well as carriage traffic.

An important department, coming under the head of "Sanitary Arrangements," is that of drainage plants and the purification of sewage. Included are all the different systems of drainage—plants for the mixing and separating systems, mechanical cleaning and settling tanks, as well as plants of the biological and oxidation processes, special plants of the Emscher-Brunner system, and minor settling plants for industrial works, hospitals, and the like.

The kindred problem of street cleansing and refuse disposal is most adequately illustrated. The city of Dortmund, for instance, shows an installation for the collection of domestic refuse destined to be transported to some distance, and for the cleaning of dustbins on the alternating system. A large-scale refuse-sorting plant connected with agricultural operation is exhibited by a refuse utilisation company. Pictures and actual models of refuse destructor plants are shown by some of the most important cities of Western Germany, and by many engineering firms.

Communal and private hygiene—inclusive of the installation of baths, sanitary plants, heating, disinfection, school hygiene, and other sanitary arrangements—constitute another department. Maps, illustrations, and models of widely different bathing establishments—from the simple douche to the large swimming tanks—and the most modern achievement—viz., riverside "beaches"—are among the more important exhibits of this part of the exhibition. Other displays of interest are those relating to the destruction of rats and gnats, and, on the other hand, to the protection of animals. The various arrangements for the treatment and prevention of disease form a special group, showing in a most comprehensive manner the management of modern hospitals, as well as the provision made for the prevention of epidemics and the protection of infants.

The department of Civil Engineering comprises plans and models of public and industrial buildings, railways, and bridges.

Gift of a Town Hall. A town hall and municipal buildings, erected and completely equipped, at a cost of £5,000, were presented to the town of Mold, North Wales, on Tuesday, by Mr. Peter E. Roberts, J.P., chairman of the Mold District Council, who is a native of the town.

CORRESPONDENCE.

[illegible]

TOWN PLANNING: WHOSE WORK?

To the Editor of THE SURVEYOR.

SIR,—Mr. Culpin's letter in a recent issue of your paper, offering to supply lecturers on behalf of the Garden Cities and Town Planning Association, prompts me to ask if you will open a discussion as to whose work town planning really is.

Are Mr. Culpin's lecturers architects, or are they municipal engineers?

If the latter, surely, before going into the district of another municipal engineer, they will wait for his personal invitation. If the former, as I suspect, I contend that the planning of a new town, a thing rarely called for in Britain, or the much more frequently required planning of extensions to an existing town, is essentially the work of a municipal engineer.

The more this is made public, the greater the justice to municipal engineers; for nowadays one frequently hears young architects and estate agents talking glibly of the town planning schemes they have in hand, or have carried out, and so claiming to be authorities on civic design. As a fact, the work they talk so much about is, as a general rule, building estate development, or, at most, suburb design on rural lines.

This is best exemplified by thinking of what the designer of mere town extensions has to do.

His first work is to choose an attractive area, and to ensure the town shall grow within it, and not "leak" outside. Mr. Carnegie told me the other day that this had been the great difficulty in America.

In Britain he must then bring the ordnance survey up to date, and set about what is by far his most tedious task—the altitude survey. Let me say at once that such methods as those of the barometer are useless for this survey. Next he has to plan his water supply and his sewerage system; and in connection with these matters, unless he be familiar with the work of such men as Dr. Hagen and Prof. Bechmann, his schemes are likely to be about as uneconomical as those in general vogue. How many architects have studied the works of these men?

In looking into the great question of communication, he comes into contact with not only such problems as modern road construction, but he is immediately faced with tramways, light railways, and sometimes jetties and even harbours.

In many cases he will desire to open up inexpensive "back" land, which will entail the construction of bridges across railways, canals and rivers; yet how many architects have made a study of economical bridge design?

Right at the outset he will be plunged into the most delicate, but none the less delightful, negotiations with landowners, railway companies, and such, for he will have the handling of huge interests; when approaching people for the first time he will be highly amused to find they expected in him a kind of park architect or landscape gardener, a kind of a "je ne sais quoi"; something they like to call a town planning expert: while the height of his ambition is to be a plain engineer. I give the above to prove how well certain schools have propounded their theories.

The leitmotiv of all his work, nay, his one object, must, of course, be to produce a beautiful, convenient and healthy place to live and work in; but I contend the municipal engineer has as much right to be [illegible] the average designer of suburban villas.

[illegible] I bear the architect not the slightest ill-will; on the contrary, I hold [illegible] I [illegible] that the latter has a living [illegible] the average [illegible] and little [illegible] and professional, to prove that he is worthy of it, except as a mere servant. That good engineer [illegible] Mr. [illegible] Britain, that he found our architects showed greater intelligence in the subject than did our engineers. [illegible] architect for Mr. John Burns' sagacious Act.

What I claim is that the British architect's true [illegible] type has done for Düsseldorf, and to concede to the municipal engineer his true work of town planning, construction and maintenance. Incidentally, I should like to see the latter individual try to rise a little more to his present opportunity.—Yours, &c.,

J. E. WILKES

Borehaven.
September 25, 1912.

THE CROMPTON PAVEMENT.

To the Editor of THE SURVEYOR.

SIR,—It is not a little curious that your current issue should contain references to Colonel Crompton's "new invention," and also to a pavement made in Germany called "Terbacca," and that their prominent features bear such a remarkable resemblance to each other that it is not easy to distinguish between the two, even when they are placed side by side.

TERBACCA.	CROMPTON PAVEMENT.
"Used in Germany for the past two or three years." (*Vide* THE SURVEYOR, September 27, 1912, p. 415.)	"The invention of Colonel Crompton." (*Vide* THE SURVEYOR, September 27, 1912, pp. 410, 426.)
Materials. 90 volumes of stone in three different sizes. 10 volumes of sand.	*Materials.* Graded granite. Sand.
Binding ingredients. 40 to 60 volumes of cement. 5 volumes of tar, thinned with solvent.	*Binding ingredients.* Cement. Bitumen
How prepared. Matrix and cement mixed together dry, then 10 per cent of water added, together with the liquefied tar.	*How prepared.* Heated and mixed to (say) a temperature of 600 degrees.
How laid. On an underlayer of beton 5 in. thick the mixture is spread much thicker than required finally, then tamped down with a 6-lb. rammer to a finished thickness of 2 in. or 3 in.	*How laid.* A sublayer of material 2½ in. thick and a wearing carpet of smaller material 1 in. thick, making a total thickness of 3½ in.

To want to probe into their relationship, and especially to rush to find out whether this is closer than "cousin German," is perhaps not altogether polite, but I may refer to their constitution and characteristics.

I must say I like the frank, open expression on the face of "Terbacca." This forms such a valuable factor in estimating its true character, and whether it is likely to have a successful and long life or not.

The character of "the new boy" cannot be as easily judged because no light is shown on part of its features, and we are not able to see what form and proportion the graded granite is in, or the quantities of sand, cement, and bitumen, nor the exact composition of the latter.

By the way, is it a good thing to mix "bitumen" and cement? To me it seems unnatural and unwise to blend black bitumen with white cement; does it not detract from the strength and spirit of the latter? I must confess I prefer it mixed with water and uncontaminated by any tarry compound. I have never been able to bring myself to believe that they go well together. I wonder what additional strength the new baby is supposed to derive from this mixture.

Then as to the heating to 600 deg., must this be so exact? Would the baby's complexion be endangered by any variation from this particular figure?

As I read it, this heating is applied after all the ingredients have been mixed together; what advantage is gained by this over the usual process of heating the aggregate only? Does the bitumen not try to run away from this "hot stuff," or is it held fast by the cement?

Then as regards the laying. Is the sublayer 2½ in. thick prior to or after consolidation, and of what gauges is the granite graded to? Similar queries apply to the carpeting and what mode of consolidation is employed. Is the carpeting "squeezed out from between rollers and spread like from a paper machine," as described in the preliminary announcement of the birth of this "new invention" (*vide* THE SURVEYOR, October 6th, 1911)?

Then as to the cost. I see this is now stated at "about 4s. 6d. per square yard," which shows that the new baby is "just a little dear." A year ago we were led to believe that the price would be 2s. a yard. Does the 100 per cent. increase represent the premium for insuring it for five years? A year ago it was estimated that its life would extend to ten or fourteen years. Is it now found not to have quite as strong a constitution as was anticipated? Or perhaps its sponsors now realise that it will have a bad time it

that "horrid creature" Mr. Torbus comes across it.—Yours, &c.

W. J. Howard Smith.

Westminster.
October 1, 1912.

P.S.—I saw that another doughty colonel—Bingham by name (you will "knaaw that maan, he cooms fra' Sheffield")—has been rating the Holborn Borough Council and its surveyor upon their ignorance in road-making matters.

Remembering that Colonel Bingham had himself invented a new type of road surface, I looked up my notes about it to see what his ideal paving was like. Here is its official description:—

"Pavements constructed according to this invention may be made of ordinary granite or stone setts or bricks put loosely in position, and blocks of hard wood, preferably about 1 in. or 1½ in. in thickness, are driven in between each stone, so that each sett is surrounded with hard wood tightly compressed and left with an elevation as may be found most convenient in height above the level of the stone blocks.

"Where a granite pavement is already laid down and it is not considered advisable to relay the same, it may under this invention be converted or rendered safe and noiseless by the insertion of wood wedges or pep between the granite setts.

"It may be necessary to do this to chip away the corners of the setts and to make holes at intervals round each sett, so that wood pep may be driven in."

I will content myself by adding that we should, at any rate, soon get to know something about "corrugation" if we had our pavements made according to Colonel Bingham's invention.

W. J. H. S.

THE VENTILATION OF SEWERS.

To the Editor of The Surveyor.

Sir,—Will the problem of sewer ventilation never be solved?

No one can read the paper presented by Mr. De Courcy Meade at the Berlin Congress, and reproduced in your last issue, without being struck with the apparent impotence of engineers to find a satisfactory solution of that question which has vexed the profession for the past half century.

The paper informs us that the Corporation of Manchester undertook a somewhat exhaustive investigation of the subject by three gentlemen eminent in their respective professions of public health, chemistry and engineering, that schemes for ventilating the sewers in the city were invited by public advertisement, and that out of twenty schemes submitted in response to the invitation, only four appeared worth consideration or, at any rate, worth the cost of the investigation.

Of these four the tests of three are described in detail, giving the results and the cost thereof.

The weak features of the several schemes are accordingly disclosed, and it is pretty clear that it would demand a generous stretch of imagination to consider any of them an unqualified success.

The honour of a detailed account of the test was, however, not done to the fourth system mentioned in the paper as "Method D." All that is said about it is that "the results of the tests would not warrant the general application of the system."

The invention of that method claimed that it prevented the disturbing action of the wind within the sewer," which, be submitted, and which is now generally accepted, was the chief cause of the emission of foul odours from the sewer openings; that it permitted the sewer to expire and inspire by natural ventilation just as the exigencies of variations in the volume of liquid in the sewer, atmospheric changes, or other phenomena rendered necessary, and that it did so to an extent which prevented any appreciable use of pressure within the sewer on the one hand, and any outward rapid rush of air at any particular spot giving rise to foul odours in the other. This was accomplished by permitting it to "breathe," not through open mouths, but, as all medical men advise, through the nose—that is, through a passage provided with a check constituting an air filtering arrangement.

What it would be interesting to the profession to know with respect to method D is, what kind of test was applied to it at Manchester; whether it did or did not verify the inventor's claim; if not, in what respect the system failed; why it should not warrant general application, and to what extent its application was warranted by the investigation.

This information would at least carry the question further than it seems to have advanced at present, if only it pointed out what should be avoided.—Yours, &c.,

T. Caink.

Worcester.
October 1, 1912.

IS THE ROAD BOARD A FAILURE?

To the Editor of The Surveyor.

Sir,—Referring to the correspondence in your paper as to the lines adopted by the Road Board in the allocation of their grants, I think most surveyors who have had interviews with them will agree that they have worked hard and done their best to meet the demands made on them, but opinion will probably differ as to whether they are on the right lines.

Many highway authorities have been disappointed to find that in almost every case a grant from the Road Board has involved an extra expenditure out of their own pocket, and it has always appeared to me that the board, in their anxiety not to relieve highway authorities of any of the ordinary expenditure which they had to incur prior to the constitution of the board, have failed to recognise that this, so-called, ordinary expenditure has increased by leaps and bounds during the last few years, owing to the ever-growing mechanical traction.

This increasing expenditure began to be felt just before the constitution of the Road Board, and no doubt many surveyors urged their councils not to let their roads go back, but to meet the extra cost, pointing out that there was talk of an increased tax on motors and a new tax on petrol, which would probably be devoted towards this cost, and when the Bill was in Parliament I think it was generally thought that this would be the case.

If grants could be made towards this extra cost, which has been almost entirely caused by the mechanical traction, it would do away with the complaint of the ordinary ratepayer that he is being called upon for a bigger expenditure on the highways in his district to meet the wear and tear of motors, from which he derives no benefit, but rather the reverse in the shape of "nuisance from dust," &c.

Again, the method of calculation on the basis of the population of an area is not to be commended. It may frequently happen that a sparsely populated district has a long length of trunk main road to keep up, which is largely used by motorists passing straight through, and from whom they derive no benefit, and yet only receive a very small grant based on their population, while a thickly populated district, and consequently probably richer, with only a short length of trunk road, gets a bigger grant.

I venture to suggest that if grants could be made on these lines, and based more on the amount of foreign traffic the roads have to bear in lieu of a population, it would be more popular.—Yours, &c.,

W. B Purser.

County Surveyor's Office,
Grantham.
October 1, 1912.

To the Editor of The Surveyor.

Sir,—I am sorry if, as you say I misinterpreted the invitation contained in your article on the above subject, but in view of your remarks I trust you will allow me to explain that I did not intend to suggest that any one was intentionally acting unfairly. At the same time the fact remains that if any certain class of material is specified for any particular work then all other similar materials are placed at a disadvantage. My point is that unless an article is proved to be altogether superior and to possess indisputable advantages over other similar goods, then it should not be specified.

As with certain materials it requires considerable experience to be able to decide which one of many is suitable for any particular purpose, it is very easy therefore for an error of judgment to be made, and as the material referred to in my previous letter has no particular advantage I submit that it is wrong practically to put all others—including several articles whose superiority has been proved—out of court.

For any one to claim to be able to say after a short experience only what, for instance, is the most suitable bitumen for any named purpose, is as humorous as it is dangerous.—Yours, &c.,

Practical.

October 2nd, 1912.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

The premium for September is divided between

Mr. J. W. Smith,
47 Eccles-road,
Clapham Junction.

and

Mr. F. E. Yewdall,
Town Hall,
Richmond, Surrey,

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

QUESTIONS.

This week answers are invited to the following questions:—

275. Cantilever.—A cantilever of uniform cross-section and length L carries a concentrated load W at the free end. A prop is placed at a point $\frac{L}{4}$ from the free end, bringing this point to the same level as the fixed end. Find an expression for the reaction at the prop, and the deflection of the free end of the cantilever. Neglect the weight of the cantilever. (B.Sc.Eng. Final.) (H. F. W., *Tottenham.*)

276. Roof Design.—It is found necessary in designing the steel trusses for a roof to adopt some system of wind bracing. Explain in detail how the cross-sectional area of the wind ties is determined. (H. F. W., *Tottenham.*)

277. Sewage Disposal.—What main principles should be kept in mind in arranging the sewage disposal of the following: (*a*) A village of 800 inhabitants (purely agricultural)? (*b*) A town of 2,000 inhabitants (industrial)? (*c*) An infectious diseases hospital of 100 beds? ("Charger.")

REPLIES TO QUESTIONS.

273. Cast-Iron Stanchion.—Calculate the size of a cast-iron stanchion 12 ft. in height alongside an external or party wall to carry a load of 54 tons. (T. R.)

The most economical and best practical form of cast-iron stanchion is that shown in Fig. 1. Cast-iron is a very treacherous material on account of flaws which may exist, and which are difficult to detect, and internal stresses which may be set up by irregular cooling. These internal stresses render the casting liable to fracture when subjected to shocks or sudden changes of temperature, such as may occur during a fire. The section selected is to enable the whole of the surface to be closely inspected, and thus a much lower factor of safety is allowable than with hollow circular columns, which cannot be well inspected.

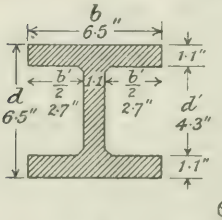


Fig. 1.

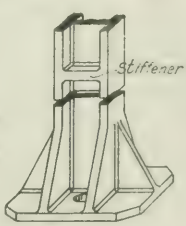


Fig. 2.

A convenient, and probably the most reliable, formula for the calculation of long stanchions and columns is that of Rankine, which is as follows:—

$$P = \frac{fs}{1 + a\frac{l^2}{r^2}}$$

Where f = ultimate resistance of material to compression in lb. per square inch. For cast iron 80,000

s = sectional area of stanchion in square inches

a = the reciprocal of the limit of elasticity of the material. For cast iron $\frac{1}{3,200}$

l = length of stanchion in inches

r = least radius of gyration

P = breaking weight of stanchion in lb.

A varying factor of safety must always be used with this formula, and is found as follows:—

$$\text{Factor of safety} = 4 + \cdot 07\ \frac{\text{length in inches}}{\text{least diameter in inches}}$$

It is required to find the dimensions of a stanchion with a height of 12 ft. to safely carry 54 tons dead load.

As a trial take a stanchion with a cross section, as shown in Fig. 1, and which has a sectional area of 19 sq. in.

The moment of inertia of the section

$$I) \quad \frac{bd^3 - b'd'^3}{12} = \frac{(6{\cdot}5 \times 37{\cdot}4) - (5{\cdot}4 \times 29{\cdot}5)}{12}$$

$$= 112{\cdot}6$$

Then $r = \sqrt{\frac{I}{A}} \qquad \sqrt{\frac{112{\cdot}6}{19}} = 2{\cdot}435$ in.

$$\frac{l}{r} = \frac{144}{2{\cdot}435} = 59$$

Then by formula—

$$P = \frac{fs}{1 + a\frac{l^2}{r^2}} = \frac{80{,}000 \times 19}{1 + \frac{1}{3{,}200} \cdot 59^2}$$

$$= 728{,}008 \text{ lb.}$$

The factor of safety $= 4 + \cdot 07\ \frac{144}{6{\cdot}5} = 5{\cdot}55$

Then safe load on stanchion $= \frac{728{,}008}{5{\cdot}55 \times 2{,}240} = 58{\cdot}56$ tons

This safe load is somewhat in excess of the requirements, but it would be found that a stanchion with a 6¼-in. side would be too small, and as the material is cast-iron the allowance is not excessive.

Stiffeners should be cast at about 3 ft. apart, as shown in Fig. 2, which also shows the base of the stanchion. The form of the cap would depend on the mode in which the load is to be transmitted to the stanchion. (J. W. S., *Clapham Junction.*)

NOTES.

[The following has been submitted in consequence of the editorial note appended to the reply to Question 267 in our issue of September 13th. Reference should be made to the further reply to the same question in our issue of September 20th, which deals more fully with the *heads* of a complete specification. Ed.]

CONVERSION OF MACADAMISED INTO A WOOD-PAVED ROAD: SPECIFICATION OF WORKS.

Excavation of Roadway. The existing roadway shall be excavated to a depth of 12 in., screened, and all suitable material laid aside to be used for concrete. Surplus soil to be carted from the works.

Cement and Concrete.—All cement to be used on the works shall be obtained from an approved manufacturer, and shall be subject to the usual tests. All concrete shall consist of 1 part of cement to 6 parts of the screened stone, which shall be clean and free from dust and dirt, and 1 part of keen, sharp sand, the whole to be thoroughly well mixed, and the usual quantity of water added. The concrete shall, when sufficiently mixed, be evenly spread to the required thickness, and rammed and levelled to a true and uniform face, and to proper gradients. If the concrete is laid in hot weather, it shall be frequently watered or covered, so that the surface may be kept moist. When the concrete has sufficiently set, it is

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
A Critic of Municipal Trading	447
Appointments Vacant	480
Assistants' and Students' Section	464
Correspondence	462
Creosoted Wood Paving	461
Dusseldorf Exhibition of City Building	461
Ilkeston Sewage Disposal Works ...	448
Ilkeston Tramways and Electricity Supply	477
Ilkeston Water Supply	474
Institution of Municipal and County Engineers	
East Midland District Meeting at Ilkeston	471
Notices	479
Institution of Municipal Engineers:—	
Northern District Meeting at Newcastle-on-Tyne ...	460
Notices	479
Is the Road Board a Failure?	463
Local Government Board Inquiries	466
Meetings	483
Motor 'Bus v. Tramcars	467
Municipal Competitions Open	481
Municipal Contracts Open... ...	481
Municipal Work in Progress and Projected	468
Personal	470
Recent Publications ...	455
Reinforced Concrete and Bridge Reconstruction	446
Removal of Gas and Water Mains	446
Royal Sanitary Institute	480
Sewage Disposal by Oxidation Methods	458
Sewage Disposal in the United States	445
Society of Engineers	480
Stafford Corporation and the Housing Act	446
Superannuation, Security of Tenure and Mutual Protection	447, 456
Surface Tarring	455
Tenders for Municipal Works or Supplies ...	482
The Crompton Pavement ...	462
Town Planning: Whose Work?	447, 462
Ventilation of Sewers	463

to be floated to a true surface with Portland cement and clean, sharp sand, in the proportion of 1 to 3 by measure, mixed with as little water as will enable it to be properly used.

Description of Blocks.—The wood blocks shall be of the very best description of Jarrah or Karri wood, 3 in. wide, 4 in. deep, and the bulk 9-in. long, cut with fibres vertical, true to gauge, free from all imperfections, thoroughly well seasoned, and equal in all respects to submitted samples. Any blocks varying $\frac{1}{8}$ in. in width or depth from the dimensions given will be rejected. The logs from which the blocks are cut shall have been out of water for at least three months. All inferior blocks brought on the works may be marked in such a manner as to ensure that they shall neither be used in the contract nor brought again upon the works.

Laying Blocks.—The floated surface of the concrete foundation must be swept quite clean before the work of laying the paving is commenced, after which the blocks must be laid in straight lines, with parallel courses at right angles to the channels. The blocks to be laid with both longitudinal and cross joints, of an approved width, and as small as possible, the blocks being placed close and driven in an approved manner. The contractor shall supply all necessary screeds, remove same, and fill in the space left with jointing material.

Bonding, &c.—The blocks shall be laid with proper bonded courses, and shall break joint in all cases. As few closers as is consistent with the proper breaking of the joints are to be used, and none will be allowed less than 4½ in. in length.

Channelling.—The channelling on each side of the roadway shall be formed by laying three rows of wood blocks parallel with the kerbing, with approved gradients and cross fall, the blocks to be laid breaking joint.

Expansion Joint and Kerb.—When the paving abuts upon the kerbs an extension joint of not less than 1½ in. shall be provided, and filled in with a mixture of clay and sand, or equally suitable and approved materials.

Paved Edges to Margins.—When the paving does not abut against the kerb a single longitudinal row of granite setts shall be laid to form a continuous edging to the blocks.

Camber of Surface and Paving round Covers, &c.—The surface of the paving shall be laid to an approved camber. The paving round manhole covers, ventilating covers, valve boxes, &c., shall be properly cut and shaped without extra charge. When the paving abuts against iron covers the adjacent blocks shall be laid at a level not less than ½ in., or more than $\frac{3}{8}$ in. above the top of the cover.

Protection from Inclement Weather.—After the blocks are headed up in position they should be covered with tarpaulins until they are permanently laid, and if from any cause they become wet after they have been laid and before they are grouted, they must be allowed to get perfectly dry before any grouting is proceeded with; and should any water get under them, or dampness appear on the top of the floating, they shall be taken up and not relaid until they and the surface of the floating have become thoroughly dry.

Works on One Side of Road at a Time.—The new work shall be carried out only on one side of the road at a time, and traffic shall not be allowed upon the paving for at least five days after its completion, so that work must be suspended for five days before the breaking up of the other side is commenced.

[This clause only relates to works on roads where it is impossible to close down for traffic.]

Uneven Paving.—Should any portion of the paving after completion be uneven, or retain water on its surface, it shall be taken up and relaid by the contractor at his own expense.

Tar Boilers.—The tar boilers to be of approved type, with provision for leading the gases from the molten pitch to underneath the fire-grate, and they must be in charge of capable men. If required, the furnaces are to be charged with coke. The boilers must be stationed as near as possible to the paving being jointed.

Method of Jointing Blocks.—The blocks to be laid immediately after being dipped, and placed not more than ⅛ in. from the adjoining block, and the joint thoroughly filled and flushed with the hot mixture to within 1 in. of the surface, rubber squeegees being used to sweep the liquid into the joints and prevent accumulation on the surface.

The surface of the wood paving is to be grouted with a mixture of 3 parts sand and 1 part Portland cement, brushed about with brooms until every joint is completely filled up.

Jointing Composition to be Boiling.—The greatest care is to be taken that the whole of the jointing material shall be poured into the joints while it is boiling, and not more than half a bucket of boiling material shall be taken from the boiler for jointing at one time. No jointing to be done in wet weather.

Covering up Paving.—When completed the paving shall be entirely covered with a sprinkling of granite chippings, ¼ in. in thickness, not less than ⅛-in. or more than ⅜-in. mesh. No paving to be so covered until permission has been received, and the contractor shall sweep off and remove the chippings when instructed to do so. (H. B., *Worcester.*)

Tar and Flooded Roads.—Of the 20 miles of road damaged by the recent floods in Huntingdonshire, the roads which suffered least (says the *Standard*) were those tar-painted or made of tar-macadam.

The Western Approach Road Scheme.—The Road Board's Approach Road Scheme for Western London has been the subject, recently, of a number of interesting communications in the *Standard* from road users and residents in the districts affected by the proposal. In Tuesday's issue of our contemporary prominence is given to a statement by Mr. H. Percy Boulnois, M.INST.C.E., late deputy chief engineer to the Local Government Board, member of the Advisory Engineering Committee of the Road Board, and vice-chairman of the Roads Improvement Association, who advances several arguments in favour of a by-pass road at Brentford. Mr. Boulnois' view is that London wants new outlets, altogether irrespective of the question of widenings, and he considers that an entirely new road would be better for traffic purposes than any widening at Brentford. He does not think it possible to have too many roads. Regarding the objections of shopkeepers, he points out that for them the wide thoroughfare is not ideal, and that it is in the narrow streets everywhere that the best trade is done. "It must not be forgotten," he adds, "that a wide road is very costly to maintain, to water and to scavenge. These points all serve to emphasise my contention that two roads are better than one."

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Chelmsford T.C. September 9th. Mr. M. K. North. £1,750 for the purchase of gas engine and engine-house at the Melbourne-road waterworks; £90 for works of sewerage in Rectory-lane; £450 for surface-water drainage in Newstead, Rectory-lane and Broomfield, and £340 for additional cattle pens, &c., in the market. The application for the £1,750 was supported by Councillor T. H. Waller, chairman of the Sewer and Water Committee. Councillor W. Harper suggested that it would be cheaper to extend the present corrugated-iron building. The borough surveyor, Mr. P. T. Harrison, said it was proposed to use the corrugated iron of the present building for a coal store, so that the material would not be thrown away. There was no objection in respect of the sum of £340 for new cattle pens, &c. With reference to the sums of £90 and £450, the town clerk, Mr. W. Smith, explained that plans had been passed for the erection of houses at the west end of Rectory-lane, and it was necessary that the sewer should be extended; and in consequence of the erection of the Marconi Works and other buildings, surface-water drainage was also considered necessary in the other streets referred to. The borough surveyor explained the plans.

Frinton U.D.C. (September 4th. Mr. F. H. Tulloch).—This was an application for sanction to borrow money for providing a cemetery on land at Kirby Cross.—Dr. H. W. Godfrey, medical officer of health, said the present burial ground was practically full, and the new site they had decided upon seemed to him to be really most suitable, regarding the aspect, subsoil and other things. Drainage of the site could be carried out efficiently without any source of danger to residents, and the effluent would be treated bacteriologically. There was considerable opposition to the scheme.

Hull T.C. (September 26th. Major J. Stewart).—£1,200 for the purchase of land in Gillett-street, £25,661 for street improvement and sewerage, and £2,175 for land on Hessle-road for the purpose of an open-air recovery school and playing fields.—It was stated that the corporation had an option of 6 acres of land on Hessle-road, at the present valuation, at £300 per acre. The school was intended for delicate and tuberculous children, and when the district was built [illegible] Evidence was also given with respect to the street and sewerage schemes.

Leyton U.D.C. (September 17th. Major J. Stewart).—[illegible] Hall.—The surveyor, Mr. E. H. Essex, stated that [illegible] about thirty years ago. The council had not yet determined whether the work should be done by [illegible] The length of the sewers to be constructed was 2,100 lin. yds. and the number of [illegible] 1,282.

New Forest R.D.C. (September 17th. Mr. Edgar Dudley).—[illegible] at the corner of the Rosery-road, and erecting [illegible] Details of the scheme were explained by Mr. I. Sanders, surveyor and architect. He stated the sum asked for the property was £1,150. After the purchase there would be about 2½ acres for building, and the [illegible] £1,000 of the total sum and £37 6s. 8d. of the annual cost. The cost of the property [illegible] £1,150.

Stamford T.C. (September 28th. Major J. Stewart).—[illegible] —The borough surveyor, Mr. T. F. R. Ryman, explained the scheme, and said he did not think the present works could be adapted to deal with the sewage adequately without the expenditure of the sum asked for. The inspector remarked that he was [illegible]

Swansea T.C. [illegible] £1,000 for the compulsory purchase from the Victoria Park Trustees of Mansel-road, and the Mumbles and London and North-Western Railways, to the Sand [illegible] £1,000 for the purpose of street improvements in Worcester-place.—The town clerk, Mr. H. Lang-Coath, explained that the corporation, having acquired the foreshore, desired now to connect the park with the Sands by means of a reinforced-concrete bridge, for which a tender of £1,147 had been received. The structure would supply a long-felt want in the town, and obviate what was at times a very dangerous state of affairs by reason of the crowds going to and from the Sands at two level crossings at the Slip. The inspector stated that a reinforced-concrete bridge, such as was proposed, would be the first of its kind in this country, and he would require trial holes to test the foundations for the bridge, and information as to the various levels of the water during spring and extraordinary spring tides, and, in the circumstances, he would adjourn that part of the inquiry *sine die*. The borough surveyor, Mr. Geo. Bell, gave the necessary explanatory details of the street improvement scheme.

Yeovil T.C. (September 18th. Mr. Edgar Dudley).—£1,225 for the construction of a new street from Earl-street to Middle-street.—The town clerk, Mr. H. Copeland Batten, stated that there was a considerable amount of traffic at the present time at the approach to the town station, and it was certainly somewhat congested. Middle-street, which was the main thoroughfare of the town, was very narrow, and the council's idea was that if there was a road opposite the town station it would greatly relieve the traffic in Middle-street, and prove a great boon to people living in that neighbourhood. Another fact was that this part of the town was greatly in need of being opened up, and the council had been wishing to bring about this work for a considerable time. The street was to be 36 ft. wide. The borough surveyor, Mr. A. Oddy, gave details of the construction of the street, and said the surface of the carriageway would be of macadam, and that of the footway of asphalt.

Yiewsley U.D.C. (September 11th. Mr. Edgar Dudley). £400 for the purchase of land at the junction of High-street and Fairfield-road, as a site for public offices.—The site comprises the present offices, with the two cottages adjoining, together with a piece of land at the rear. It was stated that the council were at present tenants of their offices, and that it was proposed to purchase the freehold of the properties, and to continue to make use of these premises until they were in a position to build new offices.

APPLICATIONS FOR LOANS.

Brighouse T.C. £18,500 for sewage outfall works.

Colne T.C.—£2,100 for works of conversion to the [illegible] system.

Eastleigh U.D.C.—£1,250 for sewerage and £450 for road improvement purposes.

Harrow U.D.C.—£1,150 for building cottages and [illegible] and £440 for sewerage to the isolation hospital.

Hinckley U.D.C.—£5,800 for works of sewerage.

Ipswich T.C.—£440 for sewer extensions.

Penrith R.D.C.—£150 for a branch water main.

Sunderland T.C.—£110 for school enlargement.

Tamworth T.C.—£3,000 for laying out pleasure [illegible]

Tilbury U.D.C.—£900 for new equipments for street lighting.

LOANS SANCTIONED.

Acton U.D.C.—£7,865 for the reconstruction of carriageways with tar-macadam, £1,493 for the purchase [illegible] and £415 for works of sewerage (twenty years and eighteen years respectively from the date of borrowing) in connection with the expenditure incurred under the Acton Street Improvements Provisional Order, 1905.

Cambridgeshire C.C.—£1,600 for new county buildings.

Caxton R.D.C.—£400 for works of water supply.

East Ham T.C.—£8,628 for a fire station and fire-[illegible] dwelling.

Stone U.D.C.—£592 for the widening of North-street.

Stone R.D.C.—£425 for sewerage works.

Wrexham T.C.—£1,800 for extensions to electricity [illegible]

FORTHCOMING INQUIRIES.

OCTOBER

			£
7	**Egremont.**	For the purposes of the gas undertaking (Mr. A. W. Brotherton)	1,000

		£
7	**Finchley.** For the provision of open spaces (Mr. Edgar Dudley)	8,450
"	**Bishop Stortford.** For building a bridge (Mr. A. G. Drury)	666
"	**Bridlington.** For a housing scheme (Mr W. H. Collin)	4,700
8	**Bridport.** For the reconstruction of a bridge (Mr. H. R. Hooper)	800
"	**Dudley.** For works of sewerage (Mr. R. H. Bicknell)	1,136
8	**New Hunstanton.** For the provision of a public convenience (Mr. H. Shelford Bidwell)	324
8	**Orsett.** For water supply purposes (Mr. A. A. G. Malet)	225
"	**Ramsgate.** For the extension of East Cliff Promenade (Mr. F. O. Stanford) ...	3,206
8	**Saltburn.** For the purchase of brine baths (Major C. E. Norton)	3,500
8	**Shepton Mallet.** For water supply purposes (Mr. W. O. E. Meade-King) ...	1,650
8	**Wirral.** For street improvement purposes (Mr. M. K. North)	2,948
8	**Withnell.** For works of water supply (Mr. Courtenay Clifton)	830
9	**Bromsgrove.** For sewage disposal purposes (Mr R. H. Bicknell)	1,600
9	**Chester-le-Street.** For a housing scheme (Mr. W. H. Collin)	12,830
9	**Crewkerne.** For sewage disposal works (Mr H. R. Hooper)	4,062
9	**Margate.** For land and recreation ground purposes (Mr. F. O. Stanford)	7,500
9	**Southend.** For street and water drainage works (Mr. A. A. G. Malet) ...	9,312
9	**Turton.** For street improvement purposes (Mr. Courtenay Clifton)	37,000
9	**Wem.** For works of water supply (Mr Mr. K. North)	250
9	**Whitchurch.** For works of water supply (Mr W. O. E. Meade-King)	1,350
10	**Chard.** For works of water supply (Mr. H. R. Hooper)	13,584
10	**Ellesmere.** For water supply works (Mr. M. K. North)	2,500
10	**Kirby Moorside.** For water supply works (Major C. E. Norton)	7,600
10	**Lees.** For street widening purposes (Mr. Courtenay Clifton)	180
10	**Ross.** For works of water supply (Mr. W. O. E. Meade-King)	700
10	**Royston.** For sewage disposal works (Mr. H. Shelford Bidwell)	2,000
11	**Bowland.** For sewage disposal purposes (Mr. A. W. Broughmore)	2,320
11	**Campden.** For works of sewerage (Mr W. O. E. Meade-King)	250
11	**Chester.** For works of sewerage (Mr. M. K. North)	4,000
11	**Driffield.** For works of water supply (Major C. E. Norton)	550
11	**Heaton Norris.** For street improvement purposes (Mr. Courtenay Clifton) ...	3,576
11	**Rushden.** For sewage disposal and recreation ground purposes (Mr. H. Shelford Bidwell)	14,800
11	**Sidmouth.** For works of surface water drainage (Mr. H. R. Hooper)	195
12	**Reading.** For cattle market and street purposes (Mr. W. O. E. Meade-King) ...	4,933

Superintending Sanitary Engineer Wanted.—We have attention to an announcement in our advertisement pages of an appointment as superintending sanitary engineer for service in the Gold Coast. It will be observed that applications have to be addressed to Mr E. White Wallis, the secretary of the Royal Sanitary Institute and must be received by Tuesday next. We draw attention to the appointment at the earliest opportunity afforded, and are not, therefore, responsible for the briefness of the period remaining for sending in applications.

MOTOR 'BUS *v.* TRAMCARS.

By A "Surveyor" Engineer Correspondent.

The advocates of tramcars have been having it all their own way at the recent conference of tramway managers, and from the point of view of these prejudiced persons the motor 'bus is an abominable nuisance, which ought to be suppressed, or so heavily taxed that it would be unable to compete with the tramcar. But let us take a dispassionate view of the whole question. The horse-drawn tramcar came from America, and was introduced into this country when there were only horse omnibuses of inferior construction and incommodious interior. Then came the tremendous boom of overhead electric traction, and for many years the tramcar had it all its own way. But with the advent, and great developments, of the motor omnibus all this has been altered. This new vehicle combines all the advantages of the tramcar, with none of its drawbacks. It requires no special expensive railway on which to run. It is independent of a breakdown in the whole system by an accident to the central power station, or of a temporary breakdown in a tramcar which similarly stops all the cars behind it. It carries its own power (petrol), and is independent of coal strikes. It is flexible, and, if obstructed by traffic, can diverge to either right or left, and thus pass the obstruction, whereas a whole line of tramcars can be, and frequently is, blocked by an obstruction on the rigid road on which they are compelled to run. A motor 'bus can keep the "rule of the road," and thus avoid disturbance to other traffic, whereas a tramcar is fixed on a rigid road, and is unable to give way, either to right or left, thus frequently causing serious obstruction to the general traffic and even danger to the public. To pass a tramcar on the wrong side, which has frequently to be done, is dangerous, and to pass it on the "off" side constitutes an equal danger, as another tramcar may be coming, and the excessive length of a tramcar makes this operation one of painful anxiety while it lasts. The tramrails also offer a tempting track for heavy horse traffic, and where these are in the centre of a road a long line of slowly moving vehicles in the centre of a road is a serious obstruction and source of danger to the other more rapid traffic.

As to the public convenience, the motor 'bus can stop to let down or pick up a passenger at any point, whereas a tramcar only stops at certain stopping places. Nothing is more exasperating than just missing a tramcar because a would-be passenger is some 30 yds. or 40 yds. short of a stopping place, and a breathless run only makes him just miss the car. The fact is that the tramways in our streets have become a dangerous monopoly of public thoroughfares, which were never intended for railways, but for the use of the general traffic. Anyone who has eyes and observation can see a dozen or more places in London where the tramway traffic causes the most serious obstruction to the general traffic, and consequent loss of money to traders. A very large percentage of serious street accidents is caused, either directly or indirectly, by the presence on their fixed lines of these huge "Juggernauts," which are unable to budge a single inch in order to relieve the pressure of the moment. It was all very well to argue that the tramcar was essential for the convenience of the general public in the old days of the horse omnibus, but now that equal, if not better, facilities are provided by the modern motor 'bus, it is quite time that railways should no longer be permitted in our streets.

The London County Council and other local authorities have "gone nap" on tramways, and vast sums of the ratepayers' money have been invested in this method of mechanical traction, which is already doomed to failure on account of its many imperfections in the light of recent developments in mechanical traction. It would be well if these authorities could realise this before committing themselves to further useless expenditure on a system of street locomotion which is already quite behind the times, and in a few years will be obsolete. Motor 'buses are with us, and in the form of "trackless trams" they are coming.

Hay (Brecknock) Sewage Disposal Scheme.—Messrs. Willcox & Raikes, of Birmingham, are the engineers of a scheme promoted by the Hay Urban District Council for the treatment of the sewage on bacterial lines.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Denbigh, Devon £13,500, Luton £13,545, Newton Abbot; housing and town planning—Tilbury; roads and materials—Brentford, Devon; sewerage and sewage disposal—Brighouse £18,500, Fareham £12,831, Leigh, Tredegar £21,279; miscellaneous—Edinburgh.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

ADMINISTRATION.

Derby T.C.—The salaries of ten members of the professional and clerical staffs in the surveyor's department have been increased by £95 per annum in the aggregate.

Tutbury (Staffs) R.D.C.—The clerk, at a recent meeting, read a circular-letter from the Local Government Board with reference to by-laws as to new streets, buildings, &c. Questioned by a member, the surveyor, Mr. H. S. Tebbitt, stated that some of the by-laws in force in the council's area were too stringent, and might, with advantage, be relaxed. Some of the regulations, he added, were so strict that they did not enforce them—not at all a business-like method of procedure.

BUILDINGS.

Aldershot U.D.C.—The surveyor, Mr. F. C. Uren, has been instructed to prepare plans for underground conveniences in the municipal gardens and in the grove.

Banffshire C.C.—The Keith District Committee recommend that a bridge and approaches for cart traffic be constructed at Mill of Tombreckachie, at an estimated cost of £150.

Cardiff T.C.—The Parks Committee recommend the provision of an open-air bath, 200 ft. by 50 ft. Mr. W. Harpur, the borough engineer, informed the committee that the cost of the bath would not at the outside exceed £2,000.

Chester T.C.—Sir Francis Fox, M.Inst.C.E., has presented a report on the condition of Old Dee Bridge, in which he recommends that the weak portions of the foundations should be filled with hydraulic cement by means of a grouting machine.

Denbigh T.C.—Plans have been prepared for a new town hall and market, and it is intended to apply for a loan for the erection of the buildings.

Devon C.C.—A scheme has been passed for the building of a sanatorium with ninety beds, at a cost of £13,500. Dispensaries are also to be provided.

Erith U.D.C.—The tender of Mr. J. W. Ellingham, of Bexley Heath, at £357, has been accepted for the erection of a convenience at Abbey Wood.

Finchley U.D.C.—The tender of Messrs. C. Halls & Co., at £1,339, has been accepted for the erection of a public convenience.

Luton T.C.—The tender of Mr. T. Higgs, of Northampton, at £13,545, has been accepted for the erection of public baths.

Newton Abbot U.D.C.—A committee has been appointed to consider several suggested schemes for public baths.

Plymouth T.C.—Workshops are to be provided at the Compton tramways depot, at an estimated cost of £800.

Scarborough T.C.—The borough engineer, Mr. H. W. Smith, has received instructions to prepare plans for the erection of seven bungalows and a convenience at the north-east corner of the land south of the Spa.

HOUSING AND TOWN PLANNING.

Battle U.D.C.—The Local Government Board have written approving generally of the council's housing scheme, and suggesting that it should be extended by the provision of further dwellings.

Branston R.D.C.—The tender of Messrs. Wallhead Bros., of Ruskington, at £1,408, has been accepted for the erection of eight workmen's dwellings.

Burnley T.C.—It has been intimated that the decision of the Local Government Board with respect to the proposed closing of certain houses as unfit for habitation is in favour of the corporation.

Liverpool T.C.—The number of dwellings now owned by the municipality is 2,663, classified thus: 193 one-roomed, let at 1s. 6d. to 2s. 6d., according to position; 1,227 two-roomed, 2s. 6d. to 3s. 6d.; 960 three-roomed, 3s. 6d. to 4s. 6d.; 273 four-roomed, 4s. 6d. to 5s. 6d., the latter including fifty-two self-contained cottages in the Bevington-street area, recently opened. The total gross rental is £26,750 per annum. Of this, £21,370, or 98·20 per cent of the total rental, was collected last year, the Bevington-street area, of course, not being included in this calculation. The capital expenditure involved approximates to about £1,100,000.

Tilbury U.D.C.—On Monday evening the council passed a resolution deciding to proceed with the first portion of their new housing scheme, and their surveyor, Mr. S. A. Hill-Willis, was instructed to bring up plans and specifications for 100 houses, and to make arrangements for engaging, and ascertain the terms of, an architect of repute to assist him in the elevations and advise generally on the design.

PARKS AND OPEN SPACES.

Ellesmere Port U.D.C.—A sub-committee has been appointed to select a site for a public bowling green.

Oldham T.C.—The borough surveyor, Mr. E. C. Foote, has prepared a scheme for laying out the Hargraves Recreation Ground, Oldham Edge. The proposals comprise two bowling greens, bowl-house and shelter, rebuilding the wall in front and surmounting it by ornamental iron railings, fencing elsewhere, and drainage of the bowling greens to a sump manhole.

Tamworth T.C.—The council have approved the scheme of the borough surveyor, Mr. F. E. G. Bradshaw, for laying out the pleasure grounds and incidental works, at an estimated cost of £3,000.

REFUSE COLLECTION AND DISPOSAL.

Guildford T.C.—In consequence of coal having to be used to drive the plant of the dust destructor in the absence of sufficient refuse, due to the increased use of gas stoves, an estimated annual saving of £160 on the destructor scheme has been converted into a deficit of £825, which is equal to a charge on the rates of 1½d. in the £.

Pontypool U.D.C.—The tender of Messrs. Heenan & Froude has been accepted for the erection of a refuse destructor. The estimated cost of the scheme is £1,600.

ROADS AND MATERIALS.

Alnwick R.D.C.—A committee has been appointed to consider the question of forming a new road from Shilbottle Colliery and the Greenrigg Kennels.

Banffshire C.C.—A letter was read at the last meeting of the Keith District Committee from the clerk to the Elgin County Council regarding the administration of the Road Improvement Fund by the Road Board, and suggesting that steps be taken to induce the Road Board to alter their policy with regard to the matter. It was agreed to ask Captain Waring, M.P., to discuss the question with Sir Archibald Williamson, to enable the northern counties to obtain a share of the money unrestricted by impossible and unnecessary conditions.

Brentford U.D.C.—Sir George Gibb, chairman of the Road Board, has intimated the county that the final and decisive view of the board was that they could not entertain any idea of widening Brentford High-street; 90 per cent of the traffic through the street was not local. He intimated that an Act of Parliament would have to be promoted for the new motor road which the board proposed to construct.

Camberwell B.C.—The Works Committee recommend the council to concur in the objection raised by the Stepney Borough Council to the overhead system of traction being established in any thoroughfare in the Metropolis unless the consent of the local authority has been obtained.—The borough engineer, Mr. W. Oxtoby, reports that he has made an application to the Road Board for a grant towards the cost

of widening Red Post-hill.—The borough engineer, pursuant to instructions from the Works Committee, has prepared a cartoon plan showing a line of suggested road improvement from Dulwich to Old Kent-road. The route followed is from Lordship-lane at the junction of Crystal Palace-road in a northerly direction along Crystal Palace-road, across Goose Green, along Adys-road to Oglander-road, thence by a new spur road to Bellenden-road, along Bellenden-road, Victoria-road, and Victoria-place, to High-street, Peckham, and thence along Sumner-road and Trafalgar-road to Old Kent-road. The committee consider that if the necessary widenings were effected this route would form a very desirable one for the construction by the London County Council of a relief tramway, which would materially improve the present means of communication between Old Kent-road, Peckham, and Dulwich, and would also lessen the number of cars required to pass over Dog Kennel-hill.

Chislehurst U.D.C.—The council have agreed to the offer of the Metropolitan Water Board with regard to the charge to be made in respect of the use of water for road repairs, that 3 per cent of all water taken by the local authorities from the metered standposts shall be deemed to be used in respect of road repairs and paid for at the rates specified in sec. 16 of their Charges Act of 1907.

Coventry T.C.—Land is to be purchased in order to widen the High-street on the south side.

Derby T.C.—For the purpose of street widening, property in Osmaston-road is to be purchased for £875. The Improvement Committee also ask for £375 for the acquisition of 1,548 yds. of land between Nottingham-road and Francis-street.

Devon C.C.—The Road Board propose to make a grant of £13,430 for road improvements, exclusive of the sum of £5,000 which has been set aside for widenings, improvement of corners, and similar kinds of road works. The board also offer to advance £20,000 on loan to the council, free of interest, in order to expedite the work of road improvement.

Dundee T.C.—A Provisional Order is to be promoted for the scheduling of property in Overgate and behind the Town House in furtherance of the improvement scheme.

Hailsham (Sussex) R.D.C.—The council passed the following resolution last week: "This council is of opinion that the revenue from the duty on petroleum and motor licences should be distributed to all the road maintenance authorities in the area of collection, and that the distribution should be proportioned according to the amount expended on materials by such authorities."

Heiston R.D.C.—The necessary land having been given for a road to avoid the widening of the two corners in Gunwalloe-road, it has been agreed to make an application to the Road Board for a grant towards the cost of the work, which the surveyor (Mr. C. E. Bearden) estimates will exceed £400.

Montgomery C.C.—The Main Roads Committee reported at the recent meeting of the council that, having heard the proposals of the county surveyor (Mr. G. A. Hutchins), they were of opinion that the creation of a special plant for making tar-macadam should be deferred until it could be ascertained whether tar-macadam was a success. Mr. Naylor said he thought tar-macadam had proved a success, but the report seemed to indicate otherwise. The county surveyor said he thought the tar-macadam put down in their county was perfectly satisfactory. The thing they wished to consider was whether it was more economical than ordinary macadam, and one year's experience was not enough to judge by. Mr. Hurlbutt said there was the published experience of other counties to judge by that tar-macadam was an economic success. Eventually it was agreed that the county surveyor should prepare a report based on the experience of their own and other counties as to whether tar-macadam was advisable.

Plymouth T.C.—Tenders have been accepted for making up the undermentioned thoroughfares at the cost of the owners, as follows: Kingswood Park-villas, Pethick Brothers, £557; Endsleigh Park-road, Pethick Brothers, £348; Gwynn-road, Section 4, T. Shaddock, £197.

Saffron Walden T.C.—Victoria-avenue is to be made up according to the plan and estimate of the borough surveyor, Mr. A. H. Forbes, at a cost of £863.

Southend T.C.—The tenders of Mr. W. Iles, of Southend, at £16,135, have been accepted for making up work, and for the formation of a new thoroughfare for light railway extension.

Tewkesbury T.C.—The borough surveyor, Mr. W. Ridler, has received instructions to tar the footways during the autumn.

Withernsea U.D.C.—A resolution has been passed by which the council agree to contribute towards the construction of two groynes on a three-quarter basis on condition that the whole of the frontagers convey the necessary land for a 40-ft. roadway.

SEWERAGE AND SEWAGE DISPOSAL.

Brighouse T.C.—A scheme for the extension of the sewage outfall works at Cooper Bridge, at an estimated cost of £18,500, has been approved.

Earby U.D.C.—The surveyor, Mr. J. E. Aldersley, has been asked to modify his plan and scheme for sewage disposal works, in order to reduce the cost.

Fareham R.D.C.—Plans for the sewerage of Lee-on-the Solent, at an estimated cost of £12,831, have been forwarded to the Local Government Board.

Hexham R.D.C.—The tender of Messrs. J. W. Henderson, of South Gosforth, at £2,285, has been accepted for the sewer extension at Painshawfield.

Kidderminster T.C.—Messrs. Willcox & Raikes have been appointed to report on the additional land proposed to be acquired for sewage disposal purposes at Birchen Coppice and Dropping Wells Farms, with a view to an application being made to the Local Government Board for permission to borrow £13,500 to complete the purchase of the land.

Leigh (Essex) U.D.C.—The council have approved the preliminary scheme for the construction of a new main outfall sewer to relieve the existing old town sections.

Linthwaite U.D.C.—The tender of Messrs. J. Wimpenny & Co., at £887, has been accepted for the supply of earthenware pipes and manholes.

Newcastle (Ireland) U.D.C.—The council have asked the Local Government Board to hold an inquiry into their proposed sewerage scheme, with foreshore outfall.

Spalding U.D.C.—The Sanitary Committee have a drainage scheme under consideration.

Stoke-on-Trent T.C.—A sludge-pressing plant is to be installed at the Tunstall sewage works, at an estimated cost of £520.

Tredegar U.D.C.—The tender of Messrs. W. Waring & Sons, of Huddersfield, at £21,279, has been accepted for the carrying out of the district sewage disposal scheme.

WATER, GAS, AND ELECTRICITY.

Cardiff T.C.—A sum of £11,250, with an additional £1,250 as compensation for the effect on other land, is to be paid for 50 acres of land at Cwm Taff, in connection with the new Llwynon reservoir.

Chelmsford T.C.—The borough surveyor, Mr. P. T. Harrison, has been instructed to prepare alternative estimates of wells 7 ft. and 8 ft. in diameter for a depth of 400 ft.

Edinburgh T.C.—Two new cooling towers have been erected in connection with the electric lighting station at Dewar-place. The towers were rendered necessary owing to the introduction of turbine machinery to be worked in connection with the new condensing plant. The extra plant will be capable of producing an increased output of about 3,500,000 units a year, making 10,500,000 units, and the saving in coal will then be over £10,000 a year. The whole scheme has cost about £45,000.

Evesham T.C.—The borough surveyor, Mr. H. Harvey, has received instructions to lay a new 4-in. water main, with sluices, in King's-road, as far as the upper end of North-road, and a 3-in. main to the north end of King's-road.

Howden R.D.C.—The scheme prepared by Mr. Percy Griffith, Westminster, for a new supply of water for the district has been approved, and Mr. Griffith has been engaged as engineer to carry it out. Application has been made to the Local Government Board for a Provisional Order under the Public Health Act, 1875, for the purchase of land, and meanwhile a trial bore is to be laid down.

Leeds T.C. The tender of Messrs. Leech, Goodall, & Co., at £15,632, has been accepted for an installation of one bench of five beds of Dessau vertical retorts at Meadow-lane gasworks.

Newmarket U.D.C.—The Newmarket Gas Company's tender, at £975 per annum for ten years, has been accepted for the public lighting of the district.

Pontardawe R.D.C.—It has been decided to grant facilities to Messrs. Gilbertson & Co. for the installation of the electric light in certain parts of the business places of the town.

Slough U.D.C.—The local waterworks have been taken over, and will henceforth be administered by the council.

MISCELLANEOUS.

Edinburgh T.C.—The subject of tramway extensions, which has been in abeyance for a year, has been again under consideration of the Tramway Committee. Railless traction was the last system discussed, the question to permit of the officials learing the results of experiments in London being postponed. Last week the city engineer, Mr. A. H. Campbell, reported briefly on the three systems—railless, self-propelled cars, and motor omnibuses. It was finally remitted to the Sub-Committee on New Tramways, and the city engineer to obtain a report about the three systems, with costs, &c. If so advised, the council will apply for Parliamentary powers, it being understood that these would be required even for a system of omnibuses.

Hollingbourne R.D.C.—Messrs. Chittenden & Simmonds' quotations of 2s. 10d. per hour for providing steam rollers, and 3s. for scarifying 100 super. yds., have been approved. The estimate of Messrs. Haynes Brothers for tools, and a quotation of £4 2s. 6d. for three wheelbarrows, by Messrs. Shilling & Cripps, Boxley, have also been accepted.

Llandudno U.D.C.—Owing to the introduction of mechanical improvements and the use of mechanical stokers, the council saved £1,100 in fuel during the last financial year at the electricity works, and, notwithstanding a reduction in the price of current, a nett profit of £884 was made.

PERSONAL.

Mr. D. T. G. Brown, surveyor to the Sherborne Urban District Council, has had his salary increased by £35 per annum.

Mr. James S. Smith, surveyor to the Kintyre district of the Argyll County Council, has had his salary increased by £50 per annum.

Mr. P. J. Kelly, assistant surveyor to the Londonderry Corporation, has been appointed surveyor to the Northern District of Donegal.

Mr. Fred. S. Clarkson, assistant surveyor to the Fleetwood Urban District Council, has accepted the position of surveyor to the Fleetwood Estate Company.

Mr. A. James Meeson, surveyor to the Brentwood Urban District Council, has been elected a member of the Institution of Municipal and County Engineers.

Mr. H. Cackett, surveyor to the Redruth Rural District Council, has been voted an increase of salary from £104 to £130 per annum. He made a request to the council for a testimonial, upon which a discussion ensued, and after it had been stated that the council would have to pay £150 a year if they advertised for a successor the advance of salary was granted.

Mr. Joseph Robinson, assistant county surveyor of County Longford, while inspecting roads in his district was set upon and severely injured at Newtownforbes by a road contractor, who, it appears, had been struck out in respect of a road contract. He was taken to the Lanesborough Workhouse, where Dr. Delany was called in and dressed several wounds on his head.

Mr. John Dixon, of Peak Mount, Consett, died on August 31st, at the age of 67 years. Mr. Dixon assisted in the erection of the old Town Hall, Consett, which was burned down some years ago. Afterwards he became surveyor and inspector to the old Local Board at Consett, and for over a quarter of century he occupied similar positions under the Benfieldside Local Board and the Benfieldside Urban District Council. He retired about ten years ago, and was subsequently elected a member of the council, but, owing to failing health, he relinquished office after holding it for two years.

Mr. E. A. Brookes, county surveyor of Cornwall, was the victim of a misstatement in a local newspaper which has now been explained by the clerk of the St. Columb Rural District Council, Mr. C. E. Whitford. The latter, according to the report, stated that "the office of the county surveyor" was in a regular muddle. Mr. Whitford told the members of his council that he never said anything of the kind, for he had never been in that office. He would like to make it plain that he did not make use of the remark, but, arising out of a recent question between them and the county council over the highway account, he suggested that their surveyors and assistant clerk should go to the county surveyor's office to unravel the muddle which existed.

FOR OTHER ADVERTISEMENTS
See End of Paper.

CROYDON RURAL DISTRICT COUNCIL.
TO WOOD PAVING CONTRACTORS AND OTHERS.

The above Council invite Tenders for Laying approximately 10,800 super. yards of Soft-Wood Paving in the London-road, Mitcham, and in High-street, Collierswood.

Plans and Specification, prepared by the Council's Surveyor, Mr. Robt. Chart, junr., can be inspected, and Forms of Tender obtained, at his Offices, Katharine-street, Croydon, on payment of £2 (which will be returned on receipt of a *bonâ-fidê* Tender).

Sealed Tenders, endorsed "Tender for Wood Paving," must be delivered to the undersigned before 12 o'clock noon on Thursday, the 17th day of October, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

E. J. GOWEN,
Clerk to the Council.

Council Offices,
Katharine-street, Croydon.
October 1, 1912.

HOWDEN RURAL DISTRICT COUNCIL.
TRIAL BORING AT SOUTH NEWBALD, EAST YORKS.

The Council are prepared to receive Tenders for the Construction of a Trial Boring in the Parish of South Newbald, in the East Riding of Yorkshire, and for Testing the Yield of Water therefrom. Copies of the Specification and Form of Tender can be obtained from the Engineer, Mr. Percy Griffith, M.INST.C.E., F.G.S., 20 Victoria-street, Westminster, S.W., on payment of a deposit of Two Guineas (by cheque), which will be returned on receipt of a *bonâ-fide* Tender by the date named below.

Sealed Tenders, endorsed "Tender for Trial Boring," to be delivered to the undersigned not later than Friday, October 11th, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

By order of the Council,
HENRY GREEN,
Solicitor and Clerk.

Howden, East Yorkshire.

SURVEYOR'S CLERK.

The Frimley Urban District Council require the services of a General Clerk in the Surveyor's Department, at a salary of £52 per annum. Applicants must be good shorthand writers and typists, and must have had previous experience in a Surveyor's Office. Applications, in applicant's own handwriting, stating full particulars as to age, experience, &c., accompanied by copies of not more than three recent testimonials, to be sent to Mr. T. Clement James, Surveyor, Municipal Buildings, Camberley, not later than first post Saturday, October 12th, 1912. No forms of application.

REQUIRED, for a few months, in London, a Draughtsman capable of preparing plans, specification, &c., in connection with a small bridge, and incidental building works.—Reply, stating salary required, &c., to Box 1,185, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

Institution of Municipal and County Engineers.

EAST MIDLAND DISTRICT MEETING AT ILKESTON.

A well-attended meeting of the Institution of Municipal and County Engineers was held on Saturday last at Ilkeston. As recorded elsewhere in this issue, new sewage disposal works for the town were opened on Wednesday last, and the members were enabled to make a close examination of the undertaking in the course of the afternoon, a detailed description of the works, prepared by Mr. H. P. Raikes, the engineer, being circulated for the convenience of those taking part in the inspection. This, together with papers on the water supply and tramway and electricity undertakings, by Mr. H. J. Kilford, the borough surveyor, and Mr. H. P. Stokes, the borough electrical engineer, formed the subject of an interesting discussion at the meeting, at which Mr. R. J. Thomas (Buckinghamshire), the president, occupied the chair, others present including Messrs. E. W. Booth (Manchester), H. Bottomley (Bingley), W. Burn (Sutton-in-Ashfield), J. Clarke (Sleaford), W. G. J. Clarke (Wigston Magna), R. E. Clarke (Arnold), R. C. Cordon (Belper), H. J. Coleby (Atherstone), C. A. Clews (Derby), W. H. A. Court (Leicester), E. H. Crump (Hinckley), A. H. Elliott (Nottingham), E. J. Elford (Southend-on-Sea), T. Frank (Ripon), A. D. Greatorex (West Bromwich), J. R. Hadfield (Uttoxeter), J. C. Haller (Carlton), T. Henry (Retford), E. Purnell Hooley (Notts), J. D. Kennedy (East Retford), J. Lobley (Stoke-on-Trent), R. A. MacBrair (Lincoln), W. B. Madin (Rushden), S. Maylan (Basford), E. G. Mawbey (Leicester), R. Oakden (Newark), J. A. Settle (Heywood), P. H. A. Smith (Leicester), S. Turner (Ashby-de-la-Zouch), A. G. Wheeler (Eastwood), C. F. Wike (Sheffield), J. E. Wilcox (Birmingham), F. W. Wright (Ilkeston); Alderman C. A. Sudbury, J.P. (chairman Finance Committee, Ilkeston), Alderman Moss (chairman General Works Committee), Alderman Beardsley (chairman Gasworks Committee), H. J. Kilford (borough surveyor), S. S. Robinson (assistant surveyor), H. P. Stokes (tramway engineer), G. Knowles (assistant town clerk), F. C. Humphreys (gasworks manager), J. Baker (chief sanitary inspector), J. E. Carter, E. H. Colgrove, H. Collins, J. R. Elliot, W. S. J. Haseldine, H. L. Hall, W. Harvey, C. F. Hodson, W. Keay, H. P. Raikes, C. Raynor, F. Rist, F. M. Royle, H. H. Sands, W. Sanders, A. J. Smith and F. Tuckey.

In receiving the members at the free library, the Mayor (Councillor S. Shaw, J.P.) said that everyone who studied the numerous costly and important works carried out by the public authorities of this country must be impressed by the responsibilities placed on the shoulders of municipal engineers. Their duties imposed a thousand-and-one claims upon their attention, and it seemed to him that no department of a public body was independent of their help. The thoroughness with which municipal undertakings were usually carried out always appealed to him, and it was his hope that that condition of affairs would continue, and that the municipal engineer would never sacrifice good work in the mistaken idea of effecting economies. He was afraid there was a tendency at the present time to do work on a cheaper scale, but he trusted the day was far distant when the members of the municipal engineering profession would adopt such methods. The nation owed its present position to the solidity underlying all our manufactures, and his belief was that if they continued on the same lines in all they undertook they would always hold their own with their competitors in other countries. There was little of historic interest in Ilkeston to show them, but although they were a young borough they were a very progressive one, for, as they were aware, they were the owners of the town's gas, water and tramway undertakings. He was obliged to admit, however, that so far as the tramways were concerned they were like the people who "married in haste and repented at leisure," for, although they were the first town in Derbyshire to have electric tramways, they were the first to regret having them. His Worship, in conclusion, expressed regret that, owing to a severe operation which he was obliged to undergo about three weeks before, he would be unable to accompany the members on their visits of inspection during the day, but he trusted that their stay in the town would prove an enjoyable and instructive one.

The President (Mr. R. J. Thomas), in proposing a vote of thanks to the mayor, warmly acknowledged the compliment paid to the institution by his Worship in being present in person to receive them, despite his recent illness. In the course of further remarks, Mr. Thomas said that what had struck him particularly was the pertinacity of the town council in determining to find an ample supply of pure water. He had to congratulate the engineer on the ingenious manner in which he had overcome the very intricate problems which had presented themselves in the past, and sincerely hoped the result would be that no trouble would be experienced in the future.

Mr. E. G. Mawbey (Leicester), in seconding the proposition, also thanked the mayor for being present at the meeting under such physical disadvantages, and commented on the pluck shown by his Worship in attending to welcome them. Mr. Mawbey added that great progress was being made by the institution. One result of their work was a distinct improvement in the qualifications of the younger members of the profession, and the production of a really splendidly trained body of men whose services should prove of the greatest benefit to the public authorities of the country.

The President, in conveying the thanks of the meeting to the mayor, wished the latter a speedy return to health.

His Worship having made a short acknowledgment, the members left the town hall and proceeded in tramcars to the Stanton Iron Company's works at Hallam Fields, over an hour being devoted to a tour of the various departments of the huge establishment. Afterwards at luncheon, which was provided at the company's hotel, adjoining the works, a vote of thanks was accorded to the company for the facilities granted to the members. Referring to the process of pipe manufacture carried on by the firm, the President observed that it was most gratifying to find that they in England could produce such work, carried out in such a capital way, without waste or loss. Not only was the waste slag produced there used, but 50 per cent more was sold than they made, this being explained by the fact that some 2,000,000 tons had accumulated at the works from their operations in the past.

Mr. G. J. Ward made a short response on behalf of the Stanton Iron Company, and the ordinary business of the meeting was then resumed.

Election of District Executive Committee.

The President, in asking Mr. E. G. Mawbey, chairman of the district, to take the chair during the transaction of this business, said he should like to make a few remarks on the subject of district committee work. Having congratulated Mr. Mawbey on his appointment as chairman of the East Midland district, Mr. Thomas proceeded to appeal to the members to treat the matter before them with every elasticity as a first attempt at the formation of what he believed would prove to be a valuable auxiliary to the work of the institution. It was not his intention to suggest that they should blindly follow what other districts had done, but decide for themselves what was most suitable for their own district. In discussing district work, only members of the district were entitled to speak or vote. In the South-Eastern District—Kent, Surrey and Sussex—they met a few days ago and elected twelve representatives on the executive committee. Of those twelve they decided that three should be of the associate class, the younger members—which he felt they would agree with him was the right thing to do. The chairman was elected already, he was, therefore, *ex officio* a member of their committee. They had also elected Mr. Hooley on the council proper. It was quite open to them to elect or co-opt Mr. Hooley a member of the committee. What he had described was done at Grays on the previous Saturday, twelve being appointed on the committee, three being associates. What he wanted to suggest was with reference to the work of this district committee. The whole idea was to get into closer touch with each other, and in order to do this it was obvious that they would have to have more meetings. Those meetings could be held in the evening, if they so desired, during the winter.

The objection generally raised to winter meetings was that the days were so short that they could not see the works in daylight. One way to get over this was to arrange first to have their reception by the local authority, then at once to inspect the works while daylight lasted, get back, have a cup of tea and a pipe, and discuss things. There was a good deal to be said in favour of seeing works first and discussing them afterwards. They were very keen that this new move should result in larger numbers. He left it to their district to do all they could to induce engineers in whom they had confidence, and who, they knew, would be a credit to the institution, to put up for membership. The Orphan Fund held a very large part in their thoughts at times, and particularly at the present time. He would give them.

The Mayor of Ilkeston
(Councillor S. Shaw).

Alderman Moss,
Chairman of General Works Committee, Ilkeston.

Alderman C. A. Sudbury, J.P., C.C.,
Chairman of Finance Committee, Ilkeston.

Councillor Woolley,
Chairman of Health, Sewage Farm, and Lighting Committee, Ilkeston.

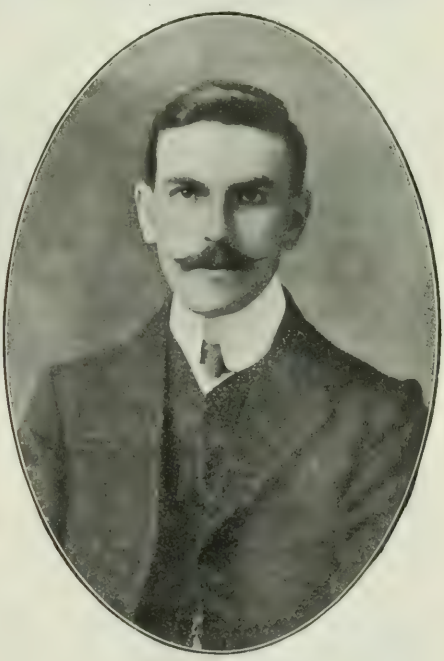
as an instance, a case which had occurred recently, the case of a borough engineer of his own county, an excellent man. Why he did not get a better appointment he did not know. This man had a salary under

months later, had now £20 a year to live upon. The Orphan Fund, he was glad to say, had been able to do its little to help in that case. They had several other cases, fortunately not so bad. He appealed to

Councillor W. Richards,
Chairman of Tramways and Electricity Committee, Ilkeston.

Mr. Sidney F. James,
Town Clerk of Ilkeston.

Mr. H. J. Kilford,
Borough Surveyor and Water Engineer, Ilkeston.



Mr. H. P. Stokes,
Borough Electrical Engineer and Tramways Manager, Ilkeston.

£200 a year, and a family of eight. He was taken suddenly ill, and his council gave him £10 to go on a fortnight's holiday, but at the station he died suddenly. His widow, who gave birth to a child two

the members—the young members especially. His friend Mr. Hooley had told him there had been a splendid response so far to the appeal for this fund, but he (the president) did not see why every single

member of the institution should not do something—however small—for the assistance of those who could not help themselves.

Mr. E. G. Mawbey (Leicester) then took the chair, and the election of the executive committee for the district—which comprises the counties of Derby, Leicester, Lincoln, Nottingham, and Rutland—was proceeded with. Twelve members in addition to Mr. Mawbey, the chairman, Mr. E. Purnell Hooley (Nottingham), representative on the council, and Mr. R. A. MacBrair (Lincoln), district secretary, were finally chosen to serve on the committee, their names being as follows: Nottinghamshire—Messrs. J. C. Haller (Carlton), urban district councils; T. Henry (Retford), rural, and T. W. Gordon (Nottingham), associate members. Leicestershire — Messrs. A. H. Walker (Loughborough), urban; S. Turner (Ashby-de-la-Zouch), rural; W. J. Court (Leicester), assistants. Lincolnshire—H. G. Whyatt (Grimsby), urban; W. B. Purser (Kesteven), county; T. Lake (Bourne), rural. Derbyshire—J. W. Horton, county, C. A. Clews, boroughs, F. W. Wright, associate members.

The Town Hall, Ilkeston.

Public Free Library, Ilkeston.

The consideration of the papers was afterwards proceeded with.

WATER SUPPLY, ILKESTON.

By Henry J. Kilford,

Borough Surveyor and Water Engineer.

Ilkeston is an old market town situate midway (about 8 miles) between Nottingham and Derby. The population in 1831 was 4,446; in 1881, 14,199; and in 1911, 31,673. The town in point of population was, until Chesterfield recently extended its boundaries, the second in the county of Derby. The charter for the market was granted to Hugh Fitz-Ralph by King Henry, 1251. The chief industries are coal, iron, lace and hosiery. The rateable value in 1884 was £44,728 5s. 6d.; in 1912, £88,329 10s.

WATER SUPPLY.

In 1884, when the writer commenced his duties, the water supply was a falling one, and was obtained from three sources—*viz.* (1) Queen-street, (2) Little Hallam, (3) Heanor-road.

(1) The Queen-street pumping station, situate in the centre of the town, was established by the late Ilkeston Waterworks Company, Limited, in 1855. The pump well was 46 yds. deep, the yield originally 10,000 gallons of water per day. In 1884, the horizontal H.P. engine and pumps were capable of delivering in one and a-half hours all the water the well could yield in twenty-four hours. This plant was set down in 1886, and removed later, but buildings are still in existence and are used as stores. The water was pumped into an open storage reservoir, with a capacity of 76,000 gallons, at the rear of the town hall.

(2) The Little Hallam pumping station is situate inside and near the south-west boundary of the borough. In 1871-72 the waterworks company extended their works by forming two open storage reservoirs, about 2½ acres, with a storage capacity of about 2,500,000 gallons. The water for the supply of these reservoirs was derived from three sources—*viz.*, the Oakwell spring, the Stanley brook, and the Nutbrook. These brooks drain a watershed of about 7,000 acres: both brook sources were decidedly objectionable and polluted with sewage. The plant consisted of a non-condensing high-pressure beam engine, 18-in. cylinder by 2½-ft. stroke, connected to an 8-in. double-acting pump. Water was delivered to the above-mentioned reservoir at the rear of the town hall through 1 mile of 7-in. mains. Steam was raised in a Lancashire boiler, 18 ft. by 6 ft. diameter.

These pumping plants (1) and (2), with engineman's cottage, land and water mains, were purchased from the waterworks company by the local board in 1878. The local board immediately added two sand filters, having a sand surface of 526 sq. yds.

(3) The Heanor-road pumping station is situate at the north end of the borough, and was established by the local board in 1878-79. The works adjoined a colliery, and comprised a shaft sunk about 80 yds. deep into the coal measures, a water lodge in the coal seam, deep-well pumps, high-pressure non-condensing horizontal pumping engine, one 30-ft. by 8-ft. Lancashire boiler, engine-house, and cottage. The yield of the well was about 80,000 gallons per day. A covered storage reservoir, with a capacity for 250,000 gallons, was erected at the same time at Shipley, just outside the borough, at an elevation of 382 ft. (top-water level) above ordnance datum, giving a head of 50 ft. in the market place. At a later date two sand filters were added. The plant was a modern one, but the quantity and quality of the water left much to be desired. This plant was abandoned in 1891; the water supply failed owing to colliery workings at a lower level.

In October, 1884, the Shipley reservoir was in a leaky condition, on account of mining operations, and the reservoir at Little Hallam empty. Steps were hurriedly taken to augment the supply, and within a week from the author's report to the board a disused colliery, noted for its water supply, quantity and quality (?), situate just outside the borough at Kirk Hallam, near the Little Hallam pumping station, was leased from Colonel Newdigate, the owner of the freehold, and the old plant, consisting of an 18-in. single-cylinder winding engine, a small horizontal pumping engine connected to deep well pumps by rods and quadrants, three old egg-end boilers, buildings, and sundry other apparatus appertaining to a colliery, were purchased. These were all in a deplorable state, having been set down several years, but in spite of it all, and the innumerable and almost insurmountable difficulties, water was being wound in barrels from the shaft and delivered through a new 6-in. main into the filters at Little Hallam in the time mentioned, and proved a great

boon to the town for many years. The lease was for forty years and the rent £50 per annum; this includes a house which is let at £20. The yield of this source of supply was well maintained at 240,000 to 280,000 gallons per day. Gradually the old colliery plant was either put in good condition or scrapped.

Subsequently a Davy pumping engine, 45-in. steam cylinder by 8-ft. stroke, was erected over No. 1 shaft, and a new 18-in. bucket and plunger pump, 86 yds. deep, fixed in the shaft, the pump rods being connected direct on the piston rod. This pump would deal with the water in eight hours and deliver it through a 12-in. main into the filters at Little Hallam. A steam capstan engine was fixed near the No. 1 shaft capable of lifting 20 tons. The double set of pumps left in the No. 2 shaft used by the colliery company were of the ordinary deep-well old-fashioned bucket type delivering into a "launder" about 3 yds. below the surface; these were altered so as to lift the water into the Little Hallam filters. Two 30-ft. Lancashire boilers provided steam for all purposes. The new buildings for Davy engine, capstan and boilers were of a substantial character The whole was abandoned in 1904 (when the Meerbrook Sough scheme came into operation) and the pumps subsequently removed from the shafts under great difficulties, but with success. It is not often experienced that an engineer has the removal of plant of this nature he designed and put down. The author could write a book upon the troubles and worries consequent on converting a disused colliery plant into a town's water-supply plant.

At Little Hallam a new engine-house was built, and a Worthington compound duplex jet condensing pumping engine by James Simpson erected therein capable of lifting 30,000 gallons of water per hour against a head of 300 ft. The water was pumped direct into a 12-in. supply main which was laid in from Little Hallam through the town to Heanor-road, the surplus or unconsumed water being delivered into the Shipley reservoir, from which the town was supplied by gravitation when pumps were standing. This arrangement of pumping was a great success, providing an adequate supply at a pressure of 100 ft. in the market place, the highest point in the borough, 332 ft. above ordnance datum. This pressure could be increased when required for fire brigade purposes. The engine was under perfect automatic control, and never at any time gave trouble under the varying conditions.

Later, another temporary engine-house and pump well was built, and another Worthington compound duplex surface condensing pumping engine installed, capable of delivering 60,000 gallons per hour against a head of 300 ft. through the same main. The quality of the water was not all that could be desired. Typhoid fever was prevalent, and this was traced to the water from the Nutbrook and Stanley Brook. The sand filters did not purify the water sufficiently, and the quantity required could not be passed through them; consequently two Reeves' patent pressure filters were put down. The water was forced by the pumps through these with excellent results, and the complete stamping out of typhoid.

University of Birmingham,
November 9, 1900.

ILKESTON WATER.

DEAR SIR—I have now completed my examination of this water. It has taken longer than usual on account of the difficulty experienced in correctly identifying one of the organisms isolated from the water. It presented many of the characters of the Bacillus Sporogenes Enteritides (the cause of certain diarrhœa epidemics); and it was only after a continued and prolonged examination that we were able ultimately to decide that it was not this germ. We had less difficulty in the case of the typhoid bacillus and the bacillus coli. They are not present in the water. There is no indication whatever of any contamination with human excremental matter.

The estimation of the total number of germs present in the water is surprisingly low, considering the possibilities of pollution in the area from which the water is drawn. It gives 150 germs in 1 c.c., which speaks well for the efficiency of the filtration. This is the average of three separate and careful examinations.—Yours truly,

R. F. C. LEITH,
Professor.

H. J. Kilford, Esq.,
Borough Surveyor.
Ilkeston.

The serious pollution of the brooks, the increasing population and consequent demand for water, compelled the committee to look round for another source of supply. The author explored the district for miles, and later, in 1891-2, in conjunction with Mr. I. Hodges, mining engineer, prepared an exhaustive report upon the water in the district. There were many places where the quantity required might have been obtained, but liable to be lost at any time, and to contamination by mining operations. This area was subsequently examined and reported upon by Mr. Hodson and Dr. Barwise with the same result—that all the waters were unsatisfactory, and could not be relied upon for a public water supply.

ILKESTON POLICE STATION

CEMETERY CHAPELS, ILKESTON.

BORING FOR WATER.

In 1893-5 the writer, with Mr. Ashworth, mining engineer, and Mr. Fletcher, F.R.G.S., examined the district for many miles on the west side of the borough, with the ultimate result of recommending the putting down of a borehole at Little Hallam. The boring was commenced in February, 1896. The first portion was "jumped," and the lower portions cut through with the "diamond drill." Specimens of the cores may be seen in a case at the free library. Some of these cores in the grit came out 6 ft. long. Water was struck at 837 ft., and rose in a tube 14 ft. above the surface. The quantity overflowing at the surface was 180 gallons per hour. The boring was continued down to 1,802 ft., but as far as could be ascertained no additional supply was struck. A shaft well was sunk and bricked to a depth of 125 yds. During the sinking the borehole tubes were removed, and at a depth of 53 yds. salt water was met with; upon replacing the tubes

the water issued at a higher level free from salt, perfectly bright, clear and palatable. The source of the salt water was not ascertained. It is a coincidence that it was found practically at sea level. The maximum yield of the borehole and shaft was 300,000 gallons per day. The town council called in Mr. Hodson, of Loughborough, and upon his advice the boring was abandoned. The cost of the boring was £1,615; the first 50 yds. 25s. 9d., increasing 5s. per yard each 50 yds. in depth; the last 50 yds., 87s. per yard.

The sinking of the shaft by direct labour to 125 yds. proved a difficult undertaking, the strata passed through was full of water, which was pumped by two of "Evans'" sinking pumps with sliding suctions; these were hung in slings, and lowered as the work proceeded. Trouble was experienced with clacks, valves and their seatings, until the writer altered the method of securing them, after which the trouble ceased. The temperature (120 deg.) caused by two steam and two exhaust pipes (although these were covered with felt) was very oppressive and trying, and it was a relief to drop into the cold water in the shaft bottom. One fitter sent down to do some repairs refused to work under £5 per hour. The shaft was 10 ft. in diameter, brick lined in cement mortar with oak curbs. It would have been much more convenient if this had been 12 ft., and the shaft sunk clear of the borehole.

The cost of pumping at Little Hallam, including coal, oil, lubricating labour, gas, rents, rates, &c., was 2¾d. per 1,000 gallons against a head of 350 ft. The cost of distribution, including repairs and renewals, services and inspectors, ¾d. per 1,000 gallons, making the total 3½d. per 1,000 gallons. There are 27 miles of water mains within the borough, ranging from 3 in. to 12 in. Some of the mains are much corroded, and will require new ones of greater diameter at an early date. Valves are placed so as to control each street and branch, and spindle hydrants, about 80 yds. apart, so that ample provision is made for the fire brigade. Trouble has been caused by excessive quantities of lime passing from the works into the reservoirs and pipes, Ilkeston suffering most in this respect. It is not so marked now, still, a small quantity is found in the reservoir at Shipley, hydrants in the town, and pipes of consumers. This lime deposit has, in some instances, completely choked up the iron hot water pipes in houses, but it has no effect upon lead pipes used for this purpose.

MEERBROOK SOUGH.

In 1899 the author, and again in 1901 with Mr. John Holbrook, surveyor of Heanor, visited the Wirksworth district and made exhaustive inquiries as to the source of the water issuing from the Meerbrook Sough, and the possibility of pollution and contamination from the Wirksworth sewage and lead mines. Gaugings of the water were made at the mouth of the sough, and the quantity was found to be about 16,000,000 gallons per day. A report was submitted to the council, with sketch plans of proposed route, site for reservoirs, &c., and the cost of the scheme was estimated at £86,000. The estimate of the cost practically held up the scheme for a long time until Mr. Hodson was consulted, when he strongly recommended the Meerbrook scheme, with the result that the Ilkeston and Heanor Water Board was formed, and an Act of Parliament obtained in 1901. The works, as now completed, comprise the pumping station at Whatstandwell, a little north of the sough mouth. Here a noble building has been erected to contain the three compound condensing pumping engines (each capable of lifting 50,000 gallons per hour against a head of 500 ft. through 2¼ miles of 18-in. pipes into the covered storage reservoir at Chadwick Nick), three 30 ft. by 8 ft. steel Lancashire boilers, Green's economisers, coal stores, fitters' shop, turbine-house, centrifugal and electric light plant room, &c. The softening plant—Archbutt-Daley process by Mather & Platt—is under a separate roof; two dwelling-houses, gardens, railway sidings, and spent lime, storage beds, &c. The water from the sough is diverted through a turbine, which raises part of the water required; the remainder is pumped up by centrifugal pumps into a large iron tank forming the roof of part of the buildings, from which it passes on to the softening plant. The water is here reduced from 22 deg. to 8 deg. of hardness. Thence it passes into the pure water tanks under the softeners, from which the pumps take their supply.

The works are beautifully situated by the side of the river Derwent, close to the main road from Derby to Matlock, and are well worth a visit by any who may be interested in the lifting, and treatment by softening, of water for a town's supply.

The storage reservoir at Chadwick Nick has a capacity of 1,000,000 gallons, and is at an elevation of 700 ft. (top of water) above ordnance datum. The water gravitates through 16-in., 15-in. and 14-in. pipes to Codnor Park and Tag Hill reservoirs for Heanor, and to the Shipley reservoir for Ilkeston. The water is supplied by meter into the several reservoirs, and the cost of the works to this point is borne by each constituent authority according to the quantity taken.

Difficulties have been experienced by leakage from

ILKESTON AND HEANOR WATER SUPPLY.

Collected January 10th, 1910. Examination started same day.

Description of Sample	Number of Microbes per c.c.			B. COLI TEST.																B. Enteritidis Spor. Test.		
				Presumptive.						Confirmatory.						Typical.						
				Gaseous Fermentation of Bile Salt Broth, Gas and Fluorescence in Glucose Neutral Red Broth.						Isolation of a Coli-like Microbe on Neutral Red Bile Salt Agar.						Coli-like Microbe giving the following Reactions:— Fluorescence in Gl. N. R. Broth, Acid and Clot in Litmus Milk. Indol in Peptone Water. Acid and Gas in Lactose Litmus Broth.								
Meerbrook Sough	Gelatin at 21 deg. Cent. after 48 hours.	Agar at 37 deg. Cent. after 48 hours.	"Rebipalgar" at 37 deg. Cent. after 48 hours.	Bile Salt Broth.			Glucose Neutral Red Broth.			Bile Salt Broth.			Glucose Neutral Red Broth.			Bile Salt Broth.			Glucose Neutral Red Broth.				
			One Colony of a small spindle-shaped Bacillus.	10 c.c.	1 c.c.	0·1 c.c.	10 c.c.	1 c.c.	0·1 c.c.	10 c.c.	1 c.c.	0·1 c.c.	10 c.c.	1 c.c.	0·1 c.c.	10 c.c.	1 c.c.	0·1 c.c.	30 c.c.	10 c.c.	1 c.c.	0·1 c.c.	10 c.c.	5 c.c.	1 c.c.
Untreated	13	4	+	+	+	+	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Treated ..	0	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

+ Means reaction given. — Means reaction not given.

the mains. The following figures are taken from the engineer's reports:—

Sept., 1906	...	...	1,870,000 gallons
Oct.	,,	...	3,370,000 ,,
Nov.	,,	...	6,141,000 ,,
Dec.	,,	...	13,098,000 ,,
Jan., 1907	...	...	33,775,000 ,,

In February, 1907, the writer examined and tested the mains for the board, and found that the bulk of the leakage was from the 2¼ miles 18-in. pumping main. This was a terrible loss, necessitating practically day and night pumping. The joints of the pipes were found defective; these have been made good, and the leakage is now practically nil between the pumps and Chadwick Nick reservoir. The leakage upon the whole of the mains has been reduced to about 25,000 gallons per day.

The undertaking involved a capital expenditure of £120,000. The cost of the water to the two authorities is about 6d. per 1,000 gallons.

The Ilkeston storage reservoir at Shipley is built upon land under which coal has recently been worked. Upon examination this month it was found that fractures had occurred in many places in the floor, walls and vaulting. Upon testing for leakage it was found to be practically watertight, thanks to clay puddle. The ascertained leakage being equal to a drop in surface level of 0·08 (340 gallons) in twenty-four hours, another test was interesting, as rain was falling the whole time, and the surface of the water rose slightly, the rain must have percolated through the roof cracks. Care was taken that no water was leaking in through the valves.

The water pressure in the highest part of the borough (the Market-place, 332 ft. above ordnance datum) is inadequate, and must be increased. The author has designed a water tower with small tank, at an increased elevation of 50 ft. above the water level in the storage reservoir, in which to place valves, &c., and to break the Chadwick Nick pressure, and to give a head of 80 ft. in the Market-place. Experiments are being made, but not quite completed, to pass the water through a pressure-reducing valve; if successful the tower will not be built: but the author is certainly of opinion that the tower, though more costly, would, in the end, be the most satisfactory.

The author is considering the question of utilising the waste or lost pressure and energy, the drop between Chadwick Nick pressure and the reservoir (which is equal to 700,000 gallons of water falling 240 ft. every twenty-four hours), for generating electricity; the problem is a difficult one, as the conditions are peculiar, and the consumption of the water varies from 10,000 gallons per hour to 50,000; it is also imperative that the pressure on the outlet or exhaust side of the turbine, or other hydraulic engine, be maintained constantly at about 70 ft. The quantity of water supplied daily is 700,000 gallons, equal to 22 gallons per head for all purposes. Deducting the water passed through the meters, it gives a nett consumption for domestic purposes only of 16·5 per head. There are ninety-four meters of different makes in use, with a daily consumption varying from 50,000 downwards. The average daily consumption by meter equals 5½ gallons per head of the population. The water is of excellent quality. Dr. Barwise has frequently analysed it, and one of his reports reads as follows:—

Ilkeston and Heanor Water Supply.

On January 10th this year I collected a sample of the Meerbrook Sough water before and after softening, and have submitted the same to a complete bacteriological examination. Your Committee will remember that at the time of the promotion of the Ilkeston and Heanor Water Bill it was suggested that sewage from Wirksworth occasionally found its way into this water after heavy rains. I selected January 10th because there had recently been a thaw, and the Sough water had not the brilliant transparency which it usually has. The bacteriological results of the water before treatment confirmed the results previously obtained, and indicate that it is a pure supply. The water after treatment is exceptional, and I doubt whether there is another supply in the country of equal volume of the same purity.

The results show that there is not a single organism of either suspicious or innocent nature growing therein. The attention of the Heanor District Council and the Corporation of Ilkeston should be called to these results, and it might be pointed out that they have an opportunity of starting a fresh industry, as the supply is admirably suited for the manufacture of high-class *aerated waters*.

Sidney Barwise.

The total indebtedness upon the water undertaking is £56,411 3s 8d. The income last year was £7,693, the outgoings £8,153, showing a loss of £460, which is equal to a 1½d. rate.

The writer apologises for the crudeness of his paper; his intention was, when commencing to write, to embrace and describe briefly, with cost, &c., the whole of the works appertaining to his many departments, but, owing to lack of time and unforeseen circumstances, has been compelled to alter the heading and to confine his remarks to the water department only.

ILKESTON TRAMWAYS AND ELECTRICITY SUPPLY.

By Harry P. Stokes,
Engineer and Manager.

In dealing with the electricity supply and tramway system of the Ilkeston Corporation, you will, of course, understand that having only occupied the position of borough electrical engineer and tramways manager for a period of three years, certain information with respect to the concern has been obtained from more or less indirect sources. Early in March, 1898, a company at Nottingham approached the corporation with a scheme for putting into operation a system of cable cars, but the corporation came to the conclusion that if a private company could see any good was likely to result from the operation of a system of cars in a town the size of Ilkeston, whatever benefits were to be obtained might as well be had by the municipality first hand. Steps were, therefore, taken to construct an electric tramway system, and a Provisional Order was obtained from the Board of Trade. Mr. V. B. D. Cooper, of London, was appointed consulting engineer, and submitted plans and estimates for the scheme, which were adopted by the council. About the same time the Nottingham and Derbyshire Power Company proposed to erect a number of generating stations for the supply of electricity in the counties of Nottinghamshire and Derbyshire, and as the price they offered to the borough for the supply both for light and power purposes was considered a reasonable one, the council abandoned their own scheme so far as generating electricity was concerned, and decided to purchase in bulk from the power company. The contract for laying the lines, erecting overhead equipment, and supplying cars was let to Messrs. Dick, Kerr & Co., of Preston; and that for the car sheds and offices to Messrs. Moss & Sons, of Loughborough; and that for cables for electric supply to Messrs. Callender & Co. Considerable delays were experienced after the tramways were ready for operation in obtaining the necessary supply of electricity from the power company, and it was not until May 1, 1903, that the first car was able to commence running. The system was passed by the Board of Trade on Friday, May 15, 1903. The tramway track is 3-ft. 6-in. gauge, and the district being a colliery one, considerable trouble has been experienced throughout its life with respect to maintenance.

There is no doubt that the original work was not as satisfactorily carried out as one could have expected, and unfortunately, what is known as "Dicker" rail joints were adopted, and these not having been well fitted in the first instance, continual trouble with rail joints has been the result. Extensive reconstruction of the bed has had to be carried out during recent years; in fact, practically the whole of the track has now been gone over. We are gradually introducing new rail joints throughout the system. These are known as the "Atlas" joints, and have a web on the fish plates which extends right under the bottom flange of the rail, the two fish plates meeting one another, and being secured, in addition to the ordinary fish-plate bolts, by means of two special truss bolts underneath the bottom flange. Only a few of these have been installed up to the present, but the work is being proceeded with as rapidly as possible, and their success is already well assured.

The overhead, when first erected, was of 0 trolley wire, with only single insulation; as a result, continual breakages were occurring, and some new wire was put up after only four years' operation. Unfortunately 00000 and 0000 wires were used on separate occasions, thereby adding to the difficulties of maintenance. During the last three years the whole of the overhead has been reconstructed, double insulation having been provided, and 000 non-fouling wire fitted with mechanical ears. The car sheds are situate in Park-road, and have a handsome frontage; the shed has accommodation for fifteen cars, but, unfortunately, was somewhat badly arranged for deal-

ing with repairs, and no paint shop has been provided. Additional machines and tools have recently been installed, and the whole of the repairs are now carried out on the premises. The depot is now supplied with a large lathe for wheel boring and turning and heavy work, another lathe for armature turning and binding, and a small lathe for the lighter class of work, a vertical drilling machine, Stirling hacksaw machine, emery grinder, wheel press, forge, &c. Nine of the cars are Dick, Kerr equipment throughout, the other four are Milnes Voss bodies, fitted with Westinghouse equipment.

While referring to cars, it may be of interest to note that we have had considerable trouble with rotten timber in the roofs, and are now adopting a new method of roof construction. Originally, the plank to which the trolley standard was bolted was simply screwed down to the ends of the cars, and the strain which occurs to the tops of the cars through the weight of the platform caused the top deck roofing to buckle, and eventually let the water into the roof, with disastrous results. We are now using only solid oak planks, and these are armoured with 2-in. by ⅝-in. iron running the whole length, rabbeted and screwed into the plank; angle irons are run from the car body principals across the ends of the cars, and to these the trolley plank is bolted through the iron straps, the trolley standard itself being bolted through the plank and iron straps to the base plate below. A side fillet is run all the way round the car of solid oak 4½ in. by 2 in., and a double floor is constructed of ⅝-in. red deal, 3 in. wide, with plain rabbet on either side, the second floor overlapping the seams of the first; the two floors are screwed together with a layer of lead between to make the whole roof waterproof. Wrought-iron tread strips are being adopted in place of the wooden laths, and by this means we hope to prevent the damp getting into the timbers.

When the tramway system was put into operation a universal 1d. fare was adopted, and a continual loss has always occurred on the working of the system, varying from £1,800 to £3,200 per annum; but in April last, after the conclusion of the coal strike, the council approved of a new system of fares, comprising a 1½d. through fare, with 1d. intermediate stages, and this new system is already helping to bring about an increase in the receipts. The operating costs of the tramways in the first two years of working were nearly 8d. per car-mile, and three years ago they amounted to 6·85d. per car-mile; last year they were 6·02d. per car-mile, notwithstanding the heavy renewals which have been carried out, and when it is taken into consideration that on a small system the size of Ilkeston there is a certain limit below which it is impossible to go with regard to staff, you will find that our operating costs compare very favourably with those systems of a similar size.

In connection with the electricity supply, the system is known as the three-wire solid system, bitumen cables being laid in troughs, and filled in solid with bitumen. The supply is direct current, 460-volt and 230-volt. Recently additional isolation boxes and feeder pillars have been introduced to facilitate dividing up the system into smaller sections for locating faults, and serious troubles have been avoided.

The distribution originally all took place from the car depot, a pair of heavy feeders running from there to Station-road, and distributing solely from that point. We now have three separate feeders from the power company, and eight separate feeders of our own. The switchboard and balancers adjoin the tramway depot in Park-road, but considerable alterations and improvements have been made within recent years, and a sub-station equipped to deal with the load at the lower end of the town.

Our charges for electricity supply are among the lowest in the country, and the department two years ago made a profit for the first time, but this profit is an increasing one. Very little attention had been given to electricity supply for power purposes; in fact, electrical driving had been discountenanced as much as possible, but we are now making good progress in this direction. In 1909 only 14-horse power in motors were connected to the mains; we now have just over 100-horse power connected. The electrical plant at the new sewage disposal works was installed by this department, and another interesting installation has just been completed in one of the lace factories, where steam had to be competed with. The motor has been especially built for the work, also the automatic starting apparatus, and chain driving is used instead of belt. The result has been a complete victory for electricity, notwithstanding the intense prejudice which had to be overcome. The units purchased for lighting in 1909 were 283,000, and last year they were 352,000. The losses in distribution in 1909 were 16 per cent, and in 1912, 3·9 per cent. Considerably more progress would have been made in this department but for the fact that our capital account was exhausted, and no new borrowing powers having been obtained, all new extensions to mains have had to be provided out of revenue, thus considerably handicapping the progress of this department.

The question as to the advisability of introducing a tramway system into a town the size of Ilkeston, is, of course, a question of the past, and the only thing to be done now is to obtain more patronage for the cars, and keep the working expenses down to a minimum, yet at the same time it is no use shirking the responsibility of maintaining the concern in a high state of efficiency. The amount of money spent on repairs and maintenance on the permanent way during the first seven years of working only worked out at about ½ per cent, while the overhead equipment (due to continually repairing a small section of wire) worked out at nearly 7½ per cent, and cars 10 per cent, per annum on the original costs. Had a larger sum been spent on the maintenance of the permanent way, which is the most vital part of the system, there is no doubt that a great proportion of the heavy items of expenditure which have been incurred during recent years would have been eliminated. The car depot and works are conveniently situated for any member desirous of inspecting same, and any point of interest will be thoroughly explained. In conclusion, the writer must apologise for the inefficiencies of the paper, but trusts that the visit to the town will be an interesting and helpful one.

(To be concluded.)

The paper by Mr. H. P. Raikes, describing the recently completed sewage works at Ilkeston, is reproduced elsewhere in this issue.

The Port of London.—Tenders amounting to £2,350,000 have been accepted by the Port of London authority for dock extension and improvements which cover the more important works immediately contemplated. These works form the first portion of the extensive proposals submitted by Lord Devonport in January, 1911. The complete scheme then outlined would involve a total expenditure of over £14,000,000.

Wandsworth Bridge.—A joint deputation of Fulham, Battersea, and Wandsworth Borough Councils is being arranged to urge upon the London County Council the desirability of erecting a new bridge in place of the present Wandsworth Bridge. "We are of opinion," states a report of the Battersea Highways Committee, "that the provision of a better bridge between the Putney and Battersea bridges would be a distinct benefit, inasmuch as we understand that heavy traffic, such as motor 'buses, is barred from using the present bridge."

Problems in Engineering with Solutions.*—The English journal The Surveyor and Municipal and County Engineer carries on a section devoted to various questions which might be put in an examination for the position of municipal engineer in an English town or city. The questions are given one week and answers provided by various correspondents given in subsequent issues. The volume noted above is the first one to be made up from these questions and answers. As is well known, the position of municipal engineer in England is one of most varied activity, so that the subject covered by the questions and answers extends through the whole field of engineering. For example, the chapter headings are as follows: Mechanics and Hydrostatics; Strength and Elasticity of Materials; Theory of Structures; Surveying and Levelling; Water Supply and Hydraulics; Sewerage; Sewage Disposal; Road Making and Tramways; Building Construction and Materials; Law and Miscellaneous. While the questions and most of their solutions are distinctly British in character, the wide range of subjects and the method of treatment make the book of some value to American engineers. There is a good deal to be said in favour of the question and answer method of instruction.—*Engineering News.*

* Being Questions and Answers reprinted from the Assistants' and Students' Section of The Surveyor and Municipal and County Engineer. First Series, 1909-10. Edited by Sydney G. Turner, assoc.m. inst.c.e. London: St. Bride's Press, Limited. Price 5s. nett.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. Thomas, M.Inst.C.E., County Surveyor, Buckinghamshire.

NORTH WALES DISTRICT MEETING.

A North Wales District meeting is to be held at Wrexham on Saturday, October 19th.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

President-Elect—Mr. Frank Latham, M.Inst.C.E.I., F.S.E., Borough Engineer and Surveyor, Penzance.

NORTH-WESTERN DISTRICT.

At a meeting of the North-Western District of the Institution of Municipal Engineers, held in Manchester on September 25th, there were present Messrs. A. R. Bleazard (Clitheroe), W. Briggs (Stockport), A. Dempsey (Eccles), A. Foster (Salford), K. Grimshaw (Stockport), S. M. Hindle (Chadderton), G. H. Hopkinson (Chorley), J. H. Marsh (Worsley), J. W. Sunderland (Norden), E. Walker (Stretford) and J. W. Gleave (Heywood).

The chairman, Mr. Bleazard, in opening the new session, thanked the members for electing him to the position, and urged individual members to use their best efforts and to all pull together for the benefit of the institution.

It was urged that North Wales and the West Riding of Yorkshire should be added to the present North-Western District.

Proposals to make up a party to attend the annual meeting in London on October 11th and 12th were considered, and it was decided that if members in this district would write to the hon. secretary, Mr. J. W. Gleave, at once, he would try to make satisfactory train arrangements.

A small sub-committee was appointed to make arrangements for a "social," which it is proposed to hold on December 7th; further information on the matter will be sent to the members in due course.

Mr. Bleazard reported the offer of a visit to Southport from the borough surveyor, Mr. Jackson, which was unanimously accepted. The date proposed is the second Saturday in October.

The next meeting in Manchester is fixed for November 18th, when a general discussion on the "Merits of the Intercepting Trap" will take place, and the sub-committee's proposals *re* "social" will be dealt with.

Mr. Bleazard's paper on "Municipal Progress in Clitheroe" being taken as read, there was a general discussion on matters contained therein. The items raised included charges made for connecting waste-water closets to sewers, local authorities' grants when converting pails, &c., to the water-carriage system; the flushing of sewers; intercepting traps choked with their own raking-eye stoppers; charges for fire-brigade services, &c.

Mr. Foster raised the question of exemptions under the National Insurance Act, and the following resolution was passed:—

"That this meeting of the North-Western District of the Institution of Municipal Engineers recommends the council of this institution to consider the question of National Insurance, and to draw up a scheme to secure the exemption of municipal engineers affected by the Act?

ANNUAL GENERAL MEETING.

The fourth annual general meeting of the Institution of Municipal Engineers will be held in London on Friday and Saturday, October 11th and 12th.

Programme.

Friday, October 11th.

11 a.m.—Meet in the council chamber, No. 4 Southampton-row, London, W.C.

11.15 a.m.—Annual general meeting:—
Minutes of last meeting.
Election of council for the year 1912-13.
Presentation of annual report of council.
Announcement of result of ballot.
Presidential address.

1 p.m.—Adjourn for lunch.

2 p.m.—Reassemble in council chamber.

2.15 p.m.—Discussion on the following papers to be presented to the meeting:—
"The Modernising of Building By-laws," by F. W. Platt (member).
"The L.G.B. Report on Intercepting Traps," by H. C. H. Shenton (member).
"The Influence of Town Planning upon the Public Health," by W. Louis Carr (member).
"Superannuation and Security of Tenure," by A. Winter Gray (Member).

(The papers will be taken as read, and advance copies may be obtained on application to the secretary, and will be forwarded as soon as the papers are in print.)

5 p.m.—Close of meeting. Ladies return to council chamber.

Ladies' Meeting.

(Held concurrently with General Meeting.)

11 a.m.—Meet in the council chamber, No. 4 Southampton-row, London, W.C.

11.15 a.m.—Leave council chamber and proceed to the stores of Messrs. Selfridge & Co., Oxford-street, W.

11.30 a.m.—Meet at the Duke-street entrance of the stores, where visitors will be met by a representative of the firm and conducted round the building.

1 p.m.—Lunch.

2.30 p.m.—Meet at the showrooms of Messrs. Doulton & Co., Limited, Lambeth, S.E., who have kindly arranged to conduct the visitors through their works and showrooms.

4.30 p.m.—Leave Messrs. Doulton's works.

5 p.m.—Arrive at council chamber, Southampton-row.

6.45 p.m.—Reception by the president at the Holborn Restaurant, followed by (7 p.m. to 11.30 p.m.) social evening, with musical programme, at the invitation of the president. Morning dress.

Saturday, October 12th.

10.30 a.m.—Visit to Shakespeare's England, Earl's Court. Meet in booking hall, Earl's Court Station.

12.30 p.m.—Adjourn for lunch.

2.30 p.m.—Visit to the London Hippodrome, at the request of a number of country members.

EASTERN DISTRICT MEETING, CODMANCHESTER.

(Tuesday, October 15th.)

Programme.

11.30 a.m.—Meet at Godmanchester Station and inspect Roemac road.

12.30 p.m.—Call at council's depot, where methods of sewer flushing will be shown.
Inspect reinforced concrete bridges.

1 p.m.—Lunch at the Horseshoe Temperance Hotel.

2 p.m.—Reception at the town hall by his Worship the Mayor (Mr. J. P. L. Durrell Stables, J.P.).
Inspect old charters, books and records.

3 p.m.—Walk round town, viewing sixteenth century architecture, tarviated roads, reinforced concrete posts, new system of constructing cheap cottages and "exhibition" of cheap cottages.

4 p.m.—Tea at the Horseshoe Temperance Hotel.

Philip S. Bennett,
Council Offices, *Hon. District Secretary.*
Ramsey, Hunts.

JOINT MEETING OF YORKS AND NORTHERN DISTRICTS.

A joint meeting of the Yorks and Northern districts will be held at Harrogate on Saturday, October 19th.

Programme.

Meet at Harrogate station.

Drive by motor char-a-banc to corporation depot to inspect new tar-macadam mixing plant and stone-breaking machine in operation.

Light refreshments.

Drive to north sewage outfall works; new aërating sprinklers and special apparatus for treatment of sludge; Royal Baths (there are eighty-six different treatments, the principal ones of which will be explained and viewed); Iron Gate reservoir; sand bed filters; Harlow Hill reservoir; Candy-Whitaker's

mechanical filters; corporation stables and town's yard; corporation fire brigade station; new Merryweather motor fire engine.

Dinner at North-Eastern Hotel.

A short meeting of Yorkshire members will be held to discuss rearrangement of district.

H. J. Firth.
Hon. District Secretary, Yorkshire District.

John Robinson.
Hon. District Secretary, Northern District.

October 2, 1912.

Subscriptions, 1912-13.—Members and others are requested to note that annual subscriptions for 1912-13 are now due.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*

ROYAL SANITARY INSTITUTE.

PROVINCIAL SESSIONAL MEETING, LEWES.

At a meeting of the Royal Sanitary Institute, to be held at the Town Hall, Lewes, to-day (Friday), at 7 p.m., Mr. D. Roberts, the borough surveyor of that town, will open a discussion on "The New Sewerage System for Lewes, with Special Reference to the Discharge of Effluents into Tidal Streams," among those who are expected to take part in the proceedings being Messrs. John H. Blizard, assoc.m.inst.c.e., Southampton, A. J. Martin, m.inst.c.e., Westminster, and A. E. Prescott, borough engineer and surveyor, Eastbourne.

The chair will be taken by Mr. H. Percy Boulnois, m.inst.c.e., chairman of council of the institute.

To-morrow morning the members will visit the Phœnix Ironworks and the Lewes Portland Cement and Lime works, and in the afternoon inspect the Lewes Victoria Hospital, the borough isolation hospital, the fire brigade station, and the waterworks.

NEXT YEAR'S CONGRESS.

The council of the Royal Sanitary Institute have accepted an invitation from the City Council of Exeter to hold the next congress and exhibition of the institute in Exeter, from July 7 to 12, 1913.

SOCIETY OF ENGINEERS.

At a meeting of the Society of Engineers to be held on Monday next at the Institution of Electrical Engineers, Victoria Embankment, W.C. (south end of Savoy-street, near Waterloo Bridge), a paper on "Town Planning from an Engineering Aspect" will be read by Mr. E. R. Matthews, assoc.m.inst.c.e., f.g.s., the following being a synopsis: Town planning in a residential area—Direction, width and construction of main arterial, secondary and subsidiary streets—Building line in such streets—Sites for public buildings, &c.—Open spaces for recreation grounds and parks—Sewerage and sewage disposal—Water supply and lighting—Widening of existing roads—Bridlington's town planning scheme. Town planning in an industrial area: Comparison between the planning of a residential and an industrial area, and a consideration of the various points which arise in planning an industrial area.

The chair will be taken at 7.30 p.m. precisely.

A. S. E. Ackermann,
Secretary.
17 Victoria-street, S.W.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference. *The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By Sydney G. Turner, of the Middle Temple, Barrister-at-Law, a.m.i.c.e., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but these responsible for their despatch are recommended to arrange that they shall reach* **The Surveyor** *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

CLERK OF WORKS.—October 5th.—Rivers Committee of the Manchester Corporation. £3 3s. per week.—Chairman of the Committee.

OUTDOOR ENGINEERING ASSISTANT.—October 5th.—Rivers Committee of the City of Manchester. £200 per annum.—Mr. Thomas Hudson, town clerk.

SANITARY INSPECTOR.—October 7th.—Corporation of Bournemouth. £100—£130.—Mr. H. Ashling, town clerk. Application to be endorsed "Sanitary Inspector."

CHIEF ENGINEER AND COUNTY SURVEYOR.—October 7th.—London County Council. £2,000.—Sir Laurence Gomme, clerk.

SURVEYOR.—October 8th.—Corporation of Nairn.—Mr. A. Storm, town clerk.

SURVEYOR'S ASSISTANT.—October 8th.—Shipley Urban District Council. £2 per week.—Mr. I. Lindon, clerk.

ENGINEER'S ASSISTANT.—October 8th.—Municipal Commissioners of Singapore. $350 (the dollar is valued at 2s. 4d.) per month.—Mr. C. C. Lindsay, 180 Hope-street, Glasgow.

SANITARY ENGINEER.—October 8th.—For service on the Gold Coast under Secretary of State for the Colonies. £500—£600 per annum, with £100 duty allowance.—Secretary of the Royal Sanitary Institute, 90 Buckingham Palace-road, S.W.

CLERKS OF WORKS (2).—October 9th.—Whaley Bridge Joint Sewerage Board. £3 and £2 10s. per week.—The Clerk.

ASSISTANT INSPECTOR OF NUISANCES.—October 9th.—Corporation of Coventry. £80—£110 per annum.—Mr. G. Sutton, town clerk.

HIGHWAYS SUPERINTENDENT.—October 9th.—Corporation of Huddersfield. £120 per annum.—Mr. K. F. Campbell, borough engineer and surveyor.

CLERK OF WORKS.—October 9th.—Broadstairs Urban District Council. £3 per week.—Mr. L. A. Skinner, clerk.

BUILDING INSPECTOR.—October 10th.—Corporation of Dewsbury. £100 per annum.—Mr. H. Ellis, town clerk.

HIGHWAY SURVEYOR.—October 14th.—Truro Rural District Council.—Mr. Coulter Hancock, solicitor.

GENERAL FOREMAN.—October 15th.—Whitefield Urban District Council. £2 per week.—Mr. Chas. Bradshaw, clerk. Applications to be endorsed "Foreman."

SECOND ASSISTANT.—October 15th.—Romford Rural District Council. £105—£120 per annum.—Mr. T. W. A. Greenhalgh, clerk. Applications to be endorsed "Surveyor's Assistant."

CLERKS OF WORKS (2).—October 16th.—Chapel-en-le-Frith Rural District Council. £2 10s. and £2 2s. per week.—Mr. J. B. Boycott, clerk, Union Offices.

SEWAGE WORKS MANAGER.—October 16th.—Padiham Urban District Council.—Mr. J. Gregson, surveyor.

DEPUTY CITY SURVEYOR.—October 19th.—Corporation of Manchester. £500 per annum.—Mr. Thos. Hudson, town clerk. Applications to be endorsed "Deputy City Surveyor."

INSPECTOR OF NUISANCES.—October 19th.—Patrington Rural District Council.—Mr. L. A. Milton, clerk.

COUNTY SURVEYOR.—October 19th.—County of the Soke of Peterborough. £200 per annum.—Mr. Walter J. Deacon, clerk, Cross-street, Peterborough. Applications to be endorsed "Application for County Surveyorship."

CHIEF ENGINEER.—October 28th.—Municipality of Karachi (India). 500—750 rupees per month.—Mr. Measham Lea, chief officer and chief engineer, Municipal Office, Karachi.

MUNICIPAL COMPETITIONS OPEN.

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WANDSWORTH.—October 14th.—Competitive designs for public swimming bath at Balham.—Mr. P. Dodd, borough engineer, 215 Balham High-road, S.W.

GLASGOW.—October 29th.—Preliminary sketch designs are invited by the corporation for the extension of the municipal buildings. Honorariums of 100 guineas to five selected designs.—Mr. John J. Burnet, A.R.S.A., 239 St. Vincent-street, Glasgow, is assessor.—Applications to the clerk, Mr. J. Lindsay, town clerk.

LLANDUDNO.—October 31st.—Designs for laying out about 20 acres, for the urban district council. A premium of 50 guineas is offered.—Mr. A. Conolly, clerk.

HUDDERSFIELD.—October 31st.—Designs for laying out certain areas as a town planning scheme, for the corporation. Premiums of 100, 50, and 25 guineas.—Mr. J. Henry Field, town clerk.

ROSCREA.—November 1st.—Plans, specifications, and estimates of a complete sewerage scheme, for the No. 1 Rural Council.—Mr. Thomas Dooly, clerk, Roscrea Workhouse.

CARLISLE.—December 2nd.—School buildings, for the corporation. City Surveyor, 36 Fisher-street, Carlisle.

ORSETT (Essex).—January 1st.—For the construction of a sewerage and sewage disposal scheme in the parish of South Ockendon, for the Orsett Rural District Council. Premiums of £50 and £25 are offered.—Mr. James Beck, clerk, 2 Orsett-road, Grays.

MUNICIPAL CONTRACTS OPEN.

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Buildings.

DERWADE.—October 7th.—For the construction of a bridge, for the rural district council.—Mr. A. E. Scarlett, clerk, Pulham Workhouse, Harleston.

GLASGOW.—October 5th.—For the construction of a public convenience, for the corporation.—Mr. J. Lindsay, town clerk.

BIRKENHEAD.—October 7th.—For the construction of a gallery in the swimming bath, for the corporation.—Mr. J. Fearnley, town clerk.

DURHAM.—October 7th.—For the erection of a general bath-house at county asylum, for the county council.—Mr. W. Crozier, county surveyor and architect, Shire Hall, Durham.

SOUTHAMPTON.—October 7th.—For the reconstruction of Fore Bridge, for the corporation.—Mr. H. Barber, clerk, The Castle, Winchester.

ALTRINCHAM.—October 7th.—For the erection of a public convenience, for the Sanitary Committee.—Mr. H. E. Brown, surveyor.

ST. GERMANS.—October 9th.—For the erection of five cottages, for the rural district council.—Mr. F. E. Cleverton, clerk, 4 Buckland-terrace, Plymouth.

CROYDON.—October 11th.—For the erection of a workshop, for the corporation.—Mr. F. C. Lloyd, clerk.

HARROW.—October 12th.—For the construction of two conveniences, for the urban district council.—Mr. J. Strachan, clerk.

CORNWALL.—October 12th.—For additions to a school, for the Education Committee.—Mr. F. R. Pascoe, secretary, County Hall, Truro.

WEDNESBURY.—October 12th.—For the erection of a lodge and shed at cemetery, for the corporation.—Mr. T. Jones, town clerk.

SPALDING.—October 15th.—For building thirty-six cottages, for the urban district council.—Mr. H. H. Harvey, clerk.

WATFORD.—October 15th.—For the construction of a public convenience, for the urban district council.—Mr. D. Waterhouse, engineer and surveyor.

BRAY.—October 15th.—For the erection of sixty-four dwellings, for the urban district council.—Mr. P. MacDonnell, clerk.

BRISTOL.—October 16th.—For the erection of muniment rooms, for the corporation.—Mr. P. Addie, city valuer, The Exchange.

HERNE BAY.—October 16th.—For the erection of a pavilion and concert hall, for the urban district council.—Mr. G. H. Beetenson, clerk.

LANCS.—October 17th.—For the erection of a school, for the Education Committee.—Mr. H. Littler, 16 Ribblesdale-place, Preston.

DORSET.—October 18th.—For the erection of an elementary school, for the county council.—Mr. Clement G. Bone, secretary, County Offices, Dorchester.

WEST RIDING.—October 18th.—For alterations to a school, for the county council.—The Clerk, County Hall, Wakefield.

SOUTH WESTMORLAND AND ULVERSTON.—October 19th.—For erecting a stone arch bridge, for the rural district council.—Mr. A. Milne, Lowther-street, Kendal.

PORTSMOUTH.—October 21st.—For the erection of a school, for the Education Committee.—Mr. G. Hammond Etherton, town clerk.

HENDON.—October 21st.—For the erection of fifty artisans' dwellings, for the urban district council.—Mr. H. Humphris, clerk.

HENDON.—October 21st.—For the erection of a fire station, for the urban district council.—Mr. H. Humphris, clerk.

Iron and Steel.

SWANSEA.—October 7th.—For supply of wrought-iron unclimbable fencing and gates, for the corporation.—Mr. H. Lang-Coath, town clerk.

WOMBWELL.—October 8th.—For the supply of 50 lin. yds. of 15-in. diameter cast-iron pipes, bank pipes, or steel tubes, for the urban district council.—Mr. P. M. Walker, clerk.

ROTHERHAM.—October 12th.—For excavating, laying, jointing, and filling in 21 miles of cast-iron spigot and socket pipes, the sizes ranging from 8 in. to 3 in., for the rural district council.—Messrs. Oxley and Coward, clerks.

ROTHERHAM.—October 12th.—For the supply of 1,330 tons of cast-iron spigot and socket pipes with special castings, for the rural district council.—Messrs. Oxley and Coward, clerks.

WARRINGTON.—October 14th.—For the supply of wrought-iron unclimbable hurdles and gates, for the corporation.—Borough Surveyor.

HELMSLEY.—For providing and laying 3 miles of 3-in. cast-iron water main and 3 miles of branches, with specials, valves, fittings, and hydrants, and the construction of ram-house and service reservoir, for the rural district council.—Mr. Robert Pearson, clerk.

Roads.

TEDDINGTON.—October 5th.—For making up three roads, for the urban district council.—Mr. G. H. Salmons, clerk.

WELLINGTON.—October 5th.—For the supply of tarred granite and tarred slag, for the urban district council.—Mr. J. W. Littlewood, clerk, Bank Chambers, Wellington, Salop.

HUYTON.—October 5th.—For the supply of macadam and granite chippings, for the urban district council.—Mr. G. W. Swift, clerk.

DONCASTER.—October 7th.—For making up certain streets, for the corporation.—Borough Surveyor.

WHITLEY AND MONKSEATON.—October 7th.—For the reconstruction of footways, for the urban district council.—Mr. Augustus Whitehorn, clerk.

CHESTER-LE-STREET.—October 7th.—For work of road improvement, for the rural district council.—Mr. R. V. Dickinson, clerk.

MORECAMBE.—October 7th.—For making up a thoroughfare, for the corporation.—Mr. J. W. Hipwood, borough surveyor.

EAST STEYNING.—October 7th.—For the supply of granite and granite chippings, and hire of road roller, for the rural district council.—Mr. G. W. Warr, surveyor.

ABERBARGOED.—October 7th.—For the supply of limestone and basalt, for the urban district council.—Mr. D. H. Price, surveyor.

STANLEY.—October 7th.—For making up roads and surface-water drainage, for the urban district council.—Mr. John G. Ridley, clerk.

HITCHIN.—October 7th.—For making-up work, for the rural district council.—Mr. A. E. Passingham, clerk.

HORNSEY.—October 7th.—For making up with tarred bituminous or asphalt certain roads, for the corporation.—Mr. E. J. Lovegrove, borough engineer.

TOTTENHAM.—October 8th.—For making up Barry-avenue, for the urban district council.—Mr. Edward Crowne, clerk.

BEDLINGTON.—October 8th.—For the supply of hand-broken whinstone, for the urban district council.—Mr. C. D. Forster, joint clerk, 24 Grainger-street West, Newcastle-on-Tyne.

WEETSLADE.—October 8th.—For paving work, for the urban district council.—Mr. William Webb, clerk.

STOKE NEWINGTON.—October 8th.—For supplying and laying 4-in. creosoted deal blocks, for the borough council.—Mr. George Webb, town clerk.

MOUNTAIN ASH.—October 8th.—For carrying out private street works, for the urban district council.—Mr. W. G. Thomas, surveyor.

ISLINGTON.—October 8th.—For the supply of Jarrah wood paving blocks, for the borough council.—Mr. W. F. Dewey, town clerk.

EAST HAM.—October 8th.—For tar-paving playgrounds, for the Education Committee.—Mr. H. C. Padgett, secretary, Education Offices.

BIRKENHEAD.—October 9th.—For private street works, for the corporation.—Mr. C. Brownridge, borough engineer and surveyor.

ENFIELD.—October 9th.—For making up part of Farr-road, for the urban district council.—Mr. T. W. Scott, clerk.

CLEETHORPES.—October 9th.—For making up Osborne-street, for the urban district council.—Mr. B. Greaves, clerk.

BEDFORD.—October 9th.—For new paving works and tar-paving works, for the corporation.—Mr. Chas. Stimson, town clerk.

OLDHAM.—October 10th.—For making-up work, for the urban district council.—Borough Surveyor.

HALE.—October 11th.—For making up a street, for the urban district council.—Mr. J. G. Whyatt, clerk.

HARROW-ON-THE-HILL.—October 12th.—For making up private streets, for the urban district council.—Mr. J. Strachan, clerk.

COCKERMOUTH.—October 12th.—For widening a roadway, for the rural district council.—Mr. J. H. Musgrave, clerk.

KENSINGTON.—October 14th.—For making up portion of a highway, for the borough council.—Mr. W. Chambers Leete, town clerk.

DARTFORD.—October 14th.—For making up certain private streets, for the rural district council.—Mr. Eustace J. Hobbs, clerk.

WANDSWORTH.—October 14th.—For repairing parts of two roads in Southfields, for the urban district council.—Mr. D. A. Nicholl, town clerk.

WEST SUSSEX.—October 14th.—For the supply of about 14,000 gallons of tar, for the county council.—Mr. H. W. Bryan, county surveyor, 23 North-street, Horsham.

BROADSTAIRS.—October 14th.—For the supply of granite macadam, pit flints, pit gravel, hire of stone rollers and carting and laying limestone tar paving, for the urban district council.—Mr. H. Hurd, town surveyor.

SHERNESS.—October 14th.—For the supply of kerbs of granite, Kentish rag kerbs, hoggers and Thames ballast, for the urban district council.—Mr. W. H. Stallon, clerk.

GLYNCORRWG.—October 14th.—For making up work in several streets, for the urban district council.—Mr. W. P. James, surveyor.

CLAYDON.—October 14th.—For making up a thoroughfare, for the urban district council.—Mr. D. J. Bell, surveyor.

GUILDFORD.—October 16th.—For making up approach to isolation hospital, for the corporation.—Mr. A. D. Jenkins, town clerk.

CHELMSFORD.—October 17th.—For street works in two thoroughfares, for the corporation.—Mr. W. Smith, town clerk.

CROYDON.—October 17th.—For making up private streets, for the rural district council.—Mr. E. J. Gowen, clerk.

PRESTON.—October 18th.—For making up several roads, for the corporation.—Borough Surveyor.

BRITON FERRY.—October 19th.—For the supply of broken granite or basalt, for the urban district council.—Mr. Alex. Clarke, engineer and surveyor.

Sanitary.

KEMPSTON.—October 7th.—For the construction of house connections, for the urban district council.—Mr. William Payne, clerk.

STOKE-ON-TRENT.—October 7th.—For the supply of three teams for scavenging, for the corporation.—Mr. E. B. Sharpley, town clerk.

BLAYDON.—October 8th.—For removal of contents of ashpits, for the urban district council.—Mr. H. Dalton, clerk.

BRADFORD.—October 9th.—For the construction of circular outfall sewer in tunnel, and two shafts, for the corporation.—Mr. Frederick Stevens, town clerk.

POOLE.—October 9th.—For emptying cesspools, for the rural district council.—Mr. P. E. L. Budge, clerk.

KIRKBY-IN-ASHFIELD.—October 15th.—For laying 4,378 yds. of iron and stoneware outfall sewers, with manholes and other works, for the urban district council.—Mr. E. Bertram Hibbert, clerk.

BLYTH.—October 15th.—For scavenging work, for the rural district council.—Mr. F. Hopkinson, surveyor, 66 Bridge-street, Worksop.

BINGLEY.—October 15th.—For the supply and erection of revolving sprinklers, and floor tiles, for the urban district council.—Mr. H. Bottomley, engineer and surveyor, Town Hall.

BOLTON-UPON-DEARNE.—October 21st.—For the construction of stoneware-pipe sewers and manholes, and erection of pumping station and filters, for the urban district council.—The Surveyor.

HAYES.—October 21st.—For the construction of percolating filters, sludge beds, and humus tank, and alterations at existing works, for the urban district council.—Mr. D. C. Fidler, engineer, Grange-road, Hayes.

Miscellaneous.

BRISTOL.—October 14th.—For the supply of cement, drain pipes, and paints, for the corporation.—Mr. Lessel S. McKenzie, city engineer and surveyor.

BOOTLE.—October 16th.—For excavations and drainage in recreation ground, for the corporation.—Borough Engineer.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

CHELMSFORD.—For paving work with granite blocks, for the corporation.—Mr. P. T. Harrison, borough surveyor:—

Thomas Adams, Wood Green, N.	£2,316
J. Mowlem & Co., Limited, Westminster, S.W.	2,245
W. H. Wheeler & Co., Limited, Southwark	2,243
G. Wimpey & Co., Hammersmith, W.	2,226
W. Griffiths & Co., Bishopsgate, E.C.*	2,102
G. Porter, Buckley	2,159
Brookes, Limited, Westminster (not in accordance with specification)	1,947

FELTHAM.—Accepted for the supply of granite, for the urban district council.—Mr. G. Stevens, surveyor:—

Johnston Brothers, London, 12s. 11d. per ton.

HAMMERSMITH.—For paving east side of footway in Wood-lane, for the borough council.—Mr. H. Mair, borough surveyor:—

Mowlem & Co., Westminster, S.W.	£349 & £438
H. & J. Jones, Fulham, S.W.	336
W. H. Wheeler & Co., Limited, London, S.E.	324
Wimpey & Co., Hammersmith	320
Adamant Stone Paving Company, Westminster, S.W.*	305

HESTON.—For relaying wood paving at Hounslow, for the urban district council.—Mr. J. G. Cassy, engineer and surveyor, Council House, Hounslow:—

Wm. Griffiths & Co., Limited, London	£2,061
Improved Wood Pavement Company, Limited, London	2,676
Acme Wood Flooring Company, Limited, London	2,655
J. Mowlem & Co., Limited*	2,555

HEXHAM.—Accepted for laying 3¾ miles of earthenware pipe sewers, manholes, and flushers, for the rural district council.—Mr. J. E. Parker, Post Office Chambers, Newcastle:—

J. W. Henderson, South Gosforth, £2,674.

HUNGERFORD.—For the erection of workmen's dwellings, for the rural district council.—Mr. W. S. Raine, surveyor:—

Messrs. Hoskings Brothers, Newbury	£1,366
Messrs. J. Edwards & Son, Hungerford	1,071
W. T. Adam, Lambourn, Berks	995
G. Elms, Newbury*	880

LEEK.—For the erection of a public convenience, for the urban district council.—Mr. W. E. Beacham, surveyor:—

T. Grace, Leek	£370
S. Salt, Leek	322

PETERBOROUGH.—For the construction of sewerage works and pumping machinery, for the rural district council.—Mr. G. A. Penwill, sanitary engineer:—

Sewers, Pumping Stations, &c.

W. Pattinson & Son, Ruskington	£11,793
G. Bell & Sons, London	10,138
G. Henson & Sons, Wellingboro'	9,871
Moss & Sons, Loughboro'	9,592
J. Riley, Cheltenham	9,021
C. Chamberlain, Leicester*	8,752
J. Dickson, St. Albans	8,690
S. Porter, Doncaster	8,113

Engines and Pumping Machinery

Mather & Sons	£1,775
Allen & Sons	1,660
Rees Roturbo, Co.	1,450
— Gwynnes	1,178
— Tangye*	1,070
Sun Patent Company	890

PORTLAND.—For the erection of pumping station and cottage, and fixing borehole pumps, for the urban district council.—Mr. R. S. Hershaw, waterworks engineer:—

C. Chamberlain, Leicester	£8,541
Messrs. T. Conway & Co., Weymouth	8,419
Messrs. Jesty & Baker, Portland*	8,163

WANSTEAD.—For steam rolling purposes, for the urban district council:—

Name.	10 ton per day. Working.	Idle.	6 ton per day. Working.	Idle.	10 ton Scarifying per yard super.
	£ s. d.	s. d.	£ s. d.	s. d.	d.
Oxford Steam Ploughing Company	1 6 6	—	1 6 6	—	1
W. J. Smoothy	1 6 0	5 0	1 7 0	6 0	1
Eddison Steam Rolling Company	1 5 5	3 0	1 5 5	3 0	1
T. Rowley	1 5 0	—	1 5 0	—	1
T. Adams	1 4 0	10 0	1 4 0	10 0	1
J. G. Prior	1 3 6	11 9	1 3 6	11 9	1
G. J. Anderson*	1 0 0	—	1 0 0	—	1

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

OCTOBER.

4-5.—Royal Sanitary Institute: Meeting at Lewes; Mr. D. Roberts, borough surveyor, on "The New Sewerage System for Lewes, with Special Reference to the Discharge of Effluents into Tidal Streams."

7.—Society of Engineers: Mr. E. R. Matthews on "Town Planning from an Engineering Aspect," Institution of Electrical Engineers, Victoria-embankment, W.C. 7.30 p.m.

11-12.—Institution of Municipal Engineers: Annual General Meeting in London.

15. Institution of Municipal Engineers: Eastern District Meeting at Godmanchester.

19.—Institution of Municipal Engineers: Joint Meeting of Northern and Yorkshire Districts at Harrogate.

19.—Institution of Municipal and County Engineers: North Wales District Meeting at Wrexham.

26.—Royal Sanitary Institute: Meeting at Alton; Discussions on "Housing Problems in County Areas" and "Municipal Work in Alton." Town Hall, 11.15 a.m.

TENDERS WANTED.

BRITON FERRY URBAN DISTRICT COUNCIL.

TENDERS FOR BROKEN GRANITE, &c.

The Urban District Council of Briton Ferry invite Tenders for the Supply of Broken Granite or Basalt delivered in quantities required.

Tender Form and Specification may be obtained upon application to the undersigned.

Sealed Tenders, endorsed "Tender for Granite," to be delivered at my office on or before the 19th day of October, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

H. ALEX. CLARKE,
Engineer and Surveyor.

Council Offices,
Briton Ferry.
October 1, 1912.

WEST SUSSEX COUNTY COUNCIL.

TENDERS FOR TAR FOR SURFACE TREATMENT.

The above Council invite Tenders for the Supply to the various Railway Stations within the County of about 150,000 gallons of Tar, in such quantities as directed, during the season ending 30th September, 1913.

Persons tendering should give the following particulars: (*a*) Specific Gravity; (*b*) Percentage of Water, Ammonia and Free Carbon; (*c*) Percentage of Tar produced in the Manufacture of Carburetted Water Gas.

The Council does not bind itself to accept the lowest or any Tender, and reserves the right to accept Tenders for any portion of the quantity above stated.

Tenders, marked "Tar," must reach me on or before the 14th October, 1912.

H. W. BOWEN, A.M.INST.C.E.,
County Surveyor.

23 North-street,
Horsham.

(Continued on p. xviii.)

APPOINTMENTS OPEN.

COUNTY BOROUGH OF HUDDERSFIELD.

The Corporation require the services of an experienced Highways Superintendent, to take charge of a District under the Borough Engineer.

Applicants must have had practical experience in sewering, paving and macadamising of roads, and be competent to set out and measure up work, and keep daily accounts of all labour and materials used.

The person appointed must have had previous practical experience in a similar situation, and be prepared to reside within his district.

For statement of duties apply to the Borough Engineer.

Salary £120 per annum.

Applications, in the handwriting of candidates, giving full particulars of present and previous occupation, age, &c., accompanied by copies of not more than three testimonials of recent date, endorsed "Highway Superintendent," must be addressed to me not later than 10 a.m. on Wednesday, the 9th October, 1912.

Canvassing will disqualify.

K. F. CAMPBELL, M.INST.C.E.,
Borough Engineer and Surveyor.

1 Peel-street, Huddersfield.
September 24, 1912.

SINGAPORE, STRAITS SETTLEMENTS.

MUNICIPAL ENGINEER'S DEPARTMENT.

The Municipal Commissioners of the Town of Singapore require an Assistant, under 32 years of age, and of sound constitution, chiefly for their new sewage scheme. He must have received a good technical education, a regular training as a Civil Engineer, and including a practical knowledge of surveying, levelling and estimating. He must also have had special experience in designing and constructing sewerage and sewage disposal works and waterworks, and their maintenance. Preference will be given, other things being equal, to applicants who have passed the Examination of the Institution of Civil Engineers—Associate Members—or that of the Institution of Municipal and County Engineers. The engagement will be for three years, and each applicant is to state the earliest date upon which he could be free to leave for Singapore. The selected candidate must pass a medical examination. A second-class passage will be provided by mail steamer, or a first-class passage by other steamer, with half-pay during the voyage out. The salary will be 350 dollars per month, paid monthly in dollars, the currency of the Colony, the value of the dollar being two shillings and fourpence sterling. Such local transport allowance as may from time to time be sanctioned by the Commissioners will be paid. Applications, stating age and place of birth, and giving details of education, training, and experience generally, and referring to the above requirements seriatim, accompanied by copies (only) of testimonials, and also personal references, are to be lodged with C. C. Lindsay, Esq., M.INST.C.E., 180 Hope-street, Glasgow (who will give further particulars if requested), not later than Tuesday, 8th October next.

ROMFORD RURAL DISTRICT COUNCIL.

The above Council require, at once, a Second Assistant in their Surveyor's Department, who is able to make surveys and take levels, and is a neat draughtsman.

Age not to exceed 30 years.

Preference will be given to applicants with a good knowledge of building construction and by-laws.

Salary £105, rising by yearly increments of £5 to £120 per annum.

Applications (no forms), with copies of not more than three testimonials, endorsed "Surveyor's Assistant," must reach me, the undersigned, not later than 12 o'clock noon on Tuesday, the 15th October, 1912.

Canvassing in any form will disqualify.

(By order)

T. W. A. GREENHALGH,
Clerk to the Council.

13 North-street,
Romford.
October 1, 1912.

GOLD COAST.
SUPERINTENDING SANITARY ENGINEER.

The Secretary of State for the Colonies is about to appoint a Superintending Sanitary Engineer for service in the Gold Coast. Candidates should be qualified Civil Engineers and preferably Members or Associates of the Institute of Civil Engineers with experience of drainage works in tropical countries.

It is desirable that candidates should be over 36 years of age, but this is not essential. The selected candidate will be required to take charge of constructional and other work in the Colony of the nature of Sanitary Improvements. Salary £500 per annum, rising by annual increments of £20 to £600 and a duty allowance of £100 per annum. Free single quarters or an allowance for rent in lieu. First-class passage out and home on satisfactory termination of engagement. Period of engagement, two tours of twelve months' continuous residential service. The appointment will become permanent subject to satisfactory service. Leave of absence on full salary for two months after twelve months' continuous residential service, increased to four months if returning to the Colony. Selected candidate is required to sail as soon as possible. Medical examination. The selected candidate, if married, will not be permitted to take his wife to the Colony on first appointment.

The Royal Sanitary Institute have been asked to furnish the names of suitable candidates, and applications, addressed to the Secretary of the Institute, 90 Buckingham Palace-road, S.W., should be received by Tuesday, October 8th, 1912.

ADMINISTRATIVE COUNTY OF THE SOKE OF PETERBOROUGH.
COUNTY SURVEYOR.

The County Council are desirous of obtaining at the end of the current year the undivided services of a thoroughly competent Surveyor and Draughtsman to undertake the duties—(*a*) of maintaining, &c., the Rural Main Roads and Bridges of the County; (*b*) pertaining to the adaptation of land and the erection and supervision of buildings for Small Holdings; (*c*) relating to the inspection of and additions or alterations to School Houses and Buildings, and generally to render such services as may reasonably be required of him by this Council.

Salary £200 per annum, to include clerical and other expenses, except travelling, for which an allowance of £50 per annum will be made. The person appointed will be required to reside within the County and commence his duties on the 1st of January next.

Applications, accompanied by testimonials (not exceeding three in number), to be sent to me on or before the 19th day of October next, marked "Applications for County Surveyorship."

N.B.—Personal canvass will disqualify.

WALTER J. DEACON,
Clerk of the County Council.

Cross-street, Peterborough.
September 19, 1912.

MERRYWEATHERS'

HOSE PIPES

- FOR -

FLUSHING & FIRE SERVICE.

MERRYWEATHERS'

LEATHER HOSE

Single and Double Riveted, made from the finest selected butts. British made throughout.

A Customer writes.—

"I have great pleasure in testifying to the lasting "qualities of your Leather Hose, which has been in "daily use at the Cattle Market and Fish Market for "a considerable period, it has stood rough usage "and hard work remarkably well."

MERRYWEATHERS'

"DUB SUB" (Double Substance) CANVAS HOSE

A good, strong Hose, made from best long flax on improved looms at Greenwich Road Factory.

Capt. W. G. Pidduck, of the Kent County (Canterbury) Fire Brigade, wrote in April, 1903:—

That Merryweathers' Hose supplied in 1867 was used at a fire in Canterbury Cathedral in 1872, and was still in use at the date of writing.

Write for "HINTS ON HOSE." 70 pages.

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Fire Engineers and Hose Makers,

GREENWICH, S.E., LONDON.

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If you'll look into a car as well as at it—analyse its construction and take into account shrewdly and technically the all-important matters of material and engineering factors of safety and endurance—you're bound to be interested in the Invincible Talbot. When you're looking at cars remember—what you can't see is more important than what you can!

Specifications and full particulars on request.

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The Surveyor

And Municipal and County Engineer.

Vol. XLII. OCTOBER 11, 1912. No. 1,082.

Minutes of Proceedings.

Sewage Disposal by Oxidation Methods.

The Fifteenth International Congress on Hygiene and Demography, which was held at Washington, U.S.A., last month, was the occasion for the presentation of a number of papers dealing with sewerage and sewage disposal, and the committee of the congress took the opportunity to obtain two papers upon the above subject from an engineer and a chemist respectively, the authors being Mr. J. D. Watson, M.INST.C.E., of Birmingham, and Dr. G. J. Fowler, F.I.C., of Manchester. A study of these companion papers—one of which appeared in last week's and the other being reproduced in the present issue—provides some interesting comparisons. Dr. Fowler devotes more space to consideration of the various modern methods of preliminary treatment than we should have anticipated from the title of the paper, but both authors are agreed as to the influence of the preliminary treatment upon the choice of the method of subsequent treatment by oxidation. Again, both authors set forth the advantages and disadvantages of the percolating filter and contact bed respectively, but while Mr. Watson prefers percolating filters, Dr. Fowler states that "there can be no doubt that the main advantage of the contact bed lies in its freedom from nuisance." Mr. Watson bases his preference upon the belief that the oxidising process is dependent upon the free admission of air into the heart of the bed, and "it is obvious that the air supplied to this form (the contact bed) of purifying agency is restricted to the volume of sewage treated, whereas it may be equal to many times that volume in a well-constructed percolation filter." He also gives a very full description with costs of the construction of a large area of percolating filters at Birmingham, and deals with relative efficiency in distribution of fixed sprays and a rotating distributor, which indicate that, on the whole, the ultimate result is much the same in spite of the admitted lack of uniformity of distribution by fixed sprays. This will confirm the experience of American engineers, who in nearly all cases adopt this method of distribution.

On the other hand, Dr. Fowler points out that the spraying of anything but a fresh tank effluent on percolating filters is attended with a considerable nuisance from smell, and in any case the development of insect life, particularly flies and spiders, is often extraordinary. Further, he considers that, "however good the effluent from such [percolating] filters, and however economical their construction and maintenance, it cannot be said that such a process meets all sanitary and aesthetic requirements." In these two papers we have the carefully considered arguments of two acknowledged authorities, each with a wide experience of all modern methods, the one in favour of percolating filters and the other in favour of contact beds. For our own part we recognise the greater efficiency of percolating filters in the volume treated per cubic yard of filtering material when dealing with "weak" or "average" sewage, but we believe that much of the opposition to contact beds has been due to comparisons made with results obtained from contact beds which were not only badly designed and constructed, but improperly operated. We have dealt with this subject in these columns on several occasions in the past, and we would only repeat that if contact beds had always been constructed with the same care as percolating filters, and particularly in the provision of false floors for drainage and ample fall on the bottom, and, in addition, they were always operated in such a manner that they were filled in one hour at the most, and only once per day in dry weather, the ultimate results, both as to degree of purification and as to life of the material, would compare very favourably with those from percolating filters. The two papers in question, however, form a valuable and interesting summary of the arguments for and against these two methods for the treatment of sewage by the process of oxidation, and will doubtless be considered worthy of careful study, and will be filed for reference by all who are interested in the subject.

* * *

The Cleaning of Water Mains.

The cleaning of water mains by means of mechanical scrapers is no new thing, but, owing to various causes, it has not been adopted hitherto as generally as its merits deserve. Recently several papers drawing attention to the value of the mechanical scraper to the waterworks engineer have been written. Thus Mr. Osborne Redford, in an article published in *Engineering and Contracting*, pointed out that the process was not really expensive, but that a false impression had been created owing to the exorbitant prices charged by certain contractors, and he advised water authorities to do the work themselves, and, moreover, gave a practical description of the scraper and its operation. Mr. Harry Blackadder, in an article contributed to THE SURVEYOR of February 10, 1911, drew attention to the splendid results of main cleaning, describing his own work with the "Glenfield" scraper, and giving valuable practical advice. Mr. E. D. Groves, on July 14, 1911, contributed an illustrated article describing some very successful pipe-scraping operations at South Molton. This work was carried out at the advice of the Local Government Board, the Eric (Patent) Pipe Scraper Company, of Monmouthshire, being the contractors. The machine is fully described and illustrated in this article.

In the present issue we give some particulars of special interest relating to the cleaning of water mains in the city of Halifax, Nova Scotia, furnished by Mr. F. W. W. Doane, the city engineer, in a paper read before the Union of Canadian Municipalities at Windsor, Ontario. The paper is particularly valuable because it contains exact prices

and gives the results of main cleaning extending over a period of thirty-three years. The cost of cleaning must, of course, vary according to the different conditions, but it is perfectly clear that with a little practice the waterworks engineer should be able to attend to the cleaning of his own mains without incurring any great expense. It is also clear that those who have seriously undertaken the work of main cleaning speak well of the process. When we have figures showing that 29,500 ft. of 15-in. main have been cleaned in ninety-five minutes, at a cost of £1 14s. 7d., or ·0142d. per foot-run, it is quite clear, even after making every allowance for the fact that the mains are cleaned annually at Halifax, that the process is not very costly. We are told that the incrustation of oxide of iron thus removed sometimes reduces the capacity of the Halifax mains by 50 per cent. In Mr. Redford's paper the actual costs of cleaning were given as 2·125d. per foot-run for 4-in. mains, 1·415d. per foot-run for 6-in. mains, while the cost of cleaning 5 miles of 20-in. main is stated to have been £312 10s. Seeing that the process will remove scale or deposit entirely, it may often save the relaying of a main. Large stones and pieces of lead from bad joints are sometimes removed from pipes, but the real value of scraping lies in the removal of incrustation or vegetable growth. At South Molton a main which had a theoretical discharge of 170,000 gallons per day was found to deliver only 92,000 gallons per day, owing to incrustation. If it had not been cleaned a very large outlay would have been required to set things right.

From the evidence given it appears that, though the cleaning of a badly incrusted main may be costly as compared with Mr. Doane's figures, the subsequent cleaning may be done at very small expense, and for this reason, taken together with the great advantage of maintaining mains with their full capacity, it will be well to consider the policy of the annual cleaning of certain mains.

* * *

The Engineer and Town Planning.

The arguments which we recapitulated in our last issue in regard to the peculiar qualifications of municipal engineers for the preparation and execution of town planning schemes are well illustrated by several passages in the paper on "Town Planning from an Engineering Aspect," which was read before the Society of Engineers on Monday last by Mr. Ernest R. Matthews, Assoc.M.Inst.C.E. In his capacity as borough engineer of Bridlington Mr. Matthews has gained practical knowledge of the questions with which his paper dealt in the design of a scheme for that town; and his experience, added to that of many other experts, leads to the general conclusion that many of the most important parts of a town planning scheme are of a purely engineering character, and that, provided an architect is consulted in regard to matters in which his experience would be valuable, the general design of a scheme should be in the hands of an engineer experienced in town management and development.

Mr. Matthews pointed out that the problem of town planning in a residential district is very different from that in a manufacturing centre, and he dealt with the two cases separately. Inasmuch as the fitness of municipal engineers to deal with such matters is sometimes challenged in certain quarters, it may not be inappropriate shortly to point out certain matters which are inseparable from any town planning scheme, and at the same time are clearly within their special province. As regards a scheme for a residential district, the direction, width, classification, and method of construction of the various roads are matters of primary importance. The position of most of these roads will be determined by the best and most suitable direction of main and intercepting sewers, and this is a matter solely for the decision of the engineer. Again, economy in road construction is of vital importance, and has an enormous influence upon the possibility of erecting houses which can be let at rents which are at the same time both reasonable and remunerative. Nevertheless the first cost must not be reduced below the point of efficiency, or the economy will turn out to be entirely false, being more than counteracted by an excessive annual charge for maintenance.

In regard to sewerage and sewage disposal, it is for the engineer to ascertain whether the existing sewers and disposal works are capable of taking the drainage from the proposed area, and, if not, whether they should be enlarged, or whether it would be more economical to construct new sewage disposal works for the area to be laid out, and the questions of gravitation or pumping and of the disposal of storm water have to be dealt with. In the case of the development of a manufacturing district the engineer has many additional problems to face. Among these may be mentioned the supply of electrical energy for power and lighting, and the provision of wharfage. Moreover, such a district is best suited for the erection of refuse destructor works, tramway depots, and other works required for the various municipal services. Mr. Matthews' paper looked at the matter from the point of view of the engineer, and was therefore chiefly concerned with such subjects as we have just mentioned. It concluded with a brief description of the scheme which he has prepared for Bridlington, and an expression of opinion that it is necessary in town planning matters that the engineer shall co-operate with the architect. This has always been our claim, and a consideration of the engineering questions which arise is sufficient to show that the training and experience of the municipal engineer are indispensable to the production of a thoroughly efficient and economical scheme.

* * *

Government by Commission.

For many years now American municipalities have been seeking a form of civic government which would ensure efficiency of administration and at the same time adequately safeguard against corruption. Various expedients have been tried without proving satisfactory in practice, but in recent years considerable progress has been made in what is known as the "Commission" form of municipal government. The success which has attended the inauguration of this institution is undoubtedly due to its recognition of two fundamental notions which must be at the root of any system of government of a modern municipality. In the first place, the increasing and ever widening scope of the duties which fall to be discharged by the governing authority of a modern city render it essential that the services of permanent officials who are experts in the work of their respective departments shall be invoked. If these officials, however, are left to themselves, and are not subject to supervision and control by the ratepayers or their representatives, it is evident that grave abuses might easily result. The second requirement therefore is that the permanent staff shall be under the supervision of some authority who will form a connecting link between the expert official and the citizens. In the "Commission" form of government, this link is supplied by an elective commissioner, who, although not an expert official, acts in a capacity analogous to that of an English Council Committee.

Mr. Oswald Ryan, of Harvard University, in a recent analysis of the problem of city government, expresses the view that the success of the English system is largely due to a satisfactory adjustment having been made between the professional and lay element. Be this as it may, a comparison of the English system of government by a council and committees with the American system of government by a commissioner can hardly fail to be of interest. We are led to wonder which system

works more satisfactorily in regard to such questions as security of tenure. The English system cannot really be considered independently of the relation of the local authority to the central government. English officials ask for more central control in the matter of appointment and dismissal, and in the absence of such control it seems to us that from the point of view of the official it would be far better to be in the hands of a committee rather than under the "control" of a single elected commissioner.

* * *

International Testing Association.

An exceedingly interesting congress was recently held in New York under the auspices of the International Association for Testing Materials. A variety of topics arose for discussion, but we may perhaps draw attention to two contributions to the proceedings which were made by Mr. Edwin O. Sachs, who is well known as the chairman of the British Fire-Prevention Committee. The first of these dealt with the fire resistance of concrete and reinforced concrete, and after recapitulating the methods of testing adopted in England under the universal standards, contained certain valuable suggestions as to some international tests desirable on special matters relating to these materials. These suggestions were embodied in a series of resolutions expressing the opinion that it is advisable in the future investigations of the strength of concrete and reinforced concrete as used in buildings to obtain reliable data of the effect of fire at high and at moderate temperatures upon these materials; that the tests in different countries should be arranged as far as possible on a uniform basis; and that a special sub-committee should be formed to deal with the matter. In view of the enormously increased use of reinforced concrete, there can be no doubt as to the value of such a series of tests as Mr. Sachs proposes, and the work of the sub-committee will be watched with great interest.

The other paper submitted by Mr. Sachs contained a record of the rather limited scientific research work as to stresses and strains on reinforced concrete which has been undertaken in Great Britain, and in respect of which reliable data are obtainable. Unfortunately very little research work of this character has been undertaken in this country, and Mr. Sachs concludes with the hope that his contribution, by its poverty compared with the contributions from other countries, may assist in an awakening as to the necessity of inaugurating systematic research work.

* * *

The Manchester Appointment.

Elsewhere in this issue we quote in full *The Manchester Guardian's* report and comment as to the Manchester City Council's discussion relative to the important contemplated appointment of a deputy city surveyor. It will be seen that, for the moment, the council are not agreed upon the exact terms of the appointment, the points at issue being (1) the salary to be offered, and (2) the limitation of candidature to applicants who are full members of the Institution of Civil Engineers. With regard to the first point, we venture to hope that the commencing remuneration will be at least £750 per annum. It must be remembered that in the present city surveyor, Mr. T. de Courcy Meade, Manchester has an engineer of unquestioned professional abilities, a born administrator, and a man who has in all things walked "straight as a gun barrel" along an official path beset with difficulties, especially pronounced in the earliest period of his appointment—eighteen years ago. Mr. de Courcy Meade has set a very high standard for a deputy who should be able to fill the chief post in due course—temporarily perhaps on occasions, permanently at a time which we trust may be many years hence. We think the Council, in seeking such a deputy, wisely stipulated for full membership of the Institution, as no good purpose would be served by giving juniors the trouble of applying. It is, however, the adequate salary that is essential and that is eminently justified in view of the great engineering works which, as *The Manchester Guardian* emphasises, the city has in hand and in prospect. Granted that and the city might limit applications from the fit and few by inviting them only from candidates who are members of the Institution of Civil Engineers and who have had special experience in the main drainage of large cities.

* * *

Filing Plans.

Having regard to the varied character of the administrative duties which fall to the lot of the municipal engineer, it is hardly surprising that the problems of office management frequently force themselves upon his attention. It may be taken as an axiom that any system is wasteful which demands that the time of the chief official, who is a skilled expert in professional work, should be devoted to any considerable extent to matters which concern the mere machinery of office routine. On the other hand, it is necessary that his time shall not be wasted owing to a lack of some efficient system by which, for example, any desired document or plan may easily be found. The methods in vogue for filing and indexing plans are many and diverse, and it has been suggested to us that a useful purpose would be served if we were to invite correspondence on the subject from our readers. One system, which has been found to work very well, depends upon the two fundamental ideas of having three or four stereotyped sizes of paper, to one of which every plan must be cut, and keeping the plans in drawers in specially made cabinets, grouped according to subject-matter. The class and number of each plan are stencilled on the back, and correspond to a similar entry in the plan index-book. Thus there is a definite place for every drawing. No doubt this system is not perfect, nor is it necessarily adapted to the peculiar conditions of every office. We merely mention it as an example, and we shall be glad to hear from any of our readers who have found other methods of arrangement to give satisfactory results.

* *

Electrolosis of Concrete.

A suggestion is made by Mr. Cyril de Wyrall, in a paper published in the Proceedings of the International Association for Testing Materials, to the effect that ordinary concrete is liable to disintegration by electrolytic action. We deal with the paper elsewhere in these pages. It seems upon the whole improbable, in the face of tests made and of generally observed facts, that concrete is likely to be affected in the manner suggested; none the less, it is a very important matter, and seeing that the author brings forward several instances of the apparent disintegration of wet concrete by electric currents the whole subject ought to be investigated more thoroughly than has been done hitherto. It would be useful if those of our readers who may have to deal with the disintegration of concrete from some unknown cause were to take the possibility of electrolytic action into account. If any reader has had an experience similar to that of Mr. de Wyrall, it would be advantageous to engineering generally for him to add his evidence to that already obtained. The wide use of concrete and the enduring nature of the material under most conditions gives little support to the theory of electrolosis, but, on the other hand, there may be certain special conditions where electrolytic disintegration does take place, and, if so, it is of the first importance that we should know them. We therefore invite communications from any of our readers who may be able to throw further light upon the subject.

Town Planning from an Engineering Aspect.

By ERNEST R. MATTHEWS, assoc.m.inst.c.e., f.g.s., Borough Engineer of Bridlington.

The architectural aspect of town planning has been much discussed of late, but from an engineering standpoint the subject has had less attention. It is easier to regard the matter from the former point of view, for a mere reference to town planning raises in one's mind such questions as whether the houses are to be twelve or forty to the acre; are to be set back 10 ft. or 30 ft.; are to be detached, semi-detached or in terraces; whether some portion of the area to be laid out shall be reserved for large residences, other portions for workmen's dwellings and bungalows, others for shops, and a further area for factories; or whether the two latter are to be kept out of the area entirely.

At Ruislip-Northwood the town planning area is divided up as follows:—

¼ of site area to be occupied only by	bungalows.
⅛ " " " "	shops.
⅛ " " " "	ordinary dwelling-houses and larger residences.

The provision of open spaces for parks and recreation grounds, and of sites for public buildings, monuments, &c., all affect the architectural aspect of the subject; but from an engineering point of view many other important matters have to be considered. As town planning in a residential district is very different from that in a manufacturing centre, we will consider the two cases separately.

TOWN PLANNING IN A RESIDENTIAL DISTRICT.

The town planning scheme prepared by the author for the Bridlington Corporation, part of which is shown on Plate 2, is one affecting a purely residential area. In preparing such a scheme the first matter to be dealt with is to fix the area to be planned. A knowledge of local conditions and requirements is absolutely necessary in deciding this; and those parts of the town in which building operations are likely to proceed most rapidly should be included in the area.

This area having been decided upon, and the Local Government Board's sanction to prepare a scheme for such area having been obtained, the next point to receive consideration should be the direction, width and method of construction of the various roads. Let us now consider these three points together.

(1) *Main Arterial Roads.*—At the outset the direction of the through-traffic roads should be fixed, and these should be in such a position that direct means of communication will be provided between one busy part of the town and another, or they should connect up important existing roads. The position of most roads will be determined by the best direction for main and intercepting sewers, and this is a matter for the decision of the engineer. Plate 2, which is the author's suggested scheme for the planning of a certain portion of Bridlington, which now consists of fields, shows certain arterial roads illustrating this point. The author strongly urges that none of such roads should be less than 75 ft. in width, and that they should be constructed of tar macadam in order to ensure a minimum of dust and noise. The footpaths should be of asphalt, the road should be provided with grass margins and trees, and the author recommends that they be of the section shown in Fig. 1, the houses being set back 25 ft., making a total distance between the buildings of 125 ft.

A brief description of such a road is as follows:

Width of carriageway	35 ft.
Width of footways	10 ft.
Width of grass margins	10 ft.

Such a road is of sufficient width to take a single line of trams in crowded parts and a double line on the outskirts.

The author suggests the following method of construction:—

Foundation.—The sub-foundation having been carefully prepared and shaped to the finished profile, the foundation should then be laid; this may consist of hand-packed rubble stone, preferably sandstone, or (as at Bridlington on the outskirts) well rolled in with a 10-ton steam roller. In the case of a rubble stone foundation a thickness of 9 in. will probably be sufficient; these stones will be laid on edge and will vary in length from 6 in. to 9 in., and in thickness from 4 in. to 6 in., and be laid lengthways across the street. After the rubble stone has been carefully laid, it should be "blinded" with broken bricks, broken concrete, or broken stone so as to fill up the spaces between the stones. A 10-ton steam roller should then be applied, the road being well watered, until an even surface is obtained. Where a brickbat foundation is used the author's practice has been to make the depth 12 in. after rolling.

Tar Macadam.—The stone for this may be limestone or one of the softer kinds of granite. The author has found Scotch granite to be admirable for this purpose, and has used it very considerably for tar macadam, greatly preferring it to limestone after several years' experience with the latter. The stone should be in three sizes, and as regards the relative quantity of each size the author concurs with the suggestion made by Mr. John S. Brodie, M.INST.C.E., the borough engineer of Blackpool, as follows:—

60 per cent 2½ in.
30 " " from 2½ in. to ½ in.
10 " " " ⅜ " ¼ "
All below ¼ in. being discarded.*

The tar macadam should be laid and rolled in separate layers, being rolled first with a 6-ton and afterwards with a 10-ton steam roller. The author suggests a total thickness of 6 in. of metal after rolling.

The metal should be thoroughly dried, and all dust removed before mixing with the tar, which should have a temperature of about 260 deg. The author has usually had the mixing done by hand, but there are many excellent mechanical mixers in the market, and he would recommend the use of these. The estimated cost of constructing such a road at Bridlington, with brickbat foundation, would be £4 13s. 8d. per lin. yard of roadway, including footpaths, grass margins and tree planting.

(1a) *Secondary Roads.*—The secondary roads which are important roads not carrying through traffic might be 50 ft. in width, constructed in the same manner as the arterial roads—namely, of tar macadam, but of the section shown in Fig. 2. The set-back of the houses in these roads might also be 25 ft., and the distance between buildings would be 90 ft.

Width of carriageway	24 ft.
Width of footways	7 ft.
Width of grass margins	6 ft.

A road of this width will allow three lines of vehicles passing. The estimated cost of such a road would be £3 9s. 9d. per lin. yard.

(1b) *Subsidiary Roads.*—These are roads which carry practically no traffic except vehicles coming to the houses in such roads. Under these circumstances they need only be very narrow, say 28 ft. or 30 ft., with the houses set back 20 ft., and might be constructed in the manner shown in Fig. 3. These also, in the author's opinion, should be of tar macadam, with a thickness of 4½ in. of metal, and the foundations might be a trifle lighter than those in the more important roads. While a large amount of heavy traffic will not come upon them as upon the roads already referred to, a certain amount of such traffic will do so in the way of loaded furniture vans and other occasional heavy vehicles, and the road should be capable of carrying such loads.

Width of road	16 ft.
Width of footways	4 ft.
Width of grass margins	3 ft.
Depth of road foundation	9 in.
Thickness of tar macadam	4½ in.

It may be argued that a width of 16 ft. is insufficient, and it must be admitted that it is very debatable whether the cost of maintenance of such a road is much less than that of a road double this width, for the traffic upon a road is nearly always along the centre half of such road, and therefore this concentrated traffic would cause the narrower road to require almost as much repair in proportion to the traffic passing over it as a wider road. The author, however, urges that as most subsidiary roads are connected to no important roads, that many of them are

* Paper read on Monday evening at a meeting of the Society of Engineers.

* "Suggestions towards a Standard Specification for Bituminous bound Carriageways," by John S. Brodie, M.INST.C.E. Paper read at the Institution of Municipal and County Engineers' Annual Meeting, 1912

culs-de-sac, and that ordinary vehicular traffic on these roads will consist chiefly of light tradesmen's vehicles, a width of 16 ft. is sufficient. The estimated cost of such a road would be £2 8s. 5d. per lin. yard.

Cost of Road Construction.—This is a vital point with the landowner, for it determines to a large extent the class of buildings which he must erect if he is to be recouped for his outlay. The by-laws of our towns and cities are unreasonable in their requirements both as regards width and method of construction of

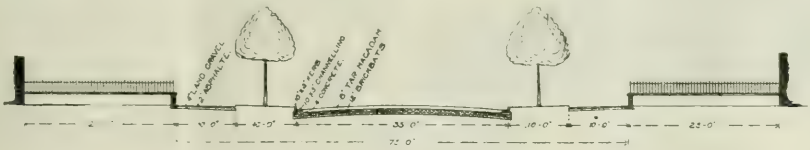


Fig. 1.—Through Traffic Street.

roads. How, for example, can one build workmen's cottages when the roads on which these are to abut must be 40 ft. in width, with flagged footways and a heavy type of kerbing, as is the case in many towns? In the author's opinion it is a waste of money to lay flags and put in, say, 12 in. by 8 in. kerbing in such a road, and an equal waste to make such a road 40 ft. wide. He has already suggested in this paper that 30 ft. is an ample width for a street of this class, and the footways should be of asphalt with grass margins, the latter being protected by stone edging, say

Fig. 3.—Subsidiary Road.

10 in. by 4 in. (see Fig. 3). Not only will this effect a great saving in cost, but roads constructed in this manner will present a more rural and pleasing appearance.

The by-laws requiring roads to be 40 ft. wide oblige the man who is intent on building small houses to

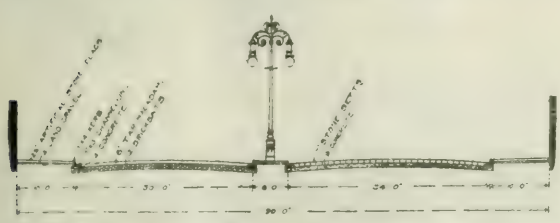


Fig. 4.—Arterial Road in an Industrial Area.

erect these with narrow frontages and deep backs, a class of house which is objectionable in many respects, a wider frontage with a shallow back being far preferable. The author deprecates the terrace type of cottages, which have been designated "coalercrows", this class of house would, in many cases, not have been erected if it had not been for the cost of roadmaking required by the by-laws, making it necessary for the landowner to crowd as many houses as possible on to his land.

It sometimes happens that a residential area in time becomes one through which heavy traffic passes to an industrial area which has sprung up beyond. Who is to pay for the reconstruction of the through-traffic roads in the residential area should such conditions arise? A proposal has been made, with the principle of which the author entirely agrees, that "in laying out land for residential purposes the developers should be called upon only to lay out and construct such roads as are needful to deal with the traffic of such area; and in the event of existing industrial conditions or future developments causing a need for heavier traffic-bearing roads through these residential areas, the extra cost of such roads over the cost of roads constructed for domestic traffic should be borne by the community."*

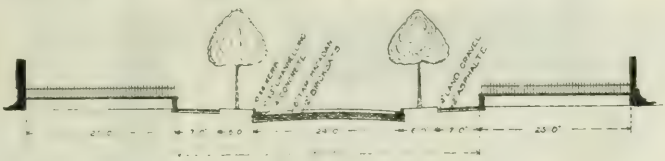


Fig. 2.—Secondary Street.

The Widening of Existing Roads.—In designing a town planning scheme it will probably be necessary to allow for the widening of some of the existing roads. This has been the case at Bridlington, where Cardigan-road, which now averages 36 ft. in width, is to be widened to 70 ft. In this instance the east side of the road is built up with large residences, but on the west side no buildings have been erected up to the present. The owner of this vacant land, however, is now desirous of erecting houses on that side of the road, and the corporation are asking him to give up a 35-ft. strip of land for the purpose of increasing the width of the road. Experience has shown that owners of land in various parts of the country have, generally speaking, been quite willing to give up a portion of their land for road widening purposes, for the reason that if their remaining land abuts upon a wider road it will be of more value to them, and the same argument applies to any houses which the landowner may erect facing the wider road. The corporation would, of course, construct the road. This matter of the improvement of existing roads is an important one, and must have full consideration when preparing a town planning scheme.

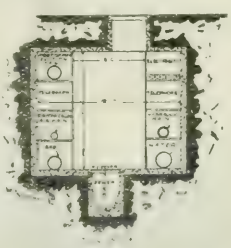


Fig. 5.—Section of Subway.

The Direction of Existing Public Footpaths. In preparing a scheme it is often advisable to improve the direction of existing public footpaths, for which purpose full powers are given by the Act, and the engineer should give careful consideration to this point.

Open Spaces. In planning a residential area it is

* Paper read by Alderman W. Rhodes, of the Chesterfield Town Council, at the National Housing and Town Planning Conference, at Manchester, 1912.

necessary to determine the best positions for parks, tennis courts, bowling green, children's playground, garden enclosures, sites for future public buildings such as public library, town hall, municipal offices, &c., unless the town is already well provided in that way, and land should be reserved for these purposes. In these matters the engineer will confer with the architect, and, of course, consult the various land-owners and others who have interests in the scheme, and it should here be noted that great tact on his part will be required in order to ensure the best results for the corporation he is serving.

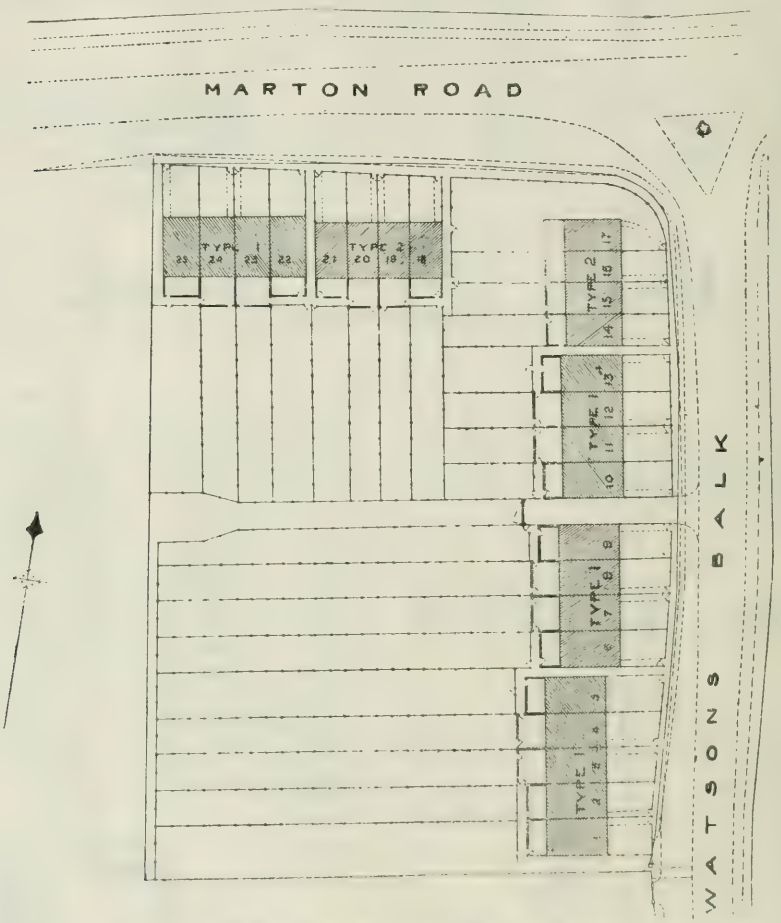
(2) *Sewerage and Sewage Disposal.*—Having dealt with the roads in the proposed area, the next matter for consideration is that of sewerage. The engineer must ascertain (*a*) if the existing sewers and disposal works are capable of taking the drainage from the proposed area, and if not whether it is proposed to enlarge them or to construct new sewage disposal works for the area to be laid out, (*b*) whether the levels permit of the area being drained into existing sewers, (*c*) how the storm water is to be dealt with.

At Bridlington, if a large area is added to the town as proposed, it will be necessary to take out the existing 12-in. northern outfall sewer which discharges into the sea below L.W.O.S.T. on the North Foreshore, and to put in a 24-in. or probably 30-in. outfall in its place, also to enlarge the existing screen chamber and to put in larger sewers for about ½ mile from the outfall sewer to the south-eastern corner of the area.

Then again on the south side of the town a portion of the area near Bessingby included in the scheme is too low to be drained into the corporation sewers, and while some of the front land may drain into the existing sewers, if the latter are lowered 5 ft. (and no doubt this will be done), the remainder of the sewage will have to be dealt with by the construction of disposal works within the area itself, or be discharged by means of a new outfall into the sea.

These instances of the difficulties that one meets with in designing a town planning scheme may be of interest to the members. The land developer should be expected to pay only for sewers of sufficient size to drain the area, and if he is required by the local authority to put in larger sewers, such as may be required eventually if the area is very considerably extended, the authority should pay the difference in cost.

As to the disposal of storm water, the author does not expect to meet with much difficulty in that way, as several good outlets are available. Separate surface-water drains will be laid in most of the roads, and these will be connected up to the existing surface-water drains.



Arrangement of Proposed Workmen's Dwellings, Bridlington.
(Plate I.)

(3) *Lighting.* The lighting of the area by means of gas or electric light is a matter of great importance, and the cost of the laying down of mains and cables from the nearest supply will have to be ascertained; if the corporation own these undertakings they may have to seek powers to extend their lighting area in order to include the town planned area.

(4) *Water Supply.*—The same remarks apply to the supply of water in the area.

TOWN PLANNING IN A MANUFACTURING TOWN.

The planning of an industrial town or city is a far more complicated matter than that of a residential

town. From an engineering and economic standpoint a number of important matters have to be considered: some of these are as follows:—

(1) The first point to be decided is the position of the industrial area. To arrive at this one must have local knowledge—that is to say, information regarding existing trades and manufactures, and which of them is likely to develop considerably. The scheme should also be arranged for the inclusion, if necessary, of any new industries, for it must be borne in mind that the industries of to-day in some of our towns were not thought of a few years ago, and that every month fresh industries are being started, some of them, doubtless, having come to stay. The motor industry might be cited as an example.

(2) The proximity of this area, with its works and factories, to railway sidings and to main lines for the supply of the raw material, coal, &c., and for the disposal of the finished materials, is a very important matter. Land adjoining railways, rivers and canals will, generally speaking, be admirable for inclusion in a manufacturing area. In certain trades, of course, it is important that the works shall be situated where there is much water. Bleach and dye works, for example, are generally found on the banks of a river, stream or canal. These points will have to be considered fully by the engineer when planning the industrial area.

Before deciding on any particular positions for railway sidings, the engineer will naturally consult the railway officials; it is preferable that there should be a general siding leading to a number of smaller sidings. It has been suggested that it will pay a landowner in some instances "to give the land to the railway for the siding or sidings in order that engines might bring the goods nearer to the factories and yet remain upon the railway company's land."*

* "Industrial Development," by Councillor W. G. Wilkins, J.P. Proceedings of the National Advisory Town Planning Committee.

(3) The facilities for vehicular traffic to and from this area. The position of main arterial roads relative to the proposed area.

While in a residential area it adds to the picturesqueness of the district if the roads are radial in plan (and the author would strongly recommend this), in an industrial centre direct communication between the area and the railway, wharf and principal parts of the city is of the utmost importance. The connection of the proposed arterial roads with existing roads is also an important matter.

(4) The necessity for constructing any new roads leading to this area in such a substantial manner that they will carry the heavy traffic likely to come upon them. All streets of this class should be paved with stone setts laid on a good concrete foundation, and they should be wide enough to take a double tramway track.

(4a) The provision of roads for rapid and slow traffic.

Fig. 4 shows a cross-section through an arterial road leading to an industrial area, and illustrates what the author recommends as to the provision of two distinct streets running parallel with each other, but intended one for rapid the other for slow and heavy traffic. He suggests that such a provision is necessary owing to the increasing number of motor cars and other speedy vehicles using the roads. It will be seen that the footpaths are flagged—they are 10 ft. in width—and that the rapid-traffic road is constructed of tar macadam and is 30 ft. wide, while the slow-traffic road is paved with setts and is 34 ft. wide, a 6-ft. refuge or footway dividing these two roads. The total width of the street would be 90 ft. It is not suggested that trees should be planted in such a street. Some have recommended that the width of the main arterial streets should not be less than 100 ft. or even 120 ft., but the author sees no reason why they should be of this great width.

Section of Bridlington Town Planning Scheme.

(Plate 2.)

(5) The area to be occupied by workmen's dwellings, and the proximity of this to the industrial area.

There is a difference of opinion regarding the best position for the houses of the workpeople. Some maintain that these houses should be away from the industrial area, but situated in an adjoining housing area, while others consider the houses should be built in the same locality as the works and factories, so that the factory hands will be close to their work and will not have to walk some distance to their homes. The author favours the first suggestion chiefly on the grounds of health. Easy communication can be provided between the two areas, and if they adjoin there need be no reason why the workmen cannot get home to dinner each day. Larger gardens can be better arranged for if the houses are in a separate area, and the fact of the dwellings being away from the works has a tendency to enable the factory hands to forget their daily avocation after working hours.

The author certainly favours keeping the works and the people apart. If the factories are on one side of a river and the houses of the people on the other, ample provision should be made by means of bridges for easy communication between the two sides.

(6) The supply of electrical energy to the manufacturing area for power and lighting purposes.

This is an absolute necessity in an industrial area. The use of electricity for power purposes is becoming more and more common, and from a smoke nuisance point of view this is necessary, for in many cases the proposed industrial area will be adjacent to a residential area.

If the electricity supply of a town or city is in the hands of the corporation, the electrical engineer should be asked to advise his committee to obtain, if necessary, powers to extend their area of supply so as to include this proposed industrial area. Cheap rates for power and lighting purposes should be offered to the factory proprietors to induce them to take the current.

(7) Whether water carriage is available, and, if so, the position for wharfage upon rivers or canals must be selected, and the estimated cost ascertained.

(8) Provision of water and gas. It is necessary to consider the advisability of supplying water power in an industrial area.

(9) Efficient sewerage and sewage disposal system.

(10) The disposal of storm water.

(11) That the area is sufficiently large to allow of ample provision being made for the future development of the various industries.

(12) In deciding the position of the proposed industrial area, the prevailing winds should be taken into account, and the area selected should be one so situated that the prevailing winds will carry the smoke away from the residential area.

(13) The advisability of constructing subways under the main arterial roads to accommodate gas and water pipes telephone, telegraph and electric cables, hydraulic mains, compressed air and sewer pipes.

This, in the author's opinion, is a matter which in this country has not received sufficient consideration. The present method of laying sewers, water mains, gas mains, &c., under our streets is altogether unsatisfactory. These streets are continually being opened for the purpose of connecting to one or the other of these, and this constant opening of the principal roads is an intolerable nuisance, while the reinstatement is not always satisfactory, and leads to a great deal of correspondence with the departments concerned relative to the unsatisfactory reinstatement of trenches.

The construction of a subway is the remedy, and the author recommends this, but, owing to the cost, he would build the subway in the main arterial streets only. Fig. 5 is a suggestion he makes as to the type of subway that might be built. Reinforced concrete he considers to be an ideal material to use in a structure of this kind.

(14) *General.* In the industrial area might be included refuse destructor works, tramway depot, car sheds, abattoirs, ice factory and cold stores; it is always best to group these together, and to place them as far away from the residential area as possible.

(15) The construction of tramways or light railways in the area is also a matter of consideration.

(16) Folly of limiting the height of buildings. If the maximum height of the building which will abut on the new street is specified in a town planning scheme, the owner of the land will be almost sure to build to that height, considering it more economical to do so. If it be [illegible] buildings that are allowed and not higher, then there is a danger of a monotonous row of four-storey buildings being erected, whereas a variation in the height of the buildings will be preferable.

(17) Having decided the industrial area, the residential area must then be chosen, and the developments of this will proceed on the lines already indicated in the first part of this paper.

Brief Description of Bridlington's Town Planning Scheme.—The author will now, in conclusion, give a few particulars regarding the town planning scheme which the Bridlington Town Council have under consideration.

The area proposed to be included in the scheme adjoins the town on three sides, and comprises some 2,805 acres, the total area of the borough being 2,751 acres. About two-thirds of the area proposed to be laid out is outside of the borough and in the rural district council's area. To avoid any opposition from them in this matter the town council have taken the wise course of asking their co-operation in the preparation of this scheme by the appointment of three members of the rural district council to attend the Town Planning Committee's meetings and tender their suggestions; the rural district council have agreed to this proposal.

It is not intended to proceed at present with the detailed plan, showing the whole area laid out as streets, building sites, parks, &c., but to do this in sections, the first of which to be planned is that shown on Plate 2. There is no need for the author to describe the laying out of this area, as the plan explains itself; he would, however, state that at present the area consists of fields, the land being worth from £60 to £100 per acre. The width and method of construction of the proposed roads is shown in Figs. 1, 2 and 3. The sewerage of this area has already been referred to; the gas company have power to lay mains within the area, and the corporation have power to supply water and electricity. If the area is laid out by the landowners in the manner shown on the plan, the land will be converted into building land worth from 7s. to 10s. per super. yard. The corporation are hoping to obtain land free for the laying out of the parks, recreation grounds, &c., shown on the plan. The area of this first section is 175 acres, and twenty-five workmen's dwellings are about to be erected on part of it (see Plate 1).

The author has endeavoured in this paper to point out the extent to which town planning affects the engineer. Landowners are welcoming the adoption of town planning throughout the country, as they find that if their land is left outside the area proposed to be laid out it may be undeveloped for years. Local authorities on the other hand have now the opportunity of extending their towns on modern lines, and so making the England of to-morrow a country of beautiful cities with open spaces and wide streets. Many authorities have already taken advantage of these opportunities, and have prepared town planning schemes, many others are now doing so, and it is the opinion of the author that in the near future there will be scarcely a town in this country of any importance that has not its town planning scheme in hand. In order to ensure the best results it is necessary in this matter that the engineer shall co-operate with the architect, and that the one shall appreciate the work of the other. Great tact will also be required in dealing with landowners and other interested parties, and experience has already shown that the landowner is not, except in obscure cases, an unreasonable man to deal with, and that if it can be made clear to him that the development of his land on town planning lines will be a great advantage to him, he will be found willing to co-operate with the local authority, and, if necessary, give up to the authority pieces of his land for street widening, provision of open spaces, &c. Many landowners have done this, and have become most keen in town planning.

DISCUSSION OF MR. MATTHEWS' PAPER.

At the meeting of the Society of Engineers at which the foregoing paper was read on Monday evening the chair was taken by the president, Mr. John Kennedy.

Mr. Ebenezer Howard (Letchworth) remarked that the author's paper divided itself into two sections, as though those two sections embraced the whole possibilities of the case. There was town planning in relation to a residential district, and town planning in relation to a manufacturing town; but he (Mr. Howard) suggested that there was a third type which was little thought of at the present time in this country, but which would be considered to a large

extent in the future—*viz.*, town planning in an open, agricultural area. The largest town planning scheme at present being carried out on these (open area) lines was at Letchworth, which embraced an area seven times as large as the walled-in City of London; it was now 4,500 acres in extent. There they had a case of town planning *ab initio*, just as when they built a building. Town planning in its primary idea was to build the town, and not to build additions to other towns. If he could add anything to the paper it would only be on one point—*viz.*, that at Letchworth they had to make such provision as regarded roads as would enable them to be widened at comparatively little expense. With respect to the roads they had constructed there, their experience had shown that grass margins were more suitable when a road was not a wide one. It was a good thing to allow the tenants to utilise the space with the condition that if the road required widening the land should be given up for that purpose. It might be of some little interest for them to know, if they did not already know, that with regard to a large area at Letchworth they dealt with it from the point of view that where there had been a purely agricultural district there would grow up a considerable town with a large number of industries. Naturally they selected a site near to the railway, and there had grown up a very large number of important industries. As to the question of the housing of the people, whether it should be adjacent to the works or not, that was decided on the lines that they should, as far as possible, have to set aside a large part of the estate for factory purposes, and also set aside land adjacent for workmen's dwellings. Originally they had 400 people; now there were 8,000, and a considerable number of the workpeople could go home to breakfast and the mid-day meal, and also be able to reach recreation grounds within a few minutes of their work. That was the only method of building a new town, and he hoped engineers would recognise that, as at Letchworth—which was known at one time as the wilderness of Hertfordshire—there were latent possibilities in the millions of unoccupied and unused acres, possibilities for the creation of healthy, beautiful, and useful towns which would rival in a perfectly healthy and natural way the old towns, so that rivalry would tend to produce better results in the old and new towns. It was evident from the author's plan that he did not contemplate putting forty cottages on an acre, or any number of that kind. If any town council were to proceed upon such lines (putting forty cottages upon an acre), though it might make immediate profits, it could only be done by putting up houses which would soon be out of date, and in which no self-respecting workman would consent to live.

Mr. Holroyd Smith said that in America town planning proceeded upon the system of dividing the city into squares. This had its conveniences, but it presented a difficulty in proceeding in a diagonal direction. He would suggest, therefore, in order to avoid that drawback, that the basis of the new town should not be squares, but hexagons. By this means direct locomotion would be improved, and the public convenience would be consulted. The speaker alluded to what he termed the absurdity of road surveyors constructing roads with an oval camber, which tended to collect all the mud at the sides of the road. He maintained that the road should slope from both sides to the centre. Mr. Smith also advocated the construction of subways for service mains, and a system of dealing circularly with the traffic at congested points where various streets converge.

Mr. C. T. A. Hanssen stated that the kind of road suggested by the last speaker was in use in St. Petersburg, and his experience was dead against it. The water that flowed in the street did not come from the street itself, but from the adjoining houses and courtyards. If the gullies were at the sides of the street the water was got rid of very quickly, but with the gully in the centre the water flowed all over the road, and the sides became very muddy. Labour was very cheap in St. Petersburg, and, in spite of the large numbers of roadmen, considerable pools of water formed in the streets. The remedy to be applied to our roads in this country was to diminish the camber. As to town planning, he objected to the centralisation of people in factories, and suggested that work should be carried on in the detached dwellings of the workmen, with properly organised means of transport and communication.

Mr. W. B. Esson alluded to the Hampstead town planning scheme as one of the most remarkable he had seen. There was another at Beckenham, which, to his mind, was better than Letchworth.

Mr. E. H. J. Brewster remarked that the Metropolitan Board of Works constructed a subway for underground pipes on the Embankment, but the cost was very great—so great as to be prohibitive of general application. He agreed that they might have roads too wide, and consequently too expensive to maintain, and as to materials, he thought small cubes of granite might be placed on a road with light traffic, but not where the traffic was heavy. He was in favour of limiting the height of buildings, but not in favour of making a compulsory given height.

Mr. R. W. A. Brewer supported Mr. Holroyd Smith in what he had stated with respect to the road surface. The camber was generally excessive, and was the constant cause of accidents. It seemed to him that surveyors who made themselves responsible for the roads could not be road users themselves. The solution of the traffic question was to adopt the Paris system by restricting slow traffic to the sides and relegating fast traffic to the centre of the road.

Mr. Brewster suggested that the society should communicate with the Road Board or the police authorities with respect to the choice of a circular system of dealing with traffic where, say, four roads met.

Mr. W. R. Davidge (district surveyor, Lewisham) said that to adopt the system of traffic distribution proposed by Mr. Brewer would be to create a perpetual wall of vehicles which it would be difficult to penetrate. He considered that architects and engineers might well give a mutually sympathetic consideration to the question of town planning.

Mr. W. Louis Carr (surveyor to the Ruislip-Northwood Urban District Council) stated that the allocation of the town planning area at Ruislip-Northwood given by Mr. Matthews needed slight correction, and might be given in the following form: The scheme out of an area of 5,690 acres allocated the following acreage for various purposes—factory sites (optional), 110 acres; shops and business centres (compulsory), 54 acres; shops and business centres (optional), 200 acres. These were spread over the district as considered advisable. On the remainder of the area public and private open spaces, lands appropriated for special purposes, and dwelling-houses were to be erected. With regard to the specification for making up main arterial roads, at what period of development did the author suggest this should operate? He assumed not until after building operations had taken place. If he was correct he should like to know the suggestions as to how much Mr. Matthews would require from the estate developer in the first construction of these roads. To carry out the specification in the first instance would, in his opinion, be a waste of money, and he did not think many owners would consent to such a lay out. As to subsidiary roads, had the author any objections to, say, 20-ft. streets in certain cases, or 10-ft. round quadrangles which led off a 40-ft. street? He would also suggest that at certain distances 24-ft. turning places were required in carriageways of 16-ft. width. He should like the author's views as to how many houses under one roof he recommended. With regard to the statement that wider roads added to the value of abutting property, he did not think this was always the case.

Mr. Matthews, in reply to the discussion, said that with respect to the question of Mr. Carr as to the period when the roads should be made according to the specification, he would suggest that this should take place when the whole of the buildings in the area had been completed, at any rate the whole of the buildings abutting on the roads. Mr. Carr suggested that in certain cases a width of road less than 30 ft. might be provided for. He (Mr. Matthews) agreed that in a quadrangle a road 20 ft. or 24 ft. wide might be sufficient. As to the number of houses under one roof, he thought it was preferable, as far as possible, to limit it to two. Then with respect to the statement of wider roads adding to the value of the abutting property, which had been questioned, it seemed to him to be so. Mr. Brodie, in a letter, had referred to the German method of purchasing land. The German method, he thought, was a far better one than ours. They could buy up land, lay out their land, and sell what they did not need. Mr. Brodie referred to the advisability of a corporation buying up land that they might require for widening purposes, and allowing residents to utilise part of it until such time as it was required. He (Mr. Matthews) did not like the idea of private owners fencing in corporation land. At best the fences would be temporary, and

probably an eyesore. The borough engineer of Yarmouth, in another letter, referred to some interesting points. He agreed with Mr. Whyatt that many local authorities were not doing as much as they ought to do owing to the fear of involving the town in some expenditure, thus retarding them in taking up the Town Planning Act or doing justice to it. Mr. Whyatt thought he (Mr. Matthews) had made too high a standard for the road making. Personally he did not think so; he thought that the width and method of construction he had described were suitable for the conditions he had mentioned. He agreed that a healthy town meant a saving of money. In Bridlington they had spent over £50,000 in road widenings, and if their town had been built on town planning lines that money would have been saved. Mr. Matthews thanked Mr. Howard for his interesting speech, and proceeded to state that the number of houses per acre in his scheme was twelve. He expressed his belief that the circular system of road traffic would be an improvement, and as to some remarks by Mr. Brewster, he added that he thought it would be a great mistake to roll the bed of the road, especially in certain soils.

A number of letters discussing the paper were sent by correspondents who were unavoidably prevented from attending the meeting.

Mr. John S. Brodie (borough engineer of Blackpool), wrote: "I agree with most of the suggestions made by the author, whom I congratulate on the clearness and brevity of his paper. There are, however, a few details which I trust the author will excuse me for offering a little friendly criticism on. To a certain extent the architectural aspect of town planning must of necessity take precedence over the engineering standpoint, and, within certain limits, the engineer will step in when the architect has completed the rough outline of his plan, just as, in the architect's design for a great building, the engineer can be usefully invited to confer on details which of necessity he must be more familiar with than the architect. The contour of the ground must to a large extent govern its laying out, and such questions as main drainage must, of course, be left to the engineer. The author suggests three classes of roads. I have for many years used six standard forms of roadways in Blackpool, so that such type of roadway may be adapted to the economical conditions for the development of the land, which are, after all, paramount in any well-devised scheme of town planning. Referring to the cross-sections in Figs. 1, 2 and 3, I am much more inclined to have wide spaces between building lines than grass margins as part of the roadway, except in special cases where they can be well looked after, as such margins tend to become untidy and depressing. I cordially endorse the remarks made in the paper as to the cost of construction. The benefits of ultimate wide arterial roads can quite easily be secured for future use by authorities acquiring land for highways of an ultimate width of 60 ft. to 100 ft., and allowing the abutting owners in the meantime to enclose in their front gardens or lawns so much of the ultimate width required as is not necessary for immediate road purposes; and it will be found that in many cases a 36-ft. roadway of 21-ft. carriageway and two 7-ft. 6-in. footpaths will be found ample for present purposes, and the land for future widening being secured, the expenditure on such future widening can be deferred until the volume of traffic warrants it, and should then be borne by the community, and not by the abutting owners. The proposed town planning adjoining the author's district appears to be well laid out for residential purposes. It is, however, always open to discussion as to whether the German method of purchasing the freehold of land immediately adjacent to the town area—a method adopted at Blackpool with much success for some years past—is preferable, so that the municipality reaps the advantage of the increased land values rather than the individual landowners."

Mr. H. Gilbert Whyatt (borough engineer of Grimsby) wrote that he had been greatly interested in the statement of the town planning problem as laid before the meeting by the author, inasmuch as the method of stating the case applied so closely to the conditions in Grimsby. A portion of the county borough which the corporation had in mind as suitable for a town planning scheme was on the verge of a district entirely residential in character; but at the same time it was certain that provision would have to be made for factories. The question had been discussed recently as to whether it was desirable for a local authority which was practically entirely residential, as one imagined Bridlington to be, to include the whole area of the borough in its application, so as to limit the erection of works and factories to one particular area in the town, or to exclude them altogether; but it would appear that even if such a scheme received the approval of the Local Government Board the law could not compel the owner to use a building as a residence, and to plant the garden with flowers and shrubs. It was quite open to him to use the house as a workshop, and the garden as an ugly store yard in connection therewith, provided the house could be made convenient for the purpose without the erection of additional buildings. Even the erection of additional buildings could not be prevented if constructed as stables, coach-houses, granaries, garages, &c., and used without alteration for the purpose of the factory. With regard to the question of a local authority paying for the extra width of road over that required by the by-laws, this could only be done to any great extent by a local authority which had a very high rateable value. The usual period for a loan allowed by the Local Government Board for road construction was eighteen or twenty years, and the annual payment was respectively £7 14s. 9½d. or £7 3s. 11d. per cent, which would have to be borne by the rates; while, on the other hand, with a reduced number of houses per acre, the local authority would have a less income from the estate. The real offset was a reduction of the death-rate. In the case of the landowner, he received a less ground rent owing to the restrictions placed upon the area and the limitation of the number of buildings per acre, but at the same time his expenditure on the construction of streets was less, and, taking the two, he suffered no financial loss. The writer ventured to disagree with the author as to the construction of a subway on the lines indicated in Fig. 5, except in so far as it tended to reduce the number of longitudinal trenches in a road. The latter were not very numerous, only occurring when it was necessary to lay a new main, and only recurring when enlargements of the extensions become necessary. The cross-trenches were the most numerous and the most exasperating, for no sooner had a road been thoroughly repaired than it was cut up a dozen or more times within six weeks to make connections of various sorts. To have a subway as sketched by the author would be to increase the difficulties; now, the electricity cables, and often the gas mains, were laid under the footpaths, and the cross-trenches were very short; they would all be the same length under the scheme, and would always cut up the roadway. Again, all drain connections would be very difficult to carry out and to supervise with the substructure in the way, and the limited headroom below the concrete carrying the gas and water pipes. Assuming one side of the subway to be east and the other west, there were difficulties in connecting the water and hydraulic mains, and the telephone and electric cables on the east side with the buildings on the west; and conversely connecting the gas main, compressed air main, &c., on the west side with the buildings on the east side of the street; but to an engineer these are not insuperable. The author's scheme for a town planning area as shown on Plate 2 appeared to be an excellent and very well designed solution which one might hope would be carried out.

Mr. J. W. Cockrill (borough surveyor of Great Yarmouth) wrote: "In my opinion one of the great features of Mr. Matthews' paper is to show that the engineer will be indispensable in carrying out any scheme of town planning, and that the engineer will be the corporation or district official with his knowledge of the needs and difficulties of his locality. With the plans of his district made up to date he is in a position at any time to commence the preparation of a scheme. The work of town planning is unfortunately retarded by the position taken by the local authorities, who, with their fear of the ratepayers and the large amount of unavoidable expenditure to which all towns now stand pledged, will not incur any expenditure. This is to be deplored, and any attempt of an official to make a scheme costly or to bring in outside help would wreck its chance of being proceeded with in more than half the towns and districts where the matter is now being discussed. So much of Mr. Matthews' paper is the outcome of real practical experience in his own district, and it cannot be controverted. Town planners will, however, urge that he is insisting on too high a standard for the road making. The estimates given are low for the work proposed, and could not be executed for the money in all parts of the country.

It will also be urged that the plan (Plate 2) is wasteful in space occupied by the roads, and that the sections of the roads given are unnecessarily costly: but from the point of view of the official, who will have to maintain them and to meet his council for years after they have been adopted, it is necessary that two items should be carried out—*viz.*, that the footways should be paved and that the grass margins should be kerbed. An attempt to do without these would in a very short time lead to the residents demanding a paved footway, and the sorry plight to which the grass margins get reduced if no kerb is fixed soon necessitates that the whole path should be paved, and as in most cases on the completion of the road they become "adopted roads," the expense falls on the ratepayers, and the official who accepted the work in its unfinished state is soon in hot water. In these matters, however, Mr. Burns' Town Planning Act gives the opportunity of negotiating with the landowners, and the following quotation from a paper read by Councillor W. G. Wilkins, J.P., at a meeting convened by the Housing and Town Planning Council in London in April last gives, in my opinion, a strong reason for the local authorities proceeding with a scheme: 'The Housing and Town Planning Act gives remarkable facilities for the making of bargains between local authorities and landowners, and the extent to which the Act is used will largely depend upon the extent to which those interested in the land meet those interested in civic progress in friendly co-operation for mutual benefit.' Anyone who has had to deal for any length of time with the development of a town sees in the Act a means of saving money to the ratepayers, in the health of the town and in the cost of street improvements which would have been unnecessary if a wise forethought had been used at a time within the memory of persons taking part in the transactions. The by-laws in force in most towns frequently come in for a large share of hostile criticism by town planners and a section of the public, especially in their result on the planning of corner houses, and in the question of drainage. As to the first, the experience of what has been done by architects and builders in overcrowding sites where there have been no by-laws controlling this matter gives no encouragement to the relaxations of this by-law, and in the second item, until the law is altered which provides that each house must have its separate drainage, local authorities will not be prepared to accept the responsibilities involved in giving way on this point. Other by-laws considered as involving curtailment of architectural effect and use of materials, might be allowed to drop, but at the present time most local authorities are open to admit anything reasonable in a well-designed and substantially constructed building."

Mr. Sydney H. Morgan (surveyor to the Prestwich Urban District Council) wrote: "The engineering aspect of town planning is of primary importance, and the municipal engineer is particularly fitted by his training and local knowledge to deal successfully with it. The ultimate success of a scheme depends on the soundness of the engineering principles underlying it. Mr. Matthews has dealt with his subject in an interesting and lucid manner, and deserves the gratitude of all engaged in the solution of the problem of town planning. The author urges tar macadam as a suitable method of construction for main arterial roads in a residential district. I am not sufficiently acquainted with the conditions at Bridlington to express an opinion as to the advisability or otherwise of this method in that particular instance, but as a general policy I cannot agree with the author of the paper. In Prestwich there are some very fine *residential* roads of tar macadam. Tar macadam is not suitable to main or even secondary road traffic. With heavy traffic—and a main arterial road must sometimes have heavy traffic—the surface is liable to wear unevenly, and it is most difficult to repair neatly. Granited rock asphalt laid on a bed of concrete would fulfil Mr. Matthews' conditions as to dust and noise, while at the same time showing greater wear and tear. Mr. Matthews deals with an arterial road in an industrial area. Here again I dissent from his recommendation that the fast traffic roadway should be constructed of tar macadam. A double tramway track will certainly be necessary on an arterial road, but the author does not appear to provide for it. Would he place it on either of the roadways shown on Fig 4, or on a separate portion of the road? In the case of subsidiary roads I would go further than the author both as regards width and mode of construction. Where the road is so designed that it will not be used by through traffic, but only as an approach to a few houses, 20 ft. or 24 ft. in width might be sufficient provided the houses on both sides were well set back. Trees, instead of being planted along the footways (as shown on Fig. 3), where in so narrow a street they become an obstruction, may suitably be planted just inside the gardens. In this manner both the minimum width of road and the pleasing avenue of trees are secured. Tar macadam in such a street seems unnecessary expense, and granite or whinstone macadam on a good foundation would meet all the needs of the case. There are many points in this suggestive paper which it would be interesting to discuss, but I should like most sincerely to express my gratitude to Mr. Matthews for his contribution to a subject which is daily growing in importance."

Mr. A. H. Campbell (city engineer of Edinburgh) wrote: "The paper submitted by Mr. Matthews is eminently practical. It deals with a subject of much importance to engineers, especially that branch of engineering represented by the author. The orderly development of cities and other centres of population has for long engaged the attention of municipal administrators, and at last the all too tardy powers conferred by the Town Planning Act open out a new scope for the engineer, and demanding the exercise not only of engineering skill, but of those not less indispensable talents of common sense—persuasive force and patient plodding—that are most certainly required to carry through a town planning scheme against a great variety of conflicting interests. For, consider what this new power is. It is the statutory declaration that no longer is the landowner master of his soil, but that it is held in trust for the common good; and in the use and development of his land he shall subordinate self to the general interests of the whole. This is an important advance in the realm of municipal economy. But if it confers such comparative absolutism upon the local authorities this very power calls for the exercise in its operation of justice tempered by prudence, and consideration as much for the reasonable rights of the individual as for the common interests of the people. And if the scales of justice are thus evenly balanced, then there is little fear for the success of town planning schemes in the neighbourhood of civic life. Now as to the concrete application of these observations as it bears upon the engineer. I do not find that Mr. Matthews has dealt very much upon that all important part of the preliminary survey work known as 'the altitude survey,' commonly called 'the contour' of the area. If the land be uneven, hilly and of undulating surface, a correct contour at every 5 ft. to 10 ft. vertical levels is an absolute necessity, and I should have liked to hear this part of the process enlarged upon by the author in that way, of which his writings in other engineering subjects show him so capable. For there is no question of the imperative need for this at the very outset of the plan, and it seems not to have had that attention which its importance demands as a purely engineering part of the work for evolving a good town plan. The methods to be followed, the engineering survey instruments to be used, and a general exposition of this foundational work, would itself be of the utmost use and interest to the Society of Engineers. One other feature of a good town plan is the importance of good vistas. In the disposition of the roads, the grouping of the buildings, the introduction of landscapes, there should be developed that artistic sense that delights in terminal features to the leading avenues, so that they do not convey the idea of disappearing in space. Probably nowhere is that pleasing feature of a town plan better exemplified than in the city of Edinburgh, where the designers of the New Town have laid hold of this idea in the artistic perspectives that present themselves—as if by nature—at every turn of the road. Engineers should endeavour to utilise the means open to them of embodying this attractive feature in the plans they prepare. The proposition advanced in the paper that the routes of roads are determined chiefly by considerations of drainage is one that I cannot accept; there are other elements of not less importance, as, for instance, convenience between given points, the positions of railway stations, the transit question, the securing of vantage points, which should influence the disposition and direction of roads. Drainage, we know, is vital, but engineering science can make it subserve the plan instead of allowing it to dominate and determine everything else. The locality of the industrial area is another part of the plan that introduces controversy. Nowadays, when electricity is so cheap and power is

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readily obtainable from a common generating centre, I see no reason why factories of good design, becoming elevation, and driven by electric power, may not be planted in the midst of habitations of the working classes, so that the advantages inherent to this combination may not be sacrificed upon the altar of prejudice begotten of other days when smoke and ugliness were the inevitable accompaniments of a factory area."

THE CLEANING OF WATER MAINS.

SUCCESSFUL WORK IN NOVA SCOTIA.

A paper read by Mr. F. W. W. Doane, city engineer of Halifax, Nova Scotia, before the Union of Canadian Municipalities at Windsor, Ontario, contains some important particulars, including prices of the cleaning of water mains. These particulars are of special value as they are the result of long experience and annual practice, for we are told that the incrustation of the mains has been removed annually in the city of Halifax for the last thirty-three years, a mechanical scraper driven forward by the pressure of the water having been used.

It appears that the incrustation in the Halifax mains is due to the formation of a coating of oxide of iron, which forms tubercules or blisters between which a ferruginous slime forms, so that the carrying capacity of a pipe is sometimes reduced by 50 per cent.

THE SCRAPING MACHINE.

The scraper which is used to remove this incrustation consists of two portions—*viz.*, the front part carrying the steel scrapers and the rear part, upon which the water pressure acts in order to propel the machine. There is a steel centre rod of wrought iron made in two pieces, which are coupled together in such a manner as to allow sufficient play to permit the machine to pass round bends in the pipe. The cutter or scraper has eight arms made of spring steel, varying in width and thickness according to the diameter of the pipe; these blades are arranged in two sets of four, so that the set behind break joint with those in front. Each of these arms has a cutting edge arranged so that it will cut or split longitudinally any heavy incrustation. Each blade is tapered, so that it forms a barbed knife working point backwards. The use of this shape cutter makes it impossible for the knife to catch in any valve or defective joint in the pipe. Also if the knife encounters a ferrule or similar obstfuction it will cause the scraper to revolve and thus to pass the obstruction without getting blocked, or, failing this, the spring-like knives will yield sufficiently to enable the scraper to pass.

The machine is propelled by means of discs upon which the water presses. Double discs are provided in order to ensure steadiness. These discs are made of iron, and are smaller in diameter than the bore of the pipe, so that water can pass them to wash out the scrapings. The iron discs are backed with leather discs intersected with radial cuts and stiffened at the backs with plates of lead. Thus their construction gives sufficient stiffness to withstand the pressure of the water one way, and yet allows the discs to yield backwards sufficiently to pass any obstruction not removed by the cutters. Small springs are attached to the backs of the iron discs in large sizes in order to maintain the machine exactly in the centre of the pipe. Rings are attached at each end of the centre rod for convenience in handling.

PROCESS OF CLEANING.

In cleaning a main a section of pipe is removed at each end. The machine is then inserted, and the section of pipe replaced at that end, and the water is then turned on. The scraper then starts making a noise in its progress by which it can easily be followed. The rate of speed varies from ¼ mile to 6 miles an hour, the speed depending upon the water pressure and the gradient of the pipe up or down hill as the case may be. Hydrants or wash-out valves are left open.

COST OF CLEANING MAINS.

It appears that in the city of Halifax the greatest length of pipe cleaned in one day consisted of a main of two sizes, 15-in. and 20-in. diameter, and 7 miles long. The first cost of cleaning the mains over thirty years ago averaged 1¾d. per foot, the lowest costs being 8¾d. and the highest 3·6d. per foot.

Twenty-one thousand five hundred feet of 15-in main have been cleaned in ninety-five minutes at a cost of £1 14s. 7d., or ·0142d. per foot run. The lowest head operated under was 11 ft., but it is only possible to work with this low head when experienced men are employed. The cost for recleaning supply mains during twenty-five years has been 1·32d. per foot, and on one occasion they were cleaned for 1·40d. per foot. The cost of cleaning distribution mains varies from 1·20d. to ¾d. per foot, while the cost of hand cleaning before a mechanical scraper was used was 7·1d. per lineal foot.

It is obvious that the saving of cost in relaying mains and the improvement in supply and pressure is great where mains are treated in the manner described in Mr. Doane's paper.

MOTOR 'BUS TRAFFIC IN THE METROPOLIS.

HACKNEY BOROUGH ENGINEER'S REPORT.

According to a report presented by Mr. Norman Scorgie, M.Inst.C.E., borough engineer, the number of miles per annum travelled by motor omnibuses in Hackney is no fewer than 2,202,520. A census taken in the borough last August showed that in a day of fourteen hours 7,324 mechanically propelled vehicles passed five important points, an average of 523 per hour. Of these 5,527 were motor omnibuses.

Mr. Scorgie reports that roads which until the advent of motor traffic were in good condition are now having their surfaces destroyed and their foundations disintegrated, while others have had to be remade entirely with more lasting materials. Where this has not been necessary up to the present time, it has been found that the usual life of the road has been curtailed even to the extent of 25 per cent. Foundations of Portland cement concrete, which were sufficient a few years ago, are now quite inadequate, and in all renewals where defects have been found and in new work undertaken the foundations are now increased in depth by 50 per cent.

From 1906 to 1909, the borough engineer states, the cost of repairs to certain wood-paved roads averaged £86 per annum. From 1909 to 1912 the annual average was £1,047, and between April 1st and August 31st of this year the cost had already amounted to £813. In addition, roads which would have lasted years longer under ordinary traffic have had and will have to be renewed. In Stamford-hill, Kingsland-road and Victoria Park-road £1,900 is for foundation renewal out of an estimate of £7,350.

Mr. Scorgie further mentions large sums which have had to be expended on macadamised roads owing to the motor-omnibus traffic, and finally points out that the only contribution made up to the date of the last published report by the Road Board to the extra cost of maintenance of London's roads has been £1,287, although the London General Omnibus Company alone pays the board £65,000 per annum. He calculates that, on the basis of ·3d. per mile, the tax paid on petrol used by the motor omnibuses of the London General Omnibus Company running within the borough amounts to £2,750 annually.

Municipal Undertakings of Birmingham: Pit Mounds Utilisation. With the *Times* of the 2nd inst. was issued one of the remarkable special supplements which it publishes occasionally. The subject to which it was devoted was "the second city of the Empire," one aspect of which—the "Municipal Undertakings of Birmingham," to which five columns were devoted—has a special appeal for Surveyor readers. The section dealt with the city's water, gas and electricity supplies; tramways; and drainage works. Another article of great interest records the excellent work of the Midland Reafforesting Association, part of whose aim is to utilise the dreary waste of the Black Country for the planting of hardy, quick-growing trees of proved economic value, such as the poplar, willow, ash and sycamore. The West Bromwich Corporation have, with the approval of the Local Government Board, agreed to let to the association for this purpose, at a nominal rent, upon lease for twenty-one years, certain pit mounds on the south side of the town, the first public recognition of the association by a corporation as a proper authority to deal with the afforestation of waste lands. We echo the hope expressed in the *Times* that this example may be followed by other corporations which possess waste lands.

Sewage Disposal by Oxidation Methods.

By GILBERT J. FOWLER, D.Sc., F.I.C., Consulting Chemist to the Manchester Corporation Rivers Committee; Lecturer in Sanitary Chemistry, University of Manchester.

[The paper reproduced herewith was submitted at the recent Fifteenth International Congress on Hygiene and Demography at Washington. A companion paper, by Mr. J. D. Watson, M.Inst.C.E., chief engineer to the Birmingham, Tame and Rea District Drainage Board, appeared in last week's issue.]

The scientific solution of the sewage problem will not be attained until the following results can be guaranteed for any given case:—

(1) An effluent which will not deteriorate the stream into which it flows.

(2) No nuisance in the course of sludge disposal.

(3) No nuisance from smell or from flies in connection with the filter-beds.

(4) An expenditure strictly proportionate to the sanitary and æsthetic results achieved.

Those of widest experience will be the least ready to say that these criteria of success are at all commonly fulfilled.

It may not be uninstructive briefly to consider these four directions of effort, with the object of seeing what has been satisfactorily accomplished, and what yet remains to be done.

EFFLUENTS.

The success of a works is most frequently judged entirely by the effluent produced, generally in accordance with some more or less recognised standard of purity.

The question of standards is too large a one to enter upon here more especially as the Royal Commission on Sewage Disposal is shortly expected to issue a report upon the subject.

Taking a broad view, it is probable that the criterion of purity suggested above—*viz.*, an effluent which will not deteriorate the stream into which it flows—is a comprehensive and practical one. It allows for some advantage to be taken of dilution, if the volume of the stream be large in proportion to the volume of the effluent; it ensures an automatic speeding up of authorities down stream, as those in the higher reaches, who have the initial advantage of clean water, do their duty; it is, in fact, in accordance with the judgment in the famous recent "Birmingham *v.* Tamworth" case.

The principle of judging an effluent by its effect in the stream into which it flows has many advantages. It is exceedingly difficult to obtain a true average sample of the effluent from any sewage works. Conditions vary from day to day, and, indeed, from hour to hour. Land areas may have been recently ploughed, and the effluent for an hour or two may be distinctly unsatisfactory; a sudden storm may push strong tank effluent through filters at a rate too great for efficient purification, or over the storm overflows without any treatment. Unless systematic sampling at short intervals is undertaken, either as part of the work of the staff or by means of mechanical devices, many of these incidents will escape notice. Snap samples often give, on the other hand, either too good or too bad an impression of the character of the effluent.

But the character of the stream below the outfall is a permanent and, on the whole, a fair witness. Where gross obvious pollution is not in evidence, a body of knowledge is being obtained of the various forms of life which indicate good or insufficient purification. It is surprising how a small amount of unbroken-down organic matter in an otherwise well-mineralised effluent will encourage the growth of masses of fungus.

The idea of the fishpond as an extra line of defence before the final discharge of an effluent into a stream, which has been successfully applied at many places in Bavaria under the direction of Prof. Hofer, is well worthy of careful study.

A consideration of the effect of an effluent on the forms of life and growth in a stream leads to the important question of disinfection, a subject which has recently been so ably dealt with by Prof. Phelps.

There is one point which has, in the writer's opinion, not been sufficiently studied in this connection—*viz.*, the possible effect of sterilising agents on the micro flora and fauna of the stream, other than bacteria. A comparatively small dose of chloride of lime will inhibit fungus growth, as a small dose of copper will prevent the development of algæ. It is worthy of further study whether the addition of chloride of lime to an effluent in sufficient amount to reasonably protect a water supply may not at the same time upset the balance of life on which the continued healthy condition of a stream depends. Speaking generally, it may, however, be said that of the four problems referred to the problem of the effluent has been carried furthest to a scientific solution.

SLUDGE.

The sludge problem is really the centre of the general sewage problem. The method of handling the solid matter, which in some form or other has to be separated from sewage, conditions the size and character of the filters, and the main question in the design of sewage works lies broadly in the allocation of expenditure as between sludge disposal and filtration costs. Thus very perfect clarification of sewage by heavy doses of chemical renders possible great economy in filter construction and maintenance, while with adequate filter area it is possible practically to dispense with preliminary treatment altogether. How far expenditure is best incurred in one direction or another depends entirely on circumstances, and it is here that judgment and experience are called for.

CHEMICAL TREATMENT.

The Fifth Report of the Royal Commission on Sewage Disposal was by no means unfavourable to chemical treatment in a number of cases. It may be doubted whether the dilute sewages resulting from the lavish use of water in American cities lend themselves generally to economical precipitation by chemicals.

The writer has had occasion lately to go somewhat closely into the question of precipitation of sewage, and has reached the following general conclusions—*viz.*, that chemical treatment is to be recommended where the following conditions predominate:—

(*a*) Where sludge disposal is cheap.
(*b*) Where land for filters is restricted.
(*c*) Where filter construction is expensive.
(*d*) Where fall is limited for either coarse percolating filters or double contact beds.
(*e*) Where special trade refuse has to be dealt with.

Conditions (*a*) and (*b*) probably both apply in Glasgow and to a less extent in Salford. Condition (*c*) depends largely on facilities of transport, which vary within wide limits. Condition (*d*) obtains, *e.g.*, at Hanley and elsewhere in the Potteries. For shallow percolating filters of fine material, advocated, *e.g.*, by Dr. Reid, chemical precipitation appears essential as a preliminary. This is, as a matter of fact, achieved at Hanley by means of the "slip" or fine clay from the pottery works, which comes down with the sewage. Ordinary septic tank treatment is likely to be disastrous for such filters, causing rapid blocking. Condition (*e*) is exemplified at Wakefield, where, owing to the presence of wool-scouring liquors and other troublesome trade effluents, chemical treatment by lime and ferric sulphate has been adopted under the advice of the writer.

Of course, the main difficulty with chemical treatment is the disposal of the resulting sludge. Apart from its quantity, the fact that it contains a large proportion of precipitated soaps renders it unsuitable for use as a fertiliser, as it is not readily incorporated by the soil.

Should Dr. Grossmann's grease extraction process, now being tried at Oldham on a large scale, or the partial carbonisation process now being taken up by Norwich and Huddersfield prove successful, even to the extent of disposing of the sludge in a satisfactory manner without additional cost, chemical precipitation may have a more extended use than was at one time thought likely.

SEPTIC TANK PROCESS.

The septic tank has not proved altogether the success as a solution of the sludge problem that was at one time hoped, but here, as always in considering the sewage problem, it is important that conclusions

should not be too hastily drawn. The defects which have shown themselves in the ordinary septic tank process are a nuisance both from the tank effluent and the sludge, and an excessive quantity of suspended solids in the tank effluent.

THE EMSCHER TANK.

The Emscher tank, concerning which much has been written of late, seeks to remedy these defects by quickly separating the sludge and effluent. The liquid portion of the sewage passes quickly through the tank in a fresh state, while the suspended solids drop through a slot into a lower compartment, where the sludge is thoroughly digested under anaërobic conditions, the construction of the tank preventing any fouling of the effluent through escaping gases and suspended matters.

The tank certainly appears to be successful in eliminating nuisance, both from sludge and effluent, and under certain conditions has manifest advantages. The Manchester Rivers Committee has recently decided to instal a trial Emscher tank at their Withington sewage works, where the sewage is dilute and purely domestic, and the present tank space, especially in rainy weather, inadequate.

Nevertheless, it is well that certain difficulties inherent in the Emscher tank process should be pointed out.

In the first place, the comparatively short time of settlement means that variations in the character of the sewage must be quickly reflected in the character of the tank effluent, and the filters accordingly called upon rapidly to accommodate themselves to fluctuating conditions. This is not conducive to developing the most efficient bacterial activity. These fluctuations will, of course, be accentuated if trade wastes are present in the sewage. One of the main advantages of the considerable time allowed for the sewage of Manchester to pass through the tanks at Davyhulme is that fluctuations of this sort get smoothed out, to a large extent at any rate, and the filters have a more equable task to perform. In some cases large tank space may be a bulwark against possible disaster, as when on a recent occasion an acid chamber gave way at a works in the city letting out many tons of vitriol into the sewage. The strong acidity of the sewage entering the tanks was, however, nearly neutralised by the mixing with the slightly fermented sewage present in the tanks, and the filters incurred no noticeable damage.

It appears to be recognised by the Emscher authorities that storm water, at any rate above moderate dilutions, will have to receive separate treatment, and ordinary stand-by tanks would still be necessary for this purpose, the sludge from which will have to be dealt with.

In any event the suspended matters which produce the sludge in the Emscher tanks are those which settle readily, say in the space of two hours. The colloids, such as are eliminated by chemical treatment, have still to be reckoned with, and the character and extent of the filter beds designed accordingly. In many cases this may mean that fine material cannot be used for constructing the filters and the alternative adopted of deep filters of coarse material, with the possible resultant nuisance from flies, referred to later.

A third consideration with reference to the Emscher tank has been forced upon the writer's attention through a small experiment in connection with the sewage of a public institution, where it has been possible to test a small Emscher tank and an ordinary septic tank side by side. Here the sewage was very strong, and, what is even more important, very fresh. In consequence, although an effluent free from visible solids and also from putrid odours was obtained from the Emscher tank, it was found on analysis to be less broken down than the effluent from the septic tank, and less readily oxidised by the subsequent filtration process.

In the controversy between the advocates of anaerobic or aerobic methods of treatment the essential biological and chemical reactions which must take place before nitrogenous organic matter is finally mineralised are often lost sight of by reason of incidental circumstances, particularly the dilution of the sewage and its alteration during its passage through long lengths of sewer. When strong fresh sewage has to be dealt with empirical conclusions drawn from ordinary town sewage cease to hold good. This is especially so with the strong sewages often met with in tropical regions, where high temperature may coincide with restricted water supply

The writer's researches in latrine sewage in Calcutta in 1906 showed that preliminary anaërobic treatment in properly designed tanks gave better results than purely aërobic methods, and this conclusion has recently been confirmed by careful detailed experiments by Major Clemesha, sanitary commissioner for Bengal. These researches showed that the bulk of the suspended matter was best broken down in a separate inlet compartment to the tank, but that distinctly better results were obtained the longer time the whole body of sewage took to pass through the tank up to a maximum of three days.

All these considerations would tend to show that the Emscher tank may need to be supplemented by some form of equalising tank if the best results are to be obtained.

SLATE BEDS.

Some of the difficulties above indicated attach themselves to the Dibdin slate bed. The true function of this process does not seem to be very generally understood. The slate bed is not a filter in the sense of a percolating filter or contact bed, but rather an aërobic tank. The coarser suspended matters in the sewage deposit themselves, during the two hours' or so period of contact, on the surfaces offered by the slate, and are afterwards digested by multifarious forms of life flourishing under aërobic conditions. The effluent from the slate bed should be treated as a tank effluent, and filter space provided according to its strength in the usual way. In order that the filters may work to the best advantage it is probable that the provision of "humus" tanks between the slate beds and the filters is desirable. Such tanks will have the double advantage of retaining solids washed away from the slate beds and of equalising to some extent the composition of the effluent passing into the filters. They have, the writer has heard, been adopted in a recent scheme for Harpenden.

The slate bed process has undoubtedly been successful in many cases in dealing with the sludge disposal portion of the sewage problem without nuisance. The process is somewhat handicapped by cost, and by the fall needed for the slate bed as a preliminary process when compared with continuous flow tanks, where the loss of fall involved is trifling.

The foregoing section will have indicated that the character of filter to be recommended, whether contact bed, coarse percolating filter or fine percolating filter, must depend, to a large extent, on the preliminary treatment used.

There are certain sewages where almost any kind of tank treatment is bound to result in nuisance. Especially is this the case where brewery refuse is present in the sewage in any large proportion. Considerable trouble has, for example, been experienced at Stratford-on-Avon from this cause, and treatment with lime and bleaching powder has had to be resorted to in order to minimise the smell in warm weather. At Burton, after heavy treatment with lime, the sewage is pumped direct on to land.

In such cases, either the slate bed method or direct treatment on filters of the Ducat type would seem to be called for.

Successful trials have been made at the sewage experimental station at Hamburg, under Dr. Dunbar, of the use of a layer of peat over the material of an ordinary percolating filter.

The writer is at present experimenting with this method in connection with the disposal of the sewage of Market Drayton, which is particularly strong and offensive. At the adjoining parish of Little Drayton a Ducat filter has been in successful operation for many years, and has been reported upon by the Royal Commission.

FILTERING MATERIALS.

The type of filter apparently most in favour in America, and also to a less degree in England and in Germany, is the deep percolating filter of coarse material. It admits of the passage of large quantities of sewage without blocking, and eventually discharges as so-called "humus" a considerable proportion of the colloidal matter applied to it. Consequently it is, for practical purposes, everlasting. Filters of this type have been at work successfully at Accrington since 1898—*i.e.*, for fourteen years. Unfortunately, the spraying of anything but fresh tank effluent on these filters is attended with considerable nuisance from smell, and whether the tank effluent be fresh or septic, the development of insect life, particularly flies and spiders, is often extraordinary. Instances could be cited of spray jets completely blocked with twisted spider webs, of ropes of web-like scarves

rom filter to filter, of small flies nearly covering the doorway of a cottage ½ mile from the works, and so forth.

However good the effluent from such filters, and however economical their construction and maintenance, it cannot be said that such a process meets all sanitary and æsthetic requirements.

Experience shows that the fly trouble is minimised if the surface layer of the filters is of fine material, and this was one of the reasons for adopting a fine surface layer in the new filters at present under construction at Wakefield. Such a fine layer presupposes, of course, good preliminary clarification, or a somewhat restricted flow, and again the balance of advantage has to be considered.

There can be no doubt that the main advantage of the contact bed lies in its freedom from nuisance.

There have been no complaints or causes for complaint in connection with the 100 acres now in operation at Davyhulme, or with the 40 acres or so now installed at Sheffield. The cost of maintenance of these beds has not been excessive, even with a thorough washing and partial renewal of the medium every five years. Incidentally it may be mentioned that the "slurry" washed out from the filtering medium, after pressing with lime, drying and grinding, finds a ready and profitable sale for direct use as a fertiliser of moderate strength, or as a basis for the manufacture of high strength fertiliser.

The economical and the scientific solutions of the sewage problem are in reality coincident, and the more the two ends are borne in mind the more quickly the desired goal will be reached.

COSTLY APPARATUS.

It is still possible to see costly devices installed at sewage works, which a little careful scientific investigation and thought would have shown could never achieve results proportionate to the outlay. Apart from actual analysis and measurement it is easy, for example, to draw the conclusions that a special form of mechanical filter is removing large quantities of suspended matter when really either very little has been retained in proportion to the volume of liquid passing, or the volume of liquid passing is much less than is assumed.

The cost of certain mechanical distributors, including repairs and loss of lime in proportion to the quantities actually filtered over lengthened periods, was ably dealt with some years ago by Mr. Watson.

The question of the desirability or otherwise of providing costly sewerage and sewage disposal works in country districts, where it is of the first importance to spend money to the best advantage, especially in the provision of cheap houses, may well receive the careful joint consideration of the medical officer and the sanitary engineer.

In many towns in India it is at present financially impracticable to undertake fully developed Western sewerage schemes. Provisional methods have in consequence to be devised, with due reference to possible complete schemes in the future. Development on such lines may be wisest for many country villages or undeveloped towns.

The harmless return of excreta to the soil is subject, of course, to scientific principles, just as the more elaborate methods of the modern sewage works, and it is well that the interest of these latter should not entirely divert attention from the study of more primitive, but still frequently necessary, methods. There is need for careful investigation of the rate of change of suspended and colloidal matter in sewage under different conditions. Closely connected with this question is the large field of research into the conditions of life of the various organisms in sewage works from bacteria to leeches, and their relation to the sewage purification process and to each other.

Thus it will be seen that while in a limited sense it may be stated that the sewage problem is solved, in that the general principles, according to which offensive organic matter can be mineralised, are now fairly well known, their detailed application will afford work for the engineer and biological chemist for many years to come.

It is gratifying to note that, in America particularly, the value of scientific research on this large problem has always been fully recognised, and that it is now the custom for any scheme of magnitude to be prefaced by preliminary scientific studies. The intelligent co-operation of the engineer and the biological chemist in this work is certain to justify itself by advancing each case nearer to the goal of perfection.

THE ROAD BOARD.

GRANTS TO HIGHWAY AUTHORITIES: EIGHTH LIST.

During the months of July, August and September, 1912, the Road Board, with the approval of the Treasury, have made advances amounting to £172,703 from the Road Improvement Fund to county councils and other highway authorities as follows:—

	£
For road crust improvements	136,724
For road widenings and improvement of curves and corners	5,422
For road diversions	407
For reconstruction and improvement of bridges	19,000
For construction of new roads and bridges	11,150

The total grants, after deducting grants cancelled, up to September 30, 1912, are as follows:—

	£
For road crust improvements	662,150
For road widenings and improvement of curves and corners	75,218
For road diversions	21,206
For reconstruction and improvement of bridges	36,475
For construction of new roads and bridges	16,078

Advances by way of loan have also been made to the sum of £108,857.

In addition, further advances amounting in the aggregate to about £702,000 have been indicated to highway authorities towards works of road improvement of which the details are still under consideration and discussion.

Authority.	Improvement of road crusts.	Widenings, corners and diversions.	New roads and bridges and reconstruction of bridges.	Total.
ENGLAND.	£	£	£	£
Berkshire C.C.	15,000			15,000
Buckingham C.C.	5,405	255	–	5,660
Cheshire C.C.		335		335
Cumberland C.C.		350	–	350
Derby C.C.	8,905	1,095	–	10,000
Dorset C.C. ...	4,853	100	–	4,953
Essex C.C.	6,240	1,500		7,740
Gloucester C.C.	500			500
Isle of Wight C.C. ...	857		–	857
Lancashire C.C.	5,719		15,000	20,719
Lincoln (Kesteven) C.C.	1,440	100		1,540
Lincoln (Lindsey) C.C.	–		10,150	10,150
Norfolk C.C.	524		–	524
Northampton C.C.	450	50		500
Northumberland C.C.	7,291	–	–	7,291
Nottingham C.C.	4,750	750	1,000	6,500
Oxford C.C.	961			961
Salop C.C.	3,120	65		3,185
Somerset C.C.	3,277			3,277
Stafford C.C.	1,885			1,885
Suffolk (West) C.C.	268			268
Surrey C.C.	12,535		–	12,535
Warwick C.C.	6,060			6,060
Worcester C.C.	8,000			8,000
Yorkshire (E. Riding) C.C.			4,000	4,000
Yorkshire (N. Riding) C.C.	112			112
WALES.				
Anglesey C.C.		10	–	10
Brecon C.C.	765	–		765
Carmarthen C.C.	1,120	960	–	2,080
Denbigh C.C.	2,774	250	–	3,024
Merioneth C.C. ...	250			250
Montgomery C.C.	449		–	449
SCOTLAND.				
Aberdeenshire (Inverurie T.C.)	75		–	75
Argyll C.C. (Kintyre District)	1,000		–	1,000
Dumfriesshire (Lockerbie T.C.)	72		–	72
Midlothian (Dalkeith T.C.)	300		–	300
Lanark (Airdrie T.C.)	800	–	–	800
Linlithgow C.C.	750	–	–	750
Perth C.C. (Western District)	653		–	653
Ross and Cromarty C.C. (Eastern Ross District)	1,452		–	1,452
Selkirk C.C.	188		–	188
Stirling C.C. (Central District)	1,960		–	2,614
Stirling C.C. (Western District)	654		–	
IRELAND.				
Armagh C.C. ...	135		–	135
Carlow C.C.	750		–	750
Down C.C.	750		–	750
Sligo C.C.	1,020		–	1,020
Tipperary, South, C.C.	2,000	–	–	2,000
Westmeath C.C.	370	–	–	370

The Discharge of Effluents into Tidal Streams.

ROYAL SANITARY INSTITUTE DISCUSSION AT LEWES.

An interesting description of the new sewage scheme for Lewes, with special reference to the discharge of effluents into tidal streams, was submitted at a sessional meeting of the Royal Sanitary Institute held in the council chamber of that town on Friday evening last, the author of the contribution being Mr. D. Roberts, the borough surveyor. Mr. H. Percy Boulnois, M.Inst.C.E., chairman of the council of the institute, presided over a large gathering of members and others, those present including representatives of Margate, Gravesend, Worthing, Eastbourne, Bexhill, London, Southampton, Chichester, and West Kent.

In welcoming the members to Lewes, the Mayor (Dr. Hugh Stott) said the corporation were both proud and honoured by the visit of the Royal Sanitary Institute. It was gratifying to think that men like those belonging to the institute should come among them to stimulate, if possible, the excellent sanitary work that was being carried on in their midst. He trusted that they would be able in some measure to instruct them, as they would be able to show them that in Lewes they were not behind the times or not alive to the necessities of modern sanitation and to the importance of stamping out that terrible scourge consumption.

Mr. H. Percy Boulnois, the chairman of the council of the institute, in taking the chair, said he could only say on behalf of the Royal Sanitary Institute that they were extremely glad to have an opportunity of holding a sessional meeting in that ancient town. These sessional meetings, which they held in various provincial centres, were extremely useful, not only in bringing together people interested in sanitary matters, but in helping to increase the membership of their great body. He said "great body" because it was almost unique in its character, representing as it did no particular profession, but including in its ranks medical men, engineers, architects, and members of the general public, so that the questions of sanitation they dealt with were approached on very broad lines.

BOROUGH SURVEYOR'S PAPER.

Lewes, as is well known, is the county town of Sussex, and is situated about eight miles from the sea coast. Mr. Roberts explained that the greater part of the borough is situated upon a ridge and sloping sides of chalk running in an easterly direction from St. Anne's and the neighbouring South Downs into the valley of the tidal river Ouse. On the opposite side of the river is the low-lying portion of the borough approached by the Lewes Bridge, and known as the Cliffe District. It lies on an alluvial flat, which is bounded on the east by the Cliffe Hill. On the south of the town, and parallel with the borough, is the Southover District, a locality known as the Wallands on the north side occupying an elevated site. The borough has an area of 1,024 acres, with a population of about 11,500, and a road mileage of about 15½ miles.

Only a portion of the borough was drained before the incorporation in 1881, but since that time the whole of the borough has been sewered, though in sections. In 1891 the late Mr. Arthur Holt, borough surveyor, prepared a scheme of drainage for the whole of the borough, and in that work he was assisted by Messrs. Brierley and Holt, of Blackburn, the engineers for the scheme now in course of construction. That scheme was never carried out as a whole, but from time to time sections of it have been completed, practically on the lines as laid down at that time. In 1895 St. Anne's district was sewered by the late Mr. Holt, and in 1896 the Paddock Valley and in 1905 Southover district were sewered by the late Mr. T. W. Franks, the then borough surveyor. In 1903 the Cliffe was sewered by Mr. Roberts. The work in this district was by pipes to the ordinary ground, chiefly alluvial deposit and waterlogged. Under this system the sewage is discharged into the river by means of two 100-gallon capacity Shone's ejectors, the compressed air for these ejectors being driven by automatic electrical machinery erected to pump a daily dry-weather flow of 400,000 gallons. The sewering of the Wallands district was carried out partly under Section 1 of the Public Health Act, 1875, and partly by the owners when laying out the estate. There are three roads on the Wallands estate drained under the separate system; the Cliffe district is also on the separate system, the old culverts being utilised for surface-water drainage. No other part of the borough is similarly drained. The whole of the sewers in the borough now discharge into the river Ouse at five different points, the highest one being at the Corporation yard, and the lowest at the point of discharge from the Cliffe ejectors, a distance of about 900 yards. It is proposed in the new scheme to pick up the sewage discharging at those points and convey the whole to the proposed sewage works at Southerham, on the south side of the borough, the effluent to be discharged at one point only into the river Ouse, adjoining the site of the works.

LEWES' NEW SEWERAGE SCHEME.

The new scheme provides for the interception of the existing main contributory sewers, the construction of high and low level intercepting and outfall sewer, sewage disposal and outfall works at Southerham, and the erection of pumping plant at Pinwell to deal with the low-level system, and the construction of several new tributary sewers in the borough. The high-level intercepting sewers will be of cast-iron, 18 in. in diameter at the lowest end, and 15 in. in diameter in the upper portion. A low-level intercepting sewer of 9-in. cast-iron pipes will be laid from Pinwell alongside the high-level sewer. This will intercept the sewage from the Paddock Valley district, which now discharges into the river at the Corporation Wharf. Another low-level intercepting sewer will branch away in the opposite direction to the last-mentioned sewer from Pinwell to the end of the Winterbourne Valley sewer. This will intercept the sewage now discharging into the Winterbourne stream.

A small pumping station will be erected on land acquired for the purpose on Pinwell-road, adjoining the railway station, the sewage from the low-level sewer being lifted through a 15-in. cast-iron pipe into the high-level sewer adjoining by means of three sets of centrifugal pumps driven by electric motors. The motors will be automatically controlled by floats so arranged as to be switched on and off according to the flow. These sets of pumps will be capable of raising 5,000, 35,000 and 40,000 gallons per hour respectively; one of the larger sets will be a stand-by. A screen will be constructed in the pump-well to arrest flocculent matter.

The construction of the main outfall sewer of 18-in. cast-iron pipes is nearing completion. This crosses the main and branch lines of railway near the Lewes Station, and in part is in the nature of a syphon, access for inspection being provided at each manhole.

The sewage disposal works will comprise six storage tanks, 60 ft. by 30 ft. by 7 ft. deep, with a total capacity for 472,500 gallons, with dividing wells at inlet for dividing "ordinary flow" and "storm water;" screening tanks in duplicate, a "top," "bottom," and sump sludge pit with small pumping plant in duplicate, worked with oil-engine and centrifugal pumps; and four sludge drying beds. The main effluent outfall drain will be 21-in. iron pipes fitted with tidal flaps.

STATISTICS.

	High level.	Low level.	Total.
Present population (approximate)	8,610	3,390	12,000
Population provided for (sewers) ...	10,800 ...	4,200 ...	15,000
Number of houses (approximate)	1,705	550	2,025
D.W.F. per head per 24 hours (4,000)	250,200	100,800 ...	340,000
Quantity to be dealt with at works per 24 hours (D.W.F. + ...)	...		2,160,000
Quantity to be dealt with at works per 12 hours (D.W.F. + ...)			1,080,000
Quantity to be dealt with at work ...		...	90,000
Quantity to be stored in tanks (... hours)		...	472,500
Quantity to be stored per hole ...	...		450,000

EFFLUENT DISCHARGE INTO THE TIDAL RIVER OUSE.

The sewage will gravitate from a drawing well to a screening chamber in which will be an inclined screen of parallel iron bars to arrest solid matter and floating refuse, heavier matter, such as road grit and

detritus, will be arrested and deposited at the bottom. The sewage will then pass to a dividing well, where the flow will be divided into "ordinary flow" and "storm water," and dealt with in the storage tanks accordingly. The flow to be provided for is up to three times the dry-weather flow, or 1,080,000 gallons per twenty-four hours treated as sewage proper, and the remaining volume of 1,080,000 gallons per twenty-four hours treated as storm water.

Two sets of storage tanks are provided of the dimensions already given. The first series are of sufficient capacity to allow for the sewage being stored for about five hours. The tanks are so designed that the inclination at the bottom is away from the river and towards the sludge pits, which will allow all sedimentation to flow back in the form of sludge and to be treated in beds of special design. In addition to these tanks another group will be provided to be filled by an overflow passing over a weir the whole length of the end of the tanks—*viz.*, 30 ft. In these secondary reservoirs (which, Mr. Roberts suggests, might be known as tidal storage receptacles) the effluent will be retained until one hour after high tide, when, by a system of penstocks (possibly automatically controlled), the contents will be discharged on the ebbing tide. The outfall into the river Ouse, as mentioned, is of 21-in. iron pipes, and carried about 2 ft. below low-water level. This outfall pipe will be laid at an acute angle with the river and discharge down stream with ebbing tide, and at one of the widest points of the river. The borough surveyor adds:—"It is obvious that what with the screening, the sedimentation in the first tanks, and the considerable amount of precipitation that will take place in the tidal storage reservoirs, the condition of the effluent as it passes into the river should leave little to be desired."

The tide in the river Ouse flows for a period of three hours and is nine hours on the ebb. The effluent discharge will commence one hour after high water and cease one hour before low water. The point of discharge into the river is about 7¼ miles from the sea and about one mile below Lewes Bridge. The tide-levels near the point of discharge are—*viz.*:—High water, ordinary spring tides, 10·52; high water, ordinary neap tides, 6·12; low water, neap tides, 0·42; low water, spring tides, 0·37 above O.D.

In September and October, 1904, Mr. Roberts gauged the flow of the river Ouse, near the discharge from the Cliffe ejectors (about half a mile above proposed effluent discharge), with the following results: A spring tide flowing during a period of 2 hrs. 55 min., with high-water mark at 10 ft. O.D., approximated 45,000,000 gallons, showing a pollution of one gallon of sewage to about 250 gallons of tidal water. A neap tide flowing 2 hrs. 58 min., with high water at 6 ft. O.D., approximated 20,000,000 gallons, or a pollution of about one gallon of sewage to about 110 gallons of tidal water. The fresh water coming down the stream was also gauged at Hamsey Lock (about 1½ miles above Lewes), which approximated 17,000,000 per day, so that on the ebbing tide there is a further dilution. Mr. Roberts mentions that the tidal portion of the river Ouse extends about thirteen miles from the sea, and that it is navigable throughout for commercial purposes, chiefly up to Lewes, and the up river stretch for pleasure (boating and fishing).

In concluding his paper, Mr. Roberts said: "It is a difficult matter to draw comparisons between one tidal stream and another into which sewage is discharged, as the circumstances are ever varying, and every case must always be judged by results. When the final Report of the Royal Commission on Sewage Disposal has been issued there may be some data arrived at, or standard fixed, to govern the extent to which sedimented sewage may be discharged into tidal streams or rivers. For years past the crude sewage of Lewes has been discharged into the tidal Ouse at all states of the tide and in the centre of the town, and the nuisance resulting has been only apparent, due to the solids and flocculent matter floating about and the discolouration near the points of discharge. The large volume of tidal and river water has always rendered the sewage innocuous. It is therefore obvious that with a better effluent discharged into the river at one point only, that one at least a mile nearer the sea, and on the ebb tide, there must be a considerable improvement as compared with the conditions now existing."

DISCUSSION OF MR. ROBERTS' PAPER.

The Mayor (Councillor Hugh Stott, J.P.), in opening the discussion on the paper, said it appeared to him to be deserving of careful consideration whether it was desirable to place upon the ratepayers of a town situated on a tidal river near the sea the enormous burden of treating their sewage before its discharge. There were naturally sentimental objections to the disposal of untreated effluent in such a manner, but the treatment of sewage by sea-water was a most effectual method, as had been acknowledged from time immemorial.

Mr. A. J. Martin (Westminster) said that, so far as one could judge, the scheme described by Mr. Roberts had been designed with every regard to the special requirements of the area to be dealt with. The perfection of a scheme of that character depended, of course, very much on details, and in the absence of the latter one was unable to criticise the scheme, or say how far it met the needs of the district; generally speaking, however, it seemed most suitable. He noticed that a very considerable length of sewer was in cast-iron, and that there was no mention of any other material. He supposed that was explained by the very treacherous nature of the ground. An interesting feature of the scheme was the use of high-level intercepting sewers to bring as much as possible to the outfall and avoid excessive pumping; but he took it that the distinctive feature of the work was the method of disposal. At present they were turning an unfiltered effluent into the river, and the question which had to be decided was whether an expenditure of some thousands of pounds on a system of purification was called for. One could not, of course, pronounce an opinion on a matter of that kind without a preliminary personal inspection of the river, but on the face of it he was inclined to think they were right in what they did. The method they had adopted—namely, that of discharging the sewage into a large volume of fully oxygenated water—was an effective and scientific method of disposal. With regard to the dilution figures, these seemed to be based on the assumption that the whole of the sewage left the estuary at every tide, and it involved the further assumption that the 7¼ miles of estuary were traversed in five hours, or at an average rate of 2¼ ft. per second. Unless that velocity were actually attained one would not get the sewage clear of the river, and if that were not done the dilution would not be as great as was shown by these figures.

Alderman Every (Lewes) expressed pleasure at the remarks of the last speaker. Replying to the inquiry with regard to the cast-iron pipes, he stated that the reason for their use was, as had been suggested, the nature of the ground through which they were to pass. In the course of other observations Alderman Every pointed out that a scheme prepared in 1866 was practically based upon the same route as the present scheme. Instead of carrying out a comprehensive scheme, the authorities in days gone by sewered various parts of the town, hoping that the little schemes would weld themselves into one harmonious whole.

Mr. J. W. Blizard (Southampton) said he was sorry that he had to differ with Mr. Martin. Mr. Martin had expressed the view that the course which had been adopted of discharging the effluent into the river was the right one. He (the speaker) thought it was absolutely wrong. He had been responsible for the provision of several sea outfalls, and was sorry for it, and if he had his time over again he would certainly advocate filtration, because of the fisheries. In the present case the point of discharge was seven miles from the sea, and the question was how far the effluent would flow down the river and whether it would actually leave the mouth. His belief was that it would not. He was not a prophet, but he predicted that Lewes would have to purify their sewage later on. That the Local Government Board should have sanctioned such a scheme was a surprise to him, and he considered it would be in the interests of the town if they carried out the work now instead of being compelled to do it in the future.

Mr. H. A. Roechling (Westminster) said that, judging by what he had seen so far, and having regard to the provision made for further treatment, for the present every need had been met. If, as Mr. Blizard predicted, that further treatment did eventually become necessary, it would be a simple matter to arrange for it, but to embark on such an expenditure now would be most unwise.

Dr. James McGlashan, chairman of the Newhaven Urban District Council, in urging the desirability of means of purification being adopted, alleged that the Lewes sewage did not reach the sea in a single tide, and that it was frequently only after three or four tides that the river was cleared.

The Chairman (Mr. H. Percy Boulnois), in closing the discussion, said he preferred, in the absence of exact knowledge of the local conditions, to make no remarks on the paper. But the scheme, it appeared, had received the sanction of the Local Government Board, and they could take it from him that that approval would not have been given unless the Board had been advised that it was a safe scheme to carry out.

Mr. Roberts, in his reply, stated that he took some float tests a year or two ago on a spring tide, and a float put in the river opposite the point at which the sewage was discharged went right out to sea in just over five hours. On a mean ebb tide the float went just to the end of the quay at Newhaven. It might be a fact that sewage went into the river at the lowest state of the tide, but bacteriological examination of the water long before Newhaven was reached had shown no trace of sewage in the river.

Votes of thanks to the Mayor for the use of the council chamber for the purposes of the meeting, and to Mr. Roberts for his paper, then brought the proceedings to a close.

On Saturday visits were paid by those attending the meeting to the Phœnix Ironworks and the Lewes Portland Cement and Lime Works, the Victoria Hospital, the borough isolation hospital, the fire brigade station and the waterworks. The party were received at the Phœnix Ironworks by the proprietor, Alderman Every, and his son, Mr. J. M. Every, by whom they were conducted through the various departments. At the cement works they were met by Mr. A. Batchelor and Councillor E. A. Glover, representing the company, to whom, as at the ironworks, the chairman of the council of the institute, Mr. Percy Boulnois, expressed thanks for the courtesies extended to the members. The Mayor (Dr. Hugh Stott) afterwards entertained the visitors at luncheon at the Bear Hotel.

THE DESTRUCTION OF CONCRETE BY ELECTROLYTIC ACTION.

Mr. Cyril de Wyrall, in a paper entitled "Electrolytic Action on Unreinforced Concrete," published in the "Proceedings" of the International Association for Testing Materials, takes the view that concrete may, under certain conditions, be damaged by electrolosis. Much has been written and said about the effect of electrolytic action on steel and iron and upon reinforced concrete, but hitherto there does not appear to have been any evidence that plain concrete is liable to disintegration by this action. The author, in examining some bolts embedded in concrete, found that not only had the bolts been affected by an electric current, but that the concrete surrounding the bolts had become disintegrated to such a degree as to make it almost useless. The effect was greatly intensified where the concrete was wet. Again, in an examination of a concrete wall six years after construction a similar result was apparent. This wall carried no load, and was below tide level; it was 3ft. thick and was made of a 1:2:4 mixture of cement, sand and trap rock. The work had been well done. "The examination showed a disintegration to such an extent that the surface was practically mush." A year later another examination was made, and large sections of from 4in. to 6in. thick, which crumbled in the hands, could be pulled off the face. Last year still further disintegration was found to be in progress. A voltometer test showed that a current under 11 volts pressure was passing through the structure. Other instances are quoted of a similar nature. It should be noted that this disintegration appears to take place anywhere the concrete is wet. Where concrete was dry no voltage was found.

Judging by this examination, it seems that further investigation and proof is required before it need be assumed that concrete is liable to disintegration by electrolytic action under normal conditions.

Woolwich Subway. The new footway under the Thames at Woolwich will be opened on the 26th inst.

SIR GEORGE GIBB AND ROAD MAINTENANCE GRANTS.

THE DUTY OF LOCAL AUTHORITIES.

A representative of the *Daily Mail* sought an interview this week with Sir George Gibb, the chairman of the Road Board, to discuss the various criticisms on the Road Board's action in not making special allowances for road repairs to local authorities in London who suffer severely from excessive motor-omnibus traffic. Sir George discussed the matter frankly, and said he wanted the Press to study the board's last annual report, in which the policy of the board was fully stated.

"Under the Act of Parliament constituting the Road Board," said Sir George Gibb, "the board is prohibited from making grants for maintenance. It is authorised to make advances 'in respect of the construction of new roads or the improvement of existing roads,' and 'to contribute towards the cost of the maintenance of such new roads,' but not of the old ones.

"There is a legal liability upon highway authorities to maintain roads for all traffic. It is true that many roads are now unsuitable for motor traffic. They are not strong enough for modern requirements. Many of them have been allowed to get into a very weak condition. While it is impossible not to feel some measure of sympathy for the small local authorities who are called upon to pay extra for road maintenance owing to motor traffic, their duty to maintain the roads is clear, and relief towards maintenance expenditure can only be given by an alteration of the law by Parliament. But highway authorities can protect themselves by raising their standard of construction when re-coating the roads. This would lead to cheaper maintenance than continuing old methods of renewal of surfaces. In fact, the methods of maintenance need to be modernised. The board advances money at low rates of interest, and in some cases without interest, for improvements which are likely to increase the life of surface coatings in a greater ratio than the increase of cost."

THE PETROL TAX.

In answer to the charge of "hoarding money" which has been made against the board, Sir George Gibb said: "While it is quite true that the income of the board has been £2,184,314, and the amount actually paid is only £279,081, grants and loans made and indicated—that is, in course of being made—during the same period amounted to £1,177,438, while the board is keeping in hand £875,000 to assist the construction of a new western approach road to London.

Sir George Gibb admitted that a large proportion of the petrol tax was paid in and around London, and that London ought to have a share in it. "The board has recognised this by the large grant promised for the suggested new approach road in London. Modified plans of the western approach road are under discussion with the London County Council and the Middlesex County Council, and I am hopeful that the scheme will go forward."

"Finally," said Sir George Gibb, "it must be remembered that road construction is in a state of transition, and that engineers are not agreed as to the best material for future requirements. It would, therefore, be unwise for the Road Board to spend money too rapidly on experimental methods of surface construction and have nothing left for emergencies, which are bound to arise in the very near future."

Roadmen's Wages.—Llandaff and Dinas Powis Rural District Council, at their last meeting, received from the secretary of the Municipal Employees' Association a letter asking them to pay their roadmen a minimum wage of 27s. a week. The surveyor, Mr. James Holden, said that no application had been received from the men. Forty-five per cent of their men were from 60 to 100 years of age—(laughter)—and their average age was 70, while 55 to 60 per cent were over 50 years of age. The gentleman who made the application did not understand the position of the council. They had kept all the old men on the road, and finding them such work as they were able to do. If the council gave more wages they would probably want more work done, and younger men would oust the older men from their work. It was decided that the communication lie on the table.

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
Appointments Vacant	517
Assistants' and Students' Section	504
Cleaning of Water Mains	485, 496
Correspondence	505
Destruction of Concrete by Electrolytic Action	487, 502
Discharge of Effluents into Tidal Streams	500
Filing Plans	487
Filtration of Water	515
Government by Commission	486
Institution of Municipal and County Engineers :—	
East Midland District Meeting at Ilkeston	511
Notices	516
Institution of Municipal Engineers: Notices	517
International Testing Association	487
Local Government Board Inquiries	506
Manchester Appointment	487, 512
Meetings	520
Motor 'Bus Traffic in the Metropolis	496
Municipal Competitions Open	517
Municipal Contracts Open	518
Municipal Work in Progress and Projected	508
Non-Slippery Whinstone	506
Personal	509
Private Street Works Dispute	513
Recent Publications	515
Road Board	499
Royal Sanitary Institute	500, 517
Sewage Disposal at Barnsley	514
Sewage Disposal by Oxidation Methods	485, 497
Sir George Gibb and Road Maintenance Grants	502
Steel Tipping Refuse Wagons	513
Tenders for Municipal Works or Supplies	520
The Crompton Pavement	500
The Intercepting Trap and the Ventilation of Sewers and Drains	503
The late Mr. G. Eccles Eachus	517
Town Planning from an Engineering Aspect	476, 488

CHEAP HEAT AND POWER.

THE "BONECOURT" SURFACE COMBUSTION SYSTEM.

Something like a revolution in the production and utilisation of heat is promised by an invention the principles and chief uses of which are being demonstrated at the Engineering and Machinery Exhibition which opened last Friday at Olympia.

In the early part of last year Prof. William A. Bone, D.Sc., PH.D., F.R.S., Livesey Professor of Applied Chemistry at the University of Leeds, delivered at the Royal Institution two lectures on "Surface Combustion and its Industrial Applications." So deep an interest was aroused, not only in this country but in America and on the Continent, by these lectures, that within a few months the development of the system on a commercial basis was being rapidly proceeded with. Such is the importance attached to the invention of Prof. Bone that the confident assertion is made that probably more trades will become directly interested in and influenced by it than by that of any of the great discoveries of recent years having for their objects economical sources of heat and power. Allied with Prof. Bone in the practical application of his ideas was Mr. C. D. McCourt, A.C.G.I., hence the name "Bonecourt" by which the various forms of the apparatus since devised are known.

The "Bonecourt" patent boiler is claimed to have the remarkable efficiency of 95 per cent. By its use steam can be raised in twenty minutes from cold water, and the normal evaporation is 20 lb. per hour per square foot of heating surface—capable of increase to 30 lb., with little loss of efficiency. The unusually small space occupied by boilers of this type will be realised when it is stated that one is at work at the Skinningrove Ironworks, which, although it is capable of evaporating 5,500 lb. of water per hour into steam at 120-lb. pressure, measures only 10 ft. in diameter and 4 ft. in length. Compared, too, with similar other apparatus, it has been found that the "Bonecourt" muffle furnace effects a very considerable saving in the amount of gas used.

By way of explanation of the system it may be stated that, as distinguished from the ordinary process of flame combustion—in which the molecules travel, step by step, so to speak, through a succession of envelopes, in which various degrees of aëration prevail—a homogeneous explosive mixture of gas and air, in the proper proportions for complete combustion, is caused to burn without flame in contact with a granular incandescent solid, as a result of which a large proportion of the potential energy of the gas is immediately converted into radiant heat. Combustion, it is claimed, is greatly accelerated by the incandescent surface, and, if so desired, may be concentrated just where the heat is required; the attainment of very high temperatures is possible without the aid of elaborate regenerative devices; and, owing to the large amount of radiant energy developed, transmission of heat from the seat of combustion to the object to be heated is very rapid.

There are two principal forms of the surface combustion element, one known as the "Diaphragm" (or No. 1 process) and the other as the "Cavity-Cobble" or "Granular Bed" (No. 2 process). The former consists of a slab of porous fireclay, of any required size or shape, mounted in a frame attached to a box or fuel chamber, from which the combustible or explosive mixture of gas and air, under a suitable pressure, percolates through the porous diaphragm until it reaches the outer face, where it can be ignited. If less air than is theoretically required be present in the mixture, flames will appear on the surface of the diaphragm, and it will become heated, but on reducing the richness of the mixture, though still maintaining the pressure, these flames will disappear, and in a very short time the mixture will commence to burn inside the porous slab at about ⅛ in. from the surface, producing an incandescent or glowing surface devoid of flame and giving out great radiant heat. The temperature near the surface is about 850 deg. Cent. = 1,562 deg. Fahr. Any kind of gas can be used, from rich coal gas to producer gas, the coarseness or fineness of the porous diaphragm being graded to suit the quality and pressure of the gas employed so as to secure the desired results. The principal uses of the diaphragm form include the evaporation of liquids by radiant heat thrown on to the surface of the liquid, and industrial and domestic heating.

The second form of the apparatus presents even a wider field of application arising partly from the fact that higher temperatures can be obtained (over 2,000 deg. Cent. = 3,632 deg. Fahr.), and that the arrangement permits of the application of the process to all shapes and sizes of furnaces. The principles involved are the same in both, but the physical arrangement of the active elements is substantially different. In the No. 2 process the diaphragm is replaced by a bed of granular refractory material, on the surface of each granule of which flameless incandescent surface combustion occurs. These granules can be easily packed into tubes which can be bodily immersed in water for steam raising purposes, or, by other equally simple arangements, employed for the melting of metals, oil and tar distillation, and even cement manufacture.

It will be evident from the foregoing that the system is likely to render possible the development, in the near future, of many important undertakings, the practicability of which has hitherto been a factor of doubt owing to the lack of a satisfactory or economical source of heat; for more detailed information with regard to it we cannot do better than suggest a call at the offices of Bonecourt Surface Combustion, Limited, Parliament-mansions, Westminster, or a visit to their stand (No. 329a) at the exhibition we have referred to, where the apparatus can be seen in actual operation during the next fortnight.

Glasgow's New Aqueduct.—A notable stage has just been reached in connection with the extension of the waterworks of Glasgow. The tunnel which is being made in Rob Roy's country at Inversnaid to connect Loch Arklet with Loch Katrine has just been bored through. The length of the tunnel is 1,300 yds., and the inside dimensions are 12 ft. by 10 ft. The boring operations were commenced over two years ago, but owing to the hardness of the rock the progress has been slow. At each end of the tunnel large basins are to be built.

Water Supply at Looe.—A new water supply for the urban district of Looe (Cornwall) was formally inaugurated last week. The water rights have been obtained from the Duchy of Cornwall. This scheme, carried out at a cost of £600 by Mr. J. Alderman, has involved the establishment of a pumping station. An oil engine, supplied by Messrs. Campbell & Sons, of Halifax, capable of pumping 2,500 gallons of water against a head of 3 ft., will augment by 20,000 gallons per day the supply in the existing reservoir at Wayland which stores 200,000 gallons.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

276. Roof Design.—It is found necessary in designing the steel trusses for a roof to adopt some system of wind bracing. Explain in detail how the cross-sectional area of the wind ties is determined. (H. F. W., *Tottenham.*)

277. Sewage Disposal.—What main principles should be kept in mind in arranging the sewage disposal of the following: (*a*) A village of 800 inhabitants (purely agricultural)? (*b*) A town of 2,000 inhabitants (industrial)? (*c*) An infectious diseases hospital of 100 beds? ("Charger.")

288. Mechanics.—Give an expression for the tension of the bucket rod or piston rod in a common suction pump. The barrel of the pump is 8 in. diameter, and the stroke of the bucket or piston is 10 in. Find the work done per stroke in ft.-lbs. when the spout is 16 ft. above the surface of the water in the well. (A.M.I.C.E., October, 1901.)

289. Paving.—What is the best material for paving carriageways of steep gradient? Give reasons. ("Mumeng.")

290. Building Construction.—The walls at the base of a high brick tower are 3 ft. 9 in. thick. Describe, with drawing, what footings should be provided, the thickness of concrete, and the distance below the surface. (T. R.)

291. Surveying.—Upon what trigonometrical rule does triangulation depend? Prove that the sides of a triangle are proportional to the sines of the angles opposite to them.

REPLIES TO QUESTIONS.

275. Cantilever.—A cantilever of uniform cross-section and length L carries a concentrated load W at the free end. A prop is placed at a point $\frac{L}{4}$ from the free end, bringing this point to the same level as the fixed end. Find an expression for the reaction at the prop, and the deflection of the free end of the cantilever. Neglect the weight of the cantilever. (B.Sc.Eng. Final.) (H. F. W., *Tottenham.*)

This problem can be solved in the following manner: Assuming

$$\frac{d^2y}{dx^2} = \frac{1}{EI} M \quad . \quad . \quad . \quad (1)$$

where E = Young's modulus for material of beam.
I = moment of inertia of beam.
M = bending moment at any part in beam.

This formula is proved in any standard text-book on strength of materials.

Let A be the point in cantilever at which it is supported by prop. Let the force in prop = P

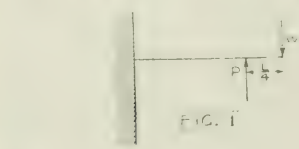
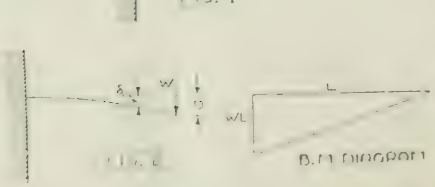


FIG. 1



Consider as in Fig. 2 the bending moment at a point x from end and under action of W *only*.

It is required as first step to find deflection of A due to W.

$$M_1 = Wx$$

$$\therefore \frac{d^2y}{dx^2} = \frac{1}{EI} Wx$$

The slope of curve is given by integrating, thus

$$\frac{dy}{dx} = \frac{1}{EI}\left(\frac{Wx^2}{2} + C_1\right)$$

to evaluate C_1 $\frac{dy}{dx} = 0$ when $x = L$

$$i.e., \quad 0 = \frac{1}{EI}\left(\frac{WL^2}{2} + C_1\right)$$

$$C_1 = -\frac{WL^2}{2EI}$$

$$\therefore \frac{dy}{dx} = \frac{1}{EI}\left(\frac{Wx^2}{2} - \frac{WL^2}{2}\right)$$

Integrating to get deflection

$$y = \frac{1}{EI}\left(\frac{Wx^3}{6} - \frac{WL^2}{2}x\right) + C_2$$

when $x = L$, $y = 0$

$$\therefore C_2 = \frac{1}{EI}\left(\frac{WL^3}{2} - \frac{WL^3}{6}\right) = \frac{1}{3}\frac{WL^3}{EI}$$

$$\therefore y = \frac{1}{EI}\left(\frac{Wx^3}{6} - \frac{WL^2x}{2} + \frac{WL^3}{3EI}\right)$$

Thus deflection of A due to W is given by putting

$$x = \frac{L}{4}$$

in this formula.

$$y = \frac{1}{EI}\left(\frac{W}{6}\frac{L^3}{64} - \frac{WL^2}{2}\frac{L}{4} + \frac{WL^3}{3}\right)$$

$$= \frac{WL^3}{EI}\left(\frac{1 - 48 + 128}{64 \times 6}\right)$$

$$= \frac{27}{128}\frac{WL^3}{EI} \quad . \quad . \quad . \quad . \quad . \quad (2)$$

Now consider as in Fig. 3 the upward movement of A due to P acting alone.

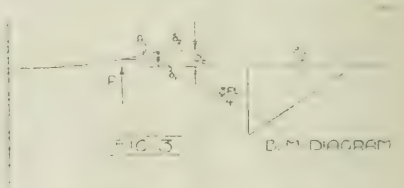


FIG. 3

The movement is given by the ordinary formula for deflection of a cantilever loaded at end—*viz.*:—

$$\delta = \frac{Wl^3}{3EI}$$

where $l = \frac{3}{4}L$, and $W = P$

$$\therefore \text{this movement is} = \frac{P}{3EI}\frac{27}{64}\frac{L^3}{}$$

$$= \frac{9}{64}\frac{PL^3}{EI} \quad (3)$$

But since the point A remains on the same level, the downward movement of A given by (2) and the upward movement given by (3) must be equal

$$i.e., \quad \frac{27}{128}\frac{WL^3}{EI} = \frac{9}{64}\frac{PL^3}{EI}$$

$$\frac{3}{2}W = P$$

$$i.e., \quad P = \frac{3}{2}W$$

The value P in terms of known load W

Final Deflection of End. This is compounded of two movements of the end—first, a downward one due to W, and, secondly, an upward one due to **P**.

It is easily deduced from (1) that the deflection

of the end of a cantilever is proportional to moment of area of B.M. diagram about free end; also, that the slope of the curve (of the beam) at this point is proportional to area of B.M. diagram.

Applying this, downward deflection

$$= \frac{1}{EI} \times \text{moment of area of B.M. diag. for Fig. 2 about end}$$

$$= \frac{1}{EI} \times \frac{WL^2}{2} \frac{2}{3} L$$

$$= \frac{WL^3}{3\,EI} = D_1 \text{ (in Fig. 2)}$$

Upward deflection must be found by two steps: -

(1) Find upward deflection of A.

(2) From this to get upward deflection of end.

(1) This is given by

$$\frac{9}{64} \frac{PL^3}{EI} = \frac{27}{128} \frac{WL^3}{EI} - \delta_1 \text{ (Fig. 3)}$$

$$\text{Slope of curve at A} = \frac{1}{EI} \times \text{area of B.M. diag. (in Fig. 3)}$$

$$= \frac{1}{EI} \frac{9}{32} PL^2$$

$$\text{i.e., } \tan\theta \text{ (Fig. 3)} = \frac{1}{EI} \frac{9}{32} PL^2$$

$$= \frac{1}{EI} \frac{9}{32} \frac{3}{2} WL^2$$

$$= \frac{27}{64} \frac{WL^2}{EI}$$

$$\text{also } \tan\theta = \frac{\delta_2}{\frac{L}{4}} \text{ (see Fig. 3)}$$

$$\text{i.e., } \delta_2 = \frac{L}{4} \cdot \frac{27}{64} \frac{WL^2}{EI}$$

$$\frac{27}{256} \frac{WL^3}{EI}$$

(2) Thus total upward deflection of end

$$= \delta_1 + \delta_2$$

$$= \frac{WL^3}{EI} \left(\frac{27}{128} + \frac{27}{256} \right) = \frac{81}{256} \frac{WL^3}{EI} = D_2$$

$\therefore$ Total deflection of end of cantilever $= D_1 - D_2$

$$= \frac{WL^3}{EI} \left(\frac{1}{3} - \frac{81}{256} \right) = \frac{13}{768} \frac{WL^3}{EI}$$

(R. E. S., *Bristol.*)

INTERCEPTING TRAPS IN HOUSE DRAINS.

IMPORTANT MEETING ARRANGED.

At a meeting of the Royal Sanitary Institute to be held at 90 Buckingham Palace-road, S.W., on Tuesday, November 12th, Mr. H. Percy Boulnois, M.INST.C.E., chairman of council of the institute, will open a discussion on the recently issued report of the Departmental Committee on Intercepting Traps in House Drains.

The chair will be taken at 8 p.m. by Sir Maurice Fitzmaurice, C.M.G., M.INST.C.E., chief engineer to the London Council Council.

Institution of Civil Engineers' Awards.—The council of the Institution of Civil Engineers have made the following further awards for papers read during the session 1911-12: A Watt Gold Medal to Prof. W. H. Burr (New York), and the Crampton Prize to Prof. R. J. Durley (Montreal). They have also awarded the following Telford Premiums for papers published in the "Proceedings" without discussion during the same session: To Messrs. Paul Seurot (New York), David Anderson and Harry Cunningham (London), S. P. Smith, D.SC. (Birmingham), E. G. Rivers, I.S.O. (Richmond) and E. H. Morris (Manchester), and Prof. A. H. Gibson, D.SC. (Dundee). The Howard Quinquennial Prize per 1912 has been awarded to Mr J. H. Darby (Sheffield), in recognition of improvement introduced by him in iron and steel production, and the Indian Premium for 1912 to Mr. H. H. G. Mitchell (Madras). The council have made the following awards in respect of students' papers read during the session 1911-12: The "James Forrest" Medal and a Miller Prize to Mr. E. P. Curtail, B.SC. (Birmingham); and Miller Prizes to Messrs. J. H. Taylor (Glasgow), W. P. Watson, B.SC. (Bristol), G. Ingram (London), E. F. Hunt (London), H. J. F. Gourley, B.E. (London), H. G. Hookings (London), E. A. Cross, B.SC. (Birmingham), and J. and W. Legg (London); and the "James Prescott Joule" Medal to Mr. V. E. Green (Birmingham).

CORRESPONDENCE.

"Be calm in arguing; for fierceness makes
Error a fault and truth discourtesie"
—Geo. Herbert, "*The Temple*."

THE INTERCEPTING TRAP AND THE VENTILATION OF SEWERS AND DRAINS.

To the Editor of The Surveyor.

Sir,—The report of the Departmental Committee of the Local Government Board on "Intercepting Traps," and the paper in your issue of the 17th ult. by Mr. de Courcy Meade, of Manchester, giving an account of his experiments on the Manchester sewers, are both extremely interesting to me, seeing that the former proves up to the hilt every count in the indictment against the intercepting trap which I first began to formulate in 1881, and the latter explodes the exaggerated claims of the numerous patent systems which generally claim to remove fabulous quantities of sewer gas from impossible lengths of sewers.

The objections to the trap are very well summarised in your quotation of remarks by Mr. R. L. Fox, of New York, published in your issue of the 4th inst.

The superstition of the intercepting trap dies hard, and its increasing numbers during the last thirty-five years have completely muddled the whole system of sewer ventilation in the great majority of towns, and now we are faced with the difficulty of its abolition. But this is not an expensive matter, and should be very easily accomplished. Mr. van Pulten suggests that the stoppers of the raking arms should be taken out. This is a very good suggestion as a temporary measure, but it does not get over the retention of the solids by the trap, and the resistance to the flow of sewage caused thereby, but it would probably get over the sentimental objection that any new drains without traps would be taking their undue share of the ventilation of the sewers. This objection could be overcome by making sound drains, especially where they pass under a dwelling-house, instead of outside as they should do where possible. The best method of making a sound job with the drains is to joint them with bitumen similar to that used for insulating purposes in electrical work. Stoneware pipes jointed in this manner can be walked over within half an hour after they are laid, and two pipes can be jointed together on the surface, and lowered into the trench, so that only half the number of joints have to be made in the trench itself, and if the drain is sound it matters not to the inhabitant of the house what passes through it.

The question of the intercepting trap and sewer ventilation has never been so thoroughly investigated before the present time, for the simple reason that there were so many points to be considered and experimented upon that no single individual could afford either the time or the expense for such an investigation, and the bugbear of the whole question has always been that each individual was generally arguing from a different and isolated point of view. We are therefore greatly indebted to the Local Government Board for their very exhaustive investigation of the whole subject, and it is not until the local authorities have power to arrange and control the ventilation of sewers and drains as one system in accordance with local conditions that any satisfactory results will be arrived at. Systems of ventilation can only be local, as it has been proved over and over again that any attempt to ventilate beyond a ¼-mile radius is a failure. Therefore the exaggerated fears indulged in by the public and others that the ventilation of a whole town can be brought to one or two isolated spots are entirely unfounded. The Bristol system, or absence of system, of ventilation is always quoted as a reason for not attempting to ventilate sewers at all, but inasmuch as whenever they want to enter a sewer they have to open several manholes for several hours before entering, it looks to me rather like Pandora's box, storing all the evils of the sewers up for a time, and then letting them all out at once.

I think it has been proved that the system of surface ventilation alone is merely stagnation, depending upon the force and direction of the wind to make it work. The system of shafts alone is simply creating similar conditions at a higher level, but with this advantage that it is above the head of the people, and if the shafts are not obstructed or overshadowed, the direction of the wind is not of so much importance, but the force of the wind converts some shafts into outlets and some into inlets with a similar action

to that of the surface ventilators when they were alone; but it has always seemed to me that the true solution is to find out the proportion which the surface ventilators should bear towards the shaft ventilators, and the surface ventilators should be as small both in size and numbers as possible, so as to create an in-current which could not be reversed.—Yours, &c.,

R. Read.

Guildhall,
Gloucester.
October 5, 1912.

THE CROMPTON PAVEMENT.

To the Editor of The Surveyor.

Sir,—It seems a great pity that Mr. W. J. Howard-Smith should make invidious comparisons when apparently he knows next to nothing about bitumen.

The veriest tyro in the manufacture of bituminous paving mixtures knows why a percentage of cement is employed, and anyone who in recent years has followed American practice would also know that Colonel Crompton is merely paying America the high compliment of emulating their example of constructing country roads on the principle of first laying a foundation of asphaltic concrete, varying in thickness according to the nature of the traffic pertaining to the road in question, upon which an asphaltic sheeting or wearing surface is superimposed, but as to why Colonel Crompton should specify that all the ingredients should be mixed at a temperature of 600 deg. Fahr. is difficult to understand, as no known fluxed bitumen will stand such a high temperature without considerable detrimental alteration to its nature.

Further, where in this country we deal with yards in America they deal with miles on this system, and that at a price of about 60 cents (2s. 6d.) per super. yard, which price usually carries with it free maintenance for at least five years.—Yours, &c.,

The Havana Exploration Company, Ltd.
Cecil Nathan, General Manager.

3 London Wall-buildings,
London, E.C.
October 7, 1912.

[Two misprints, we find, occurred in the letter of Mr. Howard-Smith which appeared in last week's issue. In the second paragraph the word "wish" was printed as "rush," and in the quotation from Colonel Bingham's specification the word "pegs" was misspelt.—Ed. The Surveyor.]

NON-SLIPPERY WHINSTONE.

To the Editor of The Surveyor.

Sir,—From the paragraph in your issue of the 27th ult. (p. 438) I gather that the Corporation of Portsmouth are flattering themselves that their tramway extensions have been paved with "whinstone which is not slippery."

It is to be hoped that disappointment in this respect will not be experienced. If such should happily be the case the members of the Tramway Committee, who together with the manager selected this material, are to be congratulated in having discovered a *rara avis* in whinstones; it must certainly be quite different to any I wot of. I claim a fairly wide experience of this class of rock as a paving material. This experience has not been such as to cause me to look upon whinstone as a possible material to employ in the construction of those tramways for which I have been the engineer.

The avoidance of slipperiness in paving in any class of material—is, of course, a matter of special concern to tramway authorities, in view of their legal liability on this score under the well-known Dublin decision.

One good trait to be remarked and commended is that the Portsmouth whinstone honestly declares its name and has not disguised itself by usurping the name of "Scotch granite," a trick whinstones from over the border are sometimes prone to adopt.—Yours, &c.,

W. J. Howard-Smith.

October 8, 1912.

Railless Trolley System at Rotherham.—The trolley bus system between Rotherham and Maltby was formally inaugurated last week. Rotherham is the first municipality to receive authority to go outside its own area.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Batley T.C. (October 2nd. Mr. P. M. Crosthwaite).—£16,395 for sewage disposal works and £3,616 for widening Mayman-lane and Healey-lane.—The borough surveyor, Mr. O. J. Kirby, stated that it was proposed to provide a new detritus tank, and they were putting down nine first contact beds and six second contact beds, in addition to the eight first contact beds and five second contact beds already existing. The present tank capacity was 1,750,000 gallons, and when the proposed works were carried out the total tank capacity would be 2,263,000 gallons. The population with which the works had to deal was 26,000. The dry-weather flow was 800,000 gallons daily, consisting of 450,000 gallons of domestic sewage and 350,000 gallons of trade waste. The inspector: That is what you treat? The surveyor: That is what should be treated. The inspector: What do you treat at present? The surveyor: As much as we can. It does not amount to more than half that. We have been unable to treat the night flow. With respect to the road widenings, it was explained that a considerable portion of the money it was proposed to spend would go in the purchase of land.

Birmingham T.C. (October 3rd. Mr. T. C. Ekin).—£19,000, £3,340 and £1,034 for works of sewerage and surface-water drainage; £12,894 for the erection of a new boiler-house at the Summer-lane electricity generating station; £2,315 and £4,692 for the provision of additional stabling at the Nechells destructor works and the Lifford destructor works respectively; and £2,700 for the improvement of Hockley brook between Factory-road and the London and North-Western Railway. The town clerk, Mr. E. V. Hiley, alluding to the sewerage schemes, stated that at Hall Green there was an area containing about 400 acres which lay on the western side of the Stratford-road. That district was at present unsewered, and a number of the houses drained into cesspools or streams. The application was to provide surface-water and foul-sewage drains for the district. Referring to an Erdington improvement, Mr. Hiley said the work had become necessary because of the rapid development of building land between Bromford-lane and Gravelly-hill. This was one of the few districts in the city from which it was necessary to pump the sewage to the drainage farm. In most of the other districts the sewage flowed by gravitation. The item of £3,340 was for works projected near those just referred to. With respect to the Summer-lane power station application, the town clerk said the council had commenced the work. They had been obliged to do that because there had been a very large increase in the demand for electric current, especially for power purposes. The total output of the undertaking next year would be about 60,000,000 units. The inspector remarked that if the undertaking progressed at such a rate Manchester would have to look to its laurels. There the output was 87,000,000 units. As regards the improvement of Hockley brook for a distance of 220 yds. between Factory-road and the London and North-Western Railway Mr. Hiley said the work was part of a complete scheme which might be presented as a whole later on. It was rendered necessary because of the difficulty in dealing with storm water in times of flood. It was proposed to deepen and straighten the length in question.

Coventry T.C. (September 13th. Mr. H. R. Hooper).—£1,700 for the purchase of land for the extension of St. Paul's Cemetery. £254 for the widening of Swan-lane, and £338 for the provision of public conveniences at the branch libraries in course of erection at Earlsdon and Stoke.

Derby T.C. (October 2nd. Mr. T. C. Ekin).—£10,750 for the extension of electricity mains and additional plant, and £1,835 for the purchase of property in Osmanton-road and Willow-road for street improvements.—It was stated that the quantity of electricity sold during the past year was 5,923,000 units, as compared with 5,687,000 in the preceding year, and but for the coal strike in March, when the output declined, a considerable profit would have been made on the year's working. The capital expenditure already sanctioned in connection with the undertaking is £323,827, while £328,934 has actually been expended.

Dewsbury T.C. (October 1st. Mr. T. C. Ekin).—£14,500 for the purposes of the electricity undertaking

and £900 for the provision of apparatus for the purification of water at the public baths.—The town clerk, Mr. H. Ellis, stated that the money required for the baths was to obtain a constant supply of clean, warm water in the two swimming ponds. The present method of supplying the baths with water was to take it direct from the town's mains, and warm the water by means of live steam from the boilers. The baths were emptied twice a week in summer and once a week in winter. That meant an expenditure of £4 10s. per week for two months. In summer the cost was about £3 a week. In reply to a question by the inspector, the borough surveyor, Mr. H. Dearden, said the tender for the apparatus amounted to £771, and Mr. Peter A. G. Bell, of the firm of Messrs. Bell Brothers, who are supplying the apparatus, proceeded to give some particulars regarding it. With respect to the proposed loan for the electricty undertaking, it was stated that the money was allocated as follows: £10,000 for new generating plant, comprising a new 1,000 kw. turbine engine, boilers, &c.; £3,500 for distributor cable extensions; and £1,000 for service cables, meters, fire boxes and connections, which, it was estimated, would be required during the next four years. The tender of the Brush Electrical Engineering Company for the 1,000 kw. turbine amounted to £3,728, and the tender of Messrs. W. H. Allan & Sons, Bedford, for the condenser was £1,569, a total of £5,297, as against £5,100 estimated in the application.

Maldens and Coombe U.D.C. (September 25th. Mr. R. H. Bicknell).—£1,627 for the provision of additional pumping machinery at the sewage disposal works.—The clerk, Mr. J. W. Johnson, stated that the works comprised in the scheme for additional pumping machinery had become necessary by the rapid growth of the population, and owing to the fact that in the past the council had permitted a large amount of roof water from the houses to be connected to their soil sewers, so that in times of storm the volume of sewage flow had been increased to an enormous extent. It had been ascertained that a destructor was not the most economical method for obtaining the additional power required for pumping at the disposal works, and the scheme for a destructor had therefore been abandoned. It was desired to instal a 50-horse power Diesel oil engine, to take the place of a 6-horse power gas engine of old pattern. The inspector examined the plans and estimates with the surveyor, Mr. R. H. Jeffes.

Mexborough and Swinton Gas Board (October 3rd. Mr. P. M. Crosthwaite).—£20,200 to develop the gas undertaking recently acquired from the Swinton and Mexborough Gas Lighting Company.—Mr. J. W. Hattersley stated that the works were purchased by arbitration, and the award was £60,370, whereas the original offer was £40,000. In addition, the Gas Board has had to pay all the legal and Parliamentary expenses, bringing the total cost to date to £70,800. The additional £20,000 was required for improving the works, extending the mains and installing new meters and services. He pointed out that in the first half-year of their control they had made £500 more than the late company ever made in a full year. There was no opposition.

APPLICATIONS FOR LOANS.

Aberystwyth T.C. £3,139 for a workmen's dwellings scheme.

Ashford U.D.C.—£15,000 for a drainage scheme.

Bournemouth T.C. £12,650 for the purchase of land for cemetery and pleasure ground purposes and £2,500 for a fire station.

Christchurch T.C.—£3,500 for the purposes of the sewerage scheme.

Colne T.C.—£13,948 for paving and flagging.

Spalding U.D.C.—£20,000 for a sewerage scheme.

Wakefield T.C.—£3,000 for mains, £500 for sub-stations and £500 for transformers for the purposes of the electricity department.

LOANS SANCTIONED.

Coalville U.D.C. £4,600 for gas-works extensions.

Darlington T.C.—£47,550 for the extension of the gas-works.

East Molesey U.D.C.—£1,019 for the improvement of Nightingale-road, Hansler-grove, Matham-road, Feltham-avenue and Hurst-road.—The sanction was given upon the understanding that any sums which might be contributed by the Road Board or the county council towards the cost of the widenig of Hurst-road would be at once applied in repayment of the loan, which should be raised on terms that would permit of this being done.

Ealing T.C.—£7,087 for a secondary school and technical institute.

Hereford T.C.—£1,100 for alterations and repairs to the market hall, and £2,000 for the proposed railway siding to the cattle market.

Holbeach R.D.C.—£2,125 for the purchase of sites for housing schemes.

Luton T.C.—£1,700 for sewerage works.

Maidenhead T.C.—£2,900 for surface-water drainage and footpaths improvement.

Stoke-on-Trent T.C.—£2,028 for the purchase of a site for a school, and £16,000 for new central schools at Burslem.

Wolverhampton T.C.—£1,800 for the purchase of land for open spaces, repayable in sixty years.

FORTHCOMING INQUIRIES.

OCTOBER.

	£
15.—**Chesterfield.** For sewage disposal purposes (Mr. F. O. Stanford)	2,541
15.—**Chester-le-Street.** For works of water supply (Mr. A. A. G. Malet)...	1,383
15.—**Irlam.** For recreation ground, fire station and mortuary purposes (Mr. F. H. Tulloch)	6,415
15.—**Sheffield.** For road, recreation and coroner's court purposes (Mr. Edgar Dudley)	37,430
15.—**Watford.** For the electricity undertaking (Mr. T. C. Ekin)	9,253
15.—**Woking.** For works of sewerage (Mr. P. M. Crosthwaite)	3,600
16.—**Burgess Hill.** For sewage disposal works (Mr. P. M. Crosthwaite)	2,250
16.—**Bury.** For improvements at the depot (Mr. F. H. Tulloch)	1,402
16.—**Chesterfield.** For works of water supply (Mr. F. O. Stanford)	1,126
16.—**Gower.** For works of water supply (Mr. R. G. Hetherington)	5,500
16.—**Ilkeston.** For road and depot purposes (Mr. Edgar Dudley)	3,246
16.—**Knottingley.** For works of sewerage (Major J. Stewart)	770
16.—**Tynemouth.** For works of sewerage (Mr. A. A. G. Malet)	—
17.—**Cookham.** For surface-water drainage (Mr. R. H. Bicknell)	—
17.—**Guildford.** For the purchase of a motor fire engine and additions to fire station (Mr. Courtenay Clifton)	1,333
17.—**Hastings.** For sewage disposal works, paving and the provision of a groyne (Mr. P. M. Crosthwaite)	5,070
17.—**Hemel Hempstead.** For sewerage purposes (Mr. M. K. North)	1,400
17.—**Horwich.** For the conversion of privies (Mr. F. H. Tulloch)	4,500
17.—**Keighley.** For public baths and park purposes (Major J. Stewart)	15,400
17.—**Wallsend.** For wharf and public convenience purposes (Mr. A. A. G. Malet) ...	4,750
18.—**Berwick-upon-Tweed.** For a sewerage scheme (Mr. A. A. G. Malet)	5,000
18.—**Cheltenham.** For works of sewerage (Mr. R. G. Hetherington)	4,473
18.—**Doncaster.** For paving and the erection of a refuse destructor (Major J. Stewart)	5,017
18.—**Maldens and Coombe.** For the purchase of land for an open space (Mr. Edgar Dudley)	3,600
18.—**Rye.** For the erection of a caretaker's lodge (Mr. P. M. Crosthwaite)	300
18.—**Solihull.** For the provision of a cemetery (Mr. F. H. Tulloch)	15,000
19.—**Wellingborough.** For works of street improvement (Mr. F. H. Tulloch)	3,500
23.—**Birmingham.** For a town planning scheme (Major C. E. Norton)	—

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works, of which particulars appear below: Buildings—Cheshire £25,000, Edinburgh, Helensburgh £10,000, Ipswich £13,500, Norfolk £30,000, Worcester; housing and town planning—Manchester; parks and open spaces—Littlehampton; refuse disposal—Cleethorpes; roads and materials—Colne £13,948, Hartlepool, Sheringham; sewerage and sewage disposal—Spalding £20,000, Worthing £10,819; water, gas and electricity—Birkenhead £10,500, Exmouth, Stirling £5,200; miscellaneous—Leeds.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

BUILDINGS.

Belfast T.C. A [illegible] is to be submitted [illegible] of slipper baths for Dock Ward.

Bolton T.C.—The Electricity Committee recommend the expenditure of £120,000 on a new generating station.

Cardiff T.C.—Consideration is being given to a proposal to erect new buildings for the weights and measures department at an estimated cost of £2,000.

Chelmsford T.C.—The borough engineer, Mr. P. T. Harrison, has received instructions to prepare a general scheme for new council buildings.

Cheshire C.C.—It is proposed to provide, in connection with the operations of Chester, Birkenhead, Stockport and Stoke, a joint sanatorium for 150 [illegible] at a cost of £25,000.

Cleethorpes U.D.C.—A scheme for two shelters and a [illegible] at an estimated cost of £600, has been prepared by the surveyor, Mr. C. H. Waithman.

Coventry T.C.—An electricity sub-station is to be built at a cost of £100.

Diss U.D.C.—The tender of Messrs. R. Hogg & Son, of East Winch, at £285, has been accepted for building a new cottage at the water tower.

East Ham T.C.—The amended estimate of the borough engineer, Mr. J. E. W. Birch, at £1,546, for the construction of an underground convenience at the corner of Barking-road and Central Park-road, has been approved.

Edinburgh T.C.—The new town hall at Portobello, for the erection of which the Dean of Guilds has issued the necessary warrant, has been designed by the city superintendent, Mr. James A. Williamson, A.R.I.B.A., and the cost is estimated at slightly over £6,000. Accommodation will be provided for about 1,000 persons, 500 in the area and about the same number in the gallery, which runs round three sides of the hall. There will also be artists' rooms, kitchen, [illegible] committee rooms.

Flintshire C.C.—A new school is to be erected at Gwespyr at a cost of £2,972, and extensions are to be carried out at the Flint school at an estimated cost of £950.

Hackney B.C.—The tender of Messrs. Allen & Co., at £18,750, has been accepted for extensions of the generating station.

Helensburgh T.C.—A plan has been prepared by the burgh surveyor for the extension of the pier at an estimated cost of £10,000.

Ipswich T.C. The Board of Education have approved a scheme for a new school, at a cost of £13,500.

Newcastle-on-Tyne T.C.—A sum not exceeding £500 is to be spent on expert architectural advice in the matter of the reconstruction of the city hall. It is proposed to enlarge entirely the existing building, and the proposal also includes building a hall to accommodate about 1,000 or 1,200 persons.

Norfolk C.C.—The county surveyor, Mr. T. H. B. Heslop, in a report states that the damage caused to the bridges by the late floods has been confined to the [illegible] bridges. No damage so far as he has been able to ascertain has been done to any of the modern bridges. In the case of the [illegible] bridges have been constructed where they appeared to be necessary. A sum of £30,000 is to be obtained for the repair of flood damages.

Rochester T.C. A material instruction centre is to be provided at a cost of £320.

Truro R.D.C.—A scheme has been discussed for the construction of a pier at Portloe. The council, not being favourable to undertaking the project, have referred it back to the local committee with a recommendation that it be forwarded to the County Fisheries Committee.

Worcester T.C.—The council have approved the principle of the provision of central swimming baths and warm baths, and have requested the Health Committee to submit one or more schemes at an early date.

HOUSING AND TOWN PLANNING.

Manchester T.C.—It has been decided to build thirty more houses on the Blackley estate, and the town planning Committee have been authorised to make application to the Local Government Board for permission to proceed with their scheme and prepare an estimate of the cost.

Mitford and Launditch R.D.C.—A resolution has been passed that cottages should be built where they are found to be necessary.

Southwick U.D.C.—The surveyor, Mr G. W. Warr, has prepared a map of the district showing the area affected by the suggested town planning scheme. It comprises the whole of the land south of the Upper Shoreham-road not already built upon, with the exception of certain isolated plots, surrounded by buildings, which could not be benefited, and upon which it did not appear necessary to place any further restrictions. The area also includes a small portion north of the Upper Shoreham-road. On the map the surveyor also shows the route of a proposed new through road eventually to take the place of the Upper Shoreham-road as a main road into Hove and Brighton.

PARKS AND OPEN SPACES.

Dawlish U.D.C.—The surveyor, Mr. S. F. C. Churchward, has submitted a modified plan for the improvement at Lea Mount, the proposal being to have plain unclimbable railings, and to dispense with the suggested dwarf wall, thus effecting a saving of £200 upon the estimated cost (£600).

Glasgow T.C.—It has been referred to a committee to consider the question of providing a bowling green on a portion of vacant land in Kennedy-street.

Littlehampton U.D.C.—The clerk has been instructed to obtain information from other seaside towns with respect to the provision of a bathing pool, public tennis courts, bowling green and croquet ground.

Sunderland T.C.—The Parks Committee are considering a scheme for providing a municipal golf course. The suggested scheme provides for an eighteen-hole course at Roker, near Seaside-lane.

REFUSE COLLECTION AND DISPOSAL.

Cleethorpes U.D.C.—The question of providing a destructor has been reported upon, and it is to be considered by the Sanitary Committee.

ROADS AND MATERIALS.

Aberdeen T.C.—Schemes for a new road to the links are under consideration.

Carmarthenshire C.C.—Claims of £5 and £3 have been received by the Main Roads Committee from a motor cyclist and motor-car driver in respect of damage sustained from, as alleged, an excess of tar upon a highway. Sir James Hill-Johnes, a member of the council, stated that when he motored over the road in question the tar was "running like a stream." Mr. Mervyn Peel said no doubt the method of tarring the roads in the county could be greatly improved. He suggested that half the road should be tarred at a time. The clerk said that the work was being done by contract and the contractor was liable and not the council.

Chelmsford T.C.—The tender of Messrs. W. Griffiths & Co., Liverpool, at £2,102, has been accepted for paving part of New-street.

Colne T.C. It is proposed to pave Burnley-road and Keighley-road with granite and flag the footpaths, at an estimated cost of £13,948.

Dunfermline T.C.—The main feature of the city extension scheme is to consist of a new road, 130 ft. wide,

connecting the city with the gates of Rosyth Naval Base. In the new road a double line of tramways is to be constructed on a principle that will enable travel to be undertaken at a very cheap rate.

Hartlepool T.C.—The council have generally approved of a scheme for the extension northward of the promenade. No definite plan has yet been decided upon. At the point in question considerable erosion by the sea has taken place.

Lewes T.C.—The Road Board have offered to make a contribution of £200 towards the proposed improvement at the bottom of Station-street, and negotiations are in progress for the purchase of the necessary property.—It has been resolved to purchase two mirrors for dangerous places at 30s. each, the surveyor, Mr. D. Roberts, to place them at some suitable spot as an experiment.

Sheringham U.D.C.—The plans of the surveyor, Mr. F. Hall-Smith, for the improvement of the sea front at an estimated expenditure of £1,450 have been adopted.

Stafford T.C.—Land is to be purchased from Lord Stafford for the construction of the proposed new road from Lichfield-road to Lammascotes.

Teignmouth U.D.C.—The council have accepted the scheme of the surveyor, Mr. J. Knight, for the construction of the new thoroughfare connecting Paradise-road with Haldon-road.

Worthing T.C.—Montague-street is to be paved with wood blocks at a cost of £2,320.

SEWERAGE AND SEWAGE DISPOSAL.

Beverley R.D.C.—The council having invited selected engineers to prepare and submit to them complete schemes of sewerage and sewage disposal for Brantingham and Elloughton-cum-Brough, submitted the schemes so received to Mr. A. M. Fowler, M.INST.C.E., of Manchester; for his award. Mr. Fowler has now presented his report, in which he recommends that the scheme of Messrs. Fairbank & Son, M.INST.C.E., of York, should be accepted, and the council have approved of his recommendation.

East Grinstead R.D.C.—The tender of Mr. J. M. Vine, of Eastbourne, at £3,332, has been accepted for carrying out the work of the St. John's sewerage and sewage disposal works at Crowborough. The estimate of the surveyor, Mr. C. Turton, was £3,732.

Greenwich B.C.—The estimate of the surveyor, Mr. Ernest J. Heward, at £900, has been accepted for the construction of a relief sewer from Delafield-road, Charlton, to Woolwich-road, East Greenwich, the work to be carried out by direct labour.

Loughborough T.C.—With respect to the council's application for a loan of £900 for sewage disposal works, the Local Government Board have written stating that the existing pumping plant was insufficient. The pumping capacity should be increased, and an additional spare pump provided, and it would also be advisable to instal a self-recording gauge to show the level of the sewage in the pump well. The borough surveyor, Mr. A. H. Walker, has been authorised to obtain a recording gauge for the purpose of ascertaining the minimum quantity of sewage to be dealt with, in order to be in a position to reply to the board's letter.

Southwick U.D.C.—The tender of Mr. H. Farrow, of Brixton, at £890 has been accepted for the construction of the surface water outfall sewer.

Spalding U.D.C.—The new sewerage scheme, estimated to cost £20,000, has been adopted.

Worthing T.C.—A scheme has been approved for the construction of new surface-water drains in various streets, and the provision of an additional outfall for surface water at East Worthing, at an estimated cost of £3,430, to be raised on loan. A scheme has also been passed for the provision of additional pumping plant and the new outfall in connection with the sewage outfall works, at a cost of £7,389, to be raised by loan.

WATER, GAS, AND ELECTRICITY.

Bangor U.D.C. The gas manager has been instructed to submit a report of the cost of a small electric plant for the town.

Birkenhead T.C.—An amended plan of the aqueduct in connection with the waterworks undertaking at Alwen, North Wales, has been approved. The estimated cost of the scheme is £10,500.

Dromore U.D.C.—Steps are being taken to introduce a scheme of electric lighting.

Exmouth U.D.C.—The question of the extension of the waterworks has been referred to committee for consideration.

Glasgow T.C.—As the result of the deputation to the Continent and to towns in England and Scotland, experiments in street lighting are being carried out in Bath-street.

Manchester T.C.—A special committee has been appointed to determine the method to be employed for the public lighting of all roads, streets, courts and passages.

Settle R.D.C.—A scheme for an improved water supply, including the enlargement of the storage tank, has been approved, the cost being estimated at £2,000.

Stalybridge T.C.—The council have adopted the proposal of the Gas Committee to lay mains for high-pressure gas lighting, and requested the committee to proceed with the scheme at once.

Stirling C.C.—The council have consented to the execution of certain works with a view to improving the East Stirlingshire water supply, and have sanctioned the borrowing of £5,200 for that purpose.

Ulverston U.D.C.—The reservoirs and filter beds are to undergo immediate repairs estimated to cost £830.

MISCELLANEOUS.

Croydon T.C.—At their last meeting the corporation confirmed a recommendation of their Tramways Committee not to seek powers for constructing further extensions of their tramway system. The advisability of running municipal motor 'buses instead was strongly urged.

Leeds T.C.—Approval has been given to proposals to seek powers for extending both the tramway and trackless trolley routes to a distance aggregating 18 miles.

Lincoln T.C.—Mr. White, chairman of the Electricity Committee, in a statement last week said the committee were seriously considering the question of tramway accommodation for parts of the city not now served. They were not in favour of extending the present system owing to the cost, but were rather in favour of railless cars or petrol-driven 'buses.

Uckfield R.D.C.—A point under the Insurance Act was elucidated in a letter from the Board of Trade giving a decision from an umpire in reference to Part 2 of the Act (Unemployment), to the effect that contributions were payable in respect of workmen engaged wholly or mainly in driving or attending steam road rollers in connection with the construction of new roads, and not merely the re-surfacing of existing roads. The chairman: We are not liable. The clerk: Not until you are making new roads.

PERSONAL.

Mr. J. R. Smith has been appointed surveyor to the Clare (Suffolk) Rural District Council.

Mr. J. P. Haugh, of Chesterfield, has been appointed surveyor to the Pontypridd Urban District Council.

Mr. H. Monson, surveyor to the Redruth Urban District Council, has been voted an increase of salary.

Mr. G. M. Denton, surveyor to the Whitefield Urban District Council, has had his salary increased to £150 a year.

Mr. W. Fiddian, of Stourbridge, has been appointed engineer to the Bewdley water supply scheme of the Stourport Urban District Council.

Messrs. J. Knight and J. A. Phillips, surveyors to the Bodmin Rural District Council, have been granted an increase in their salary to £110 per annum.

Mr. Ernest E. Fetch, of London, has been awarded first and second premiums in the competition for designs for new municipal offices at Goole, and will act as architect for the erection of the building.

Mr. Frederic George Sison Ham, chairman of the well-known firm of Ham, Baker & Co., Limited, passed away at his residence at Wimbledon Park on the 1st inst., we deeply regret to state. The cause of death was typhoid fever.

Mr. H. A. Butterfield, assistant to Mr. J. H. Drew, engineer and surveyor and waterworks engineer to the Wath-upon-Dearne Urban District Council, has been appointed to a similar position in the office of the borough surveyor of Batley, Mr. O. J. Kirby.

FOR OTHER ADVERTISEMENTS

See End of Paper.

APPOINTMENT VACANT.

Applications are invited for the post of Municipal Engineer in the Municipal Board of Cawnpore in the United Provinces of Agra and Oudh, India.

The engagement will be for five years, at a progressive salary of Rs. 800 to Rs. 1,000 per mensem, an increment of Rs. 50 per annum being given after every year of approved service up to the maximum pay of Rs. 1,000 per mensem, but the first increment will be conditional on the passing of a colloquial test in the language of the Province—*viz.*, Urdu. 9¾ per cent will be deducted each month from the salary and paid into the Municipal Provident Fund, and the Municipality will make a contribution equal to one-half of the amount of the deduction made from the salary to the deposit account of the applicant. The agreement will be terminable by six months' notice on either side, provided that, if the applicant gives notice within two years from the date of appointment, he shall refund the sum of £50 granted for passage money, but the engagement may be extended by mutual agreement at the end of the period of 5 years, and if this is desired by both parties, the question of leave allowance during leave and salary will then be considered.

Applicant must be between 28 and 40 years of age, must have practised as a Borough Surveyor or Municipal Engineer for five years, and must hold a recognised diploma in Civil Engineering. Preference will be given to candidates who also possess knowledge and experience of Mechanical Engineering, Waterworks and Maintenance of Macadamised Roads. The salary will commence from the date of the successful applicant's joining at Cawnpore, and an allowance of £50 sterling will be given in full to cover passage and travelling expenses from England to Cawnpore.

Applications, which should be accompanied by a full statement of qualifications, copies of certificates, a medical certificate of sound health, and references to three persons, who may be addressed as to character, should be addressed, not later than 21st November, to

MR. C. E. GOUMENT C.S.I., M.I.C.E.

c/o Messrs. Thos. Cook & Son,
Ludgate-circus,
London.

SINGAPORE, STRAITS SETTLEMENTS.
MUNICIPAL FIRE DEPARTMENT.

The Municipal Commissioners of the Town of Singapore require an Assistant Fire Brigade Superintendent under 32 years of age, and of sound constitution. He must have received a good education, a knowledge of Building Construction and Electricity, a regular training in Mechanical Work, have had experience in the maintenance and repair of Motor Appliances, and have served in a Fire Brigade under a Municipal Fire Superintendent. The engagement will be for three years, and each applicant is to state the earliest date upon which he could be free to leave for Singapore. The selected candidate must pass a medical examination. A second-class passage will be provided by mail steamer, or a first-class passage by other steamer, with half-pay during the voyage out. The salary will be 200 dollars per month for the first year, 220 dollars the second year, and 240 dollars the third year, paid monthly in dollars, the currency of the Colony (the value of the dollar being two shillings and fourpence sterling), with free unfurnished quarters, uniform, light and water. Should the engagement be renewed the salary would be increased by annual increments of 240 dollars up to 3,600 dollars of a maximum per annum. Applications, stating age, and place of birth, and giving details of education, training, and experience generally, and referring to the above requirements seriatim, accompanied by copies only of testimonials, and also personal references, are to be lodged with C. C. Lindsay, Esq., M.INST.C.E., 180 Hope street, Glasgow (who will give further particulars if requested), not later than Tuesday, 22nd October, 1912.

WANTED.—Young engineer on sewer contract. State experience, salary required, and when at liberty.—Contractor, Box 1,186, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

THE RURAL DISTRICT COUNCIL OF HENDON.
JUNIOR ASSISTANT IN SURVEYOR'S DEPARTMENT.

The above Council invite applications for the appointment of a Junior Assistant in the office of their Engineer and Surveyor.

The salary will be £65 per annum, rising £10 annually to a maximum of £95 per annum.

Candidates must have had experience in Municipal Work, and be conversant with the usual routine work of a Surveyor's Office.

Applications to be made on forms, which can be obtained from the undersigned on receipt of a stamped addressed envelope, and the same must be returned not later than 10 a.m. on Wednesday, the 23rd instant.

(By order)
F. J. SEABROOK,
Clerk to the Council.

Union Offices, Edgware.
October 10, 1912.

CROMPTON URBAN DISTRICT COUNCIL.
SEWAGE WORKS MANAGER.

The above Council require a Working Manager to take charge of their Sewage Works, which comprise Precipitation Tanks, Contact Beds, and Sludge-pressing Plant, with Suction Gas Engines and Electrical Plant.

Applications, in own handwriting, stating age, experience, and salary required, accompanied by copies of two recent testimonials, should be sent to the undersigned before 10 a.m. on Monday, 21st October, 1912. It is desirable that applicants should have a good knowledge of Engines and Electrical Plant, as well as experience of sewage treatment.

House and light will be provided free by the Council, and the person appointed will be required to live on the New Hey Works.

Canvassing strictly prohibited.

F. F. GARTSIDE,
Clerk to the Council.

Town Hall, Shaw, nr. Oldham.
October 8, 1912.

BOROUGH OF SOUTHEND-ON-SEA.
TO ROAD AND SEWER CONTRACTORS.

The Corporation of Southend-on-Sea invite Tenders for the Making Up of St. George's Park-avenue; Fairfax-drive, Section 1; Oban-road, Section 2; Ilfracombe-road, Section 1; Tintern-avenue, Section 3; Kingsway; and Back-passage, Strutts Cottages.

Plans, Sections and Specification may be seen and Bills of Quantities and Forms of Tender obtained, on and after Saturday next, the 12th inst., on deposit of a cheque for £1 1s. in respect of each street (which will be returned upon receipt of a *bonâ-fide* Tender and the return of all documents), upon application to Mr. Ernest J. Elford, M.INST.C.E., Borough Engineer and Surveyor.

Sealed Tenders, endorsed "Private Street Works," to be delivered at my office by 9 a.m. on October 17th, 1912.

No Tender will be considered unless made on the prescribed form.

The Corporation will not be bound to accept the lowest or any Tender.

(By order)
H. J. WORWOOD,
Town Clerk.

Town Clerk's Office,
Southend-on-Sea.
October 8, 1912.

TURTON URBAN DISTRICT COUNCIL.
GRANITE SETTS AND TRACTION WAGONS.

Tenders are invited for 13,500 tons of Welsh Granite Setts, and for 2 Traction Wagons.

Specification and Forms of Tender may be obtained from the Surveyor, Council Offices, Bromley Cross, near Bolton. Tenders, under cover, endorsed "Tender for Granite Setts" or "Tender for Traction Wagons," as the case may be, to be delivered to the undersigned on or before Saturday, the 26th October instant.

The Council do not bind themselves to accept the lowest or any Tender.

J. B. GOULBURN,
Clerk to the Council.

Council Offices, Bromley Cross.
October 10, 1912.

Institution of Municipal and County Engineers.

EAST MIDLAND DISTRICT MEETING AT ILKESTON.

(Conclusion.)

Three papers, as will be seen from last week's issue, were submitted for consideration at the recent meeting of the Institution of Municipal and County Engineers at Ilkeston, the contributions in question being: "Ilkeston Sewage Disposal Works," by Hugh P. Raikes, M.INST.C.E.; "Water Supply, Ilkeston," by Henry J. Kilford, borough surveyor and water engineer; and "Ilkeston Tramways and Electricity Supply," by Harry P. Stokes, engineer and manager. The discussion was opened by the president (Mr. R. J. Thomas) with some appreciative references to the general excellence of the papers, their concise nature being in particular commented upon.

Mr. A. G. Wheeler (Eastwood) asked Mr. Raikes the nature of the sewage at Ilkeston. He noticed there were 25 gallons of sewage treated per head per day, and he gathered therefore that the sewage was of a particularly weak character. He would be glad to know something as to the composition of the sewage.

Mr. E. G. Mawbey (Leicester) proposed a hearty vote of thanks to the authors of the three papers. As to the paper on the sewage disposal works, the total flow was given as 25 gallons per head per day; he would like to know why the flow was only equal to 25 gallons per head. The sewers must be very tight. Was there any separate system, and what volume did they expect to have to deal with in storm time? The detritus tanks were formed in a very economical way. The humus tanks were undoubtedly a very important matter. They had seen in a good many works, however good the sedimentation tanks and the percolating filters were, there was always trouble at the other end.

Mr. E. W. Booth (Manchester) said he had not previously seen examples of electrically driven distributors on rectangular beds, though it would be remembered that at Croydon the sprinklers were driven in that way. He would have liked a little more information as to the waterworks—the Meerbrook Sough scheme—shared between Heanor and Ilkeston. He had seen the outside of the pumping station at Whatstandwell, and was looking forward to seeing the inside of it.

Mr. E. H. Crump (Hinckley) asked if there was an explanation for the tremendous amount of leakage from the water mains. It was given as reduced to 25,000 gallons per day, and that, worked out at 6d. per 1,000 gallons, meant a loss of £200 per annum. Probably that had something to do with the loss of £460 per annum. Was the leakage due to subsidences from the collieries? Also, what was the cost per 1,000 gallons of softening the water? The hardness of the water was 22 deg. His authority were considering the matter of softening at the present time, and any information would be useful to him. They had a hardness of 32 deg.

Mr. C. A. Clews (Derby) put an inquiry as to what the joints of the pipes were, how they were made, and where the leakage occurred. He was interested in the Meerbrook Sough scheme, having made the necessary preliminary surveys. Unfortunately, Derby dropped it, as there was a scare as to the pollution of the water. Derby thus lost a very good thing.

Mr. E. J. Elford (Southend-on-Sea) said he had been struck in reading Mr. Kilford's paper by the tremendous difficulties which the latter had had to overcome, and the knock-down blows the council had had from time to time in regard to their water supply scheme. These difficulties had been tackled with great courage, and Mr. Kilford was to be congratulated on the plucky way in which he had stuck to things. With respect to the boring referred to in the paper, the cost of that was given, but in the absence of particulars as to the diameter of the bore that was not of much value. Consideration was being given to a suggestion for utilising the energy provided by the drop between Chadwick Nick pressure and the reservoir—equal to 700,000 gallons of water falling 240 ft. every twenty-four hours—for generating electricity. It was not stated for what purpose this was intended, but if the carrying out of the idea resulted in materially affecting the head of water, he doubted whether it was wise to proceed with it. In regard to the sewage disposal works, he noticed it was stated that the distributors were capable of discharging 500,000 gallons per ¼ acre per twenty-four hours. One million gallons an acre did not seem much, and he should have thought the range would have been much greater than that. In connection with the tramways, he noticed that Atlas joints were now being used, and his opinion was that they were likely to prove satisfactory.

Mr. C. F. Wike (Sheffield) asked whether the provision of 25 gallons per head per day of sewage allowed for storm water, having regard to the requirements of the Local Government Board in that connection. He noticed that a large quantity of granite was to be used for the contact beds. He was just completing works with 30 acres of contact beds and 16 acres of storm-water beds, and had come to the conclusion that slag and furnace and destructor clinker were the best media they could use. They could appreciate the fact that with a quantity of 200,000 tons required some consideration had to be given to the price of the material. They had in proximity to their works a large mound like that of the Stanton Company, which contained, he supposed, 1,000,000 tons of slag and old refuse. They let this to contractors, who thought they were going to get a gold mine, and then found they were getting a dust heap. The difference between 2s. and 3s. per ton of slag and 10s. for granite meant the enormous amount of £40,000 or £50,000. In a district like Ilkeston, where slag was not difficult to obtain, he should like to know why granite was selected. He appreciated the point that granite, when once put down, would last for ever, and could afterwards be used for road material—(laughter)—while slag was very friable. He also knew that not all kinds of slag were suitable; it all depended on whether it was acid or basic slag. The basic was not used because after a time it became very friable.

Mr. R. Oakden (Newark) remarked that sometimes slag would set together in a solid block. He did not know whether Stanton slag would do that. If so, it was rather an objection in a sewage filter.

The President, in putting the vote of thanks to the authors of the papers, said he wished to repeat what he had already said—how much they appreciated the work of Mr. Kilford, especially with regard to the difficulties of the council in getting an efficient water supply. He was told the supply was now admirable, and answered all purposes. The council and Mr. Kilford were to be congratulated on this. As to the matter of the dry-weather flow of the sewage, the previous week at Grays they had a capital table in the paper read by Mr. James, the surveyor, recording very accurate gaugings of his sewers. Speaking from memory, there was no single day when the flow had exceeded five times the dry-weather flow. It was most interesting, and one that should be of great value to members in making applications to the Local Government Board. He would like to know from Mr. Wike where he got that wonderful granite that lasted for ever, and then could be used to make roads. Concluding his remarks, the president said there was one thing in one of the three papers which they should not fail to observe—namely, that they had had brought to their notice the very latest edition of the Raikes' progress. (Laughter.)

The vote of thanks was carried.

Mr. Raikes said he desired to thank the members for the very kind way in which they had received his paper. The description of the works was intended to give them some idea of what they were going to see that afternoon. Mr. Wheeler had spoken as to the nature of the sewage. He mentioned the figure of 25 gallons per day, and was apparently thinking of the small quantity of sewage going through the filters. The reason for such a small quantity per yard was that the sewage was strong. The water supply had been given as 17 gallons her head; so, instead of being a weak sewage, they had an exceptionally strong one. There was no separate system, so it was necessary not only to deal with the sewage, but with surface water as well. Mr. Mawbey spoke of the tank provision, and he need only remark that they attached great importance to the preliminary

tank system. They knew that in some instances disaster had happened from making the bacteria beds do the work for which the tanks were designed. Mr. Booth said he was interested in the system of distribution by mechanically driven travelling distributors. That was perhaps the principal feature of these works, and they had been selected by the Corporation of Ilkeston as being particularly suitable for the conditions there. They wished to take every possible precaution against the disadvantages from the spraying of sewage in the air when it was anywhere near habitations. They had adopted the system of discharging the sewage close to the surface of the filter, so that there was the least possibility of causing any nuisance. It would be seen that the distributing arms were tapered. That was done with the object of reducing their weight and facilitating the distribution. It had the effect of making the arm higher at one end than the other, but it did not cause uneven distribution. The works were only just being brought into use for testing purposes, and had not yet been formally opened; and although they were obtaining an effluent which was better than they expected at this early date, they must not assume it was the effluent which they would get when the works were in order. As to the question of the maximum quantity of sewage on the filters, the statement in the paper was correct that the filters were designed to work at the rate of 1,000,000 gallons per acre per day, which was about the rate they had found satisfactory. Adjustments could, however, be made so as to increase that rate if it was found desirable to do so. The treatment of storm water was important. They had satisfied the Local Government Board by dealing with it in a separate tank before discharge into the river. The question of the material for filters was perhaps the most important of all, because costly works were often built and then filled with rubbish. They had filled some of the filters with slag, but they had not used a larger quantity of slag because they looked upon it more or less as an experiment. They had tested it very thoroughly, and they had had it analysed, and knew exactly what its composition was, but they hardly felt justified in using it on a larger scale. There was also another reason, that it was not possible to get the quantity they required cleaned and screened at the rate they needed it. Time was a matter of importance, and they had not the time to get one material for the whole works. They got different materials, and it would give them an opportunity of comparing results, which would be of use on a future occasion. Mr. Oakden asked whether the slag showed any tendency to solidify into blocks. There was no indication of that, but it might happen with slag which contained any quantity of lime, which would form concrete. Mr. Thomas had mentioned the importance of records of the flow of sewage, so they might know what the works were doing. That was a point they had always appreciated and frequently emphasised, and they were arranging for the automatic recording of the sewage flow at the inlet of the tanks, and another recorder registering the quantity at each section of the beds. They were able in that way so to regulate the flow as to be able to get the best results from each section of the beds.

Mr. Kilford, in replying, stated that the leakage in the water mains was not due to defective works, but was the result of colliery subsidences. His contention was that if one joint could be made watertight 10,000 could be rendered similarly effective, but not in a colliery district. He was unable to give figures as to the cost of softening, but he could obtain them from the Water Board. The great difficulty in connection with the softening was the disposal of the mud following the process of softening. The water was undoubtedly pure. The cost of the boring as given included the cost of the tubes.

Mr. Stokes also replied. The tramway problem was being worked out in Ilkeston, and the point he had tried to emphasise was that it was useless to attempt pumping at the start. It was necessary that the work should be at correct pitch at the very start.

"THE SURVEYOR" BOOK DEPARTMENT.

In response to suggestions from numerous readers, resident in remote districts at home and abroad, who find it difficult to procure the books they require, we have decided to establish a department for the supply of technical and scientific books, a selected classified list of which will shortly be published in our advertisement pages.

THE MANCHESTER APPOINTMENT.

IMPORTANT DEVELOPMENTS.

With reference to the proposed appointment of a deputy city surveyor of Manchester the following appeared in *The Manchester Guardian* of Thursday of last week.

Mr. Derwent Simpson, chairman of the Town Hall Committee, replying to questions on the proposed appointment of a deputy city surveyor at a salary of £500 a year, explained why a change had been made in the advertisement respecting such appointment. By the resolution as at first drafted applications were limited to persons who were full members of the Institution of Civil Engineers. Afterwards, in response to suggestions from members of the council, the advertisement was changed so as to widen the range of applicants.

Mr. Alderman Wilson said that if the chairman of the Town Hall Committee had explained how they were going to advertise for a deputy city surveyor, the committee had surely considered the matter. He did not care at all for the way in which the committee were going to advertise. He felt that it was of no use to consider men who were not full members of the Institution of Civil Engineers.

Mr. West thought they were mistaken in their policy in advertising for an associate member of the institution. They ought to secure the best man they could get. A salary of £500 would not attract suitable candidates. They ought to offer at least £750 a year. He wished to move that the Town Hall Committee should adhere to the original advertisement.

Mr. Alderman Wilson said he would second this.

Mr. Thewlis said that the distinction between an associate member and a full member of the institution was only a class distinction. If the advertisement restricted applications to full members of the institution many men would be prevented from applying for the post. Before a surveyor could have full membership he must be in receipt of at least £500 a year, but full membership had no special bearing on the ability of the man.

Mr. Alderman Wilson: I should like to say nonsense.

Mr. Alderman Walker said that before full membership of the institution could be obtained evidence had to be brought forward that the person desiring the transfer had been engaged in the control and design and carrying out of important work in his profession.

Sir Charles Behrens suggested that the matter should be taken back.

Sir Thomas Shann said there was nothing to take back.

Mr. Swarbrick said he was prepared to move that a deputy city surveyor should be appointed at a salary of £750, and that he must be a full member of the Institution of Civil Engineers.

The Lord Mayor said he thought it would be better if the committee took the matter into further consideration. If Mr. Simpson would move it Sir Charles Behrens would second it.

This course was adopted, and the question was referred back to the committee.

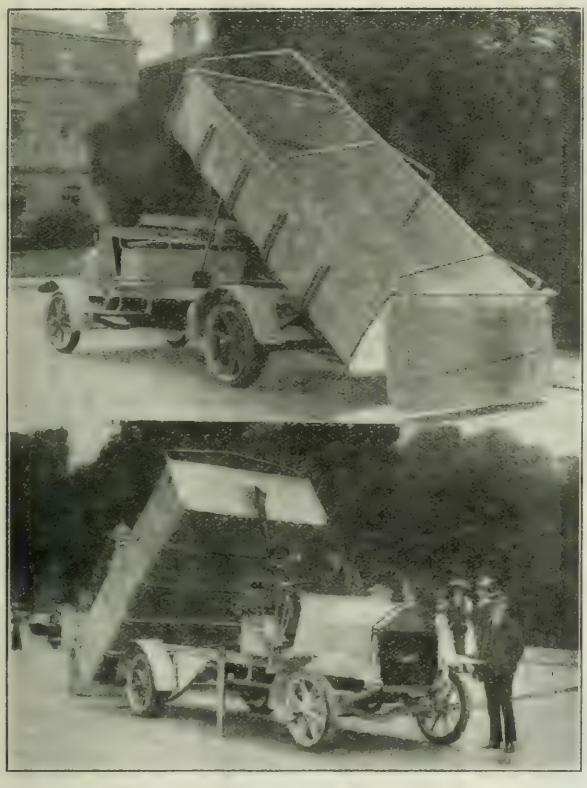
We quote also from *The Manchester Guardian* the following comment as to the foregoing report:

"At the meeting of the Manchester City Council on Wednesday, in the discussion relative to the appointment of a deputy city surveyor, the question arose as to the difference between associates and members of the Institution of Civil Engineers. The council indicated its desire to limit the applications for the appointment to members, but it was argued that the distinction between the two sections was merely a class distinction. A reference to the rules of the institution shows that the distinction is more than one of class. They provide that every candidate for election or transfer into the class of members must be more than thirty-three years of age, and must have had five years' employment in positions of responsibility for the design or execution of important engineering work, and be so engaged at the time of his application for election or transfer. The view taken by the majority in the City Council was apparently that a corporation like that of Manchester, which has often great works in hand—such, for example, as the sewage scheme, which is to cost £1,000,000—should have men of the highest qualification at the head of the city surveyor's department.

STEEL TIPPING REFUSE WAGONS.

The accompanying photographic views depict one of four 38-h.p. 4-ton steel tipping refuse wagons, which the Lacre Motor Car Company, Limited, 78 York-road, King's Cross, London, N., have supplied to the Johannesburg Municipality.

This vehicle is one of the firm's standard 4-ton chassis, with a shortened frame and stiffened at the rear to allow for tipping. The dimensions of this body are about 12 ft. 6 in. long by 7 ft. wide by 2 ft. 9 in. deep, the plates being $\frac{5}{16}$-in. steel, with steel channels and stiffens. The rear part of the body is so arranged that when the vehicle is tipped it opens automatically, and when not tipped is held in position by a lever. The screw fitted is of the telescopic type, and can tip the body to an angle of 45°. Each of these vehicles displaces twelve Scotch carts and twenty mules, and the Johannesburg authorities have written expressing their satisfaction with those with which they have been supplied, and commenting on the great saving in time and labour which their use results in.



The Lacre Steel Tipping Refuse Wagon.

Address Wanted.—Mr. W. H. Williams, late of Ashley-road, Hale, Cheshire, is asked to send his present address to Mr. J. H. Jevons, borough surveyor, Hertford.

The Proposed Western Approach Road.—Heston and Isleworth Urban District Council have submitted to the Road Board a project for diverting the route of the proposed western approach road to London where it passes through the district near Osterley Park. The council desires to divert the new road to the south so as to bring it to a junction with the existing main road at Spring-grove, and then continue it to the north-west to resume the course originally intended. The Road Board have approved the scheme, and recommended the council to petition the Middlesex County Council to promote a bill in Parliament for the construction of so much of the proposed road as lies between Kew Bridge and its original termination near Cranford.

PRIVATE STREET WORKS DISPUTE.

The dispute between a number of property owners in Featherstone and the Featherstone Urban District Council as to the apportionment of the cost of making numerous streets in their Halfpenny-lane district again came before the Pontefract West Riding Bench on Saturday. The matter had been adjourned for a conference between the respective surveyors. Mr. S. Chesney, surveyor to the council, produced his original specifications, showing an estimated expenditure of £5,394. This had since been reduced to £4,994 which was the irreducible minimum—and his figures were supported by Mr. Frank Massey, M.Inst.C.E., Wakefield, and Alderman Arthur Hartley, Castleford, chairman of the West Riding County Council Highways Committee. He considered nothing short of tar macadam would do for the roads. The county authority had tried tarred dross, and were finding it unsatisfactory. On the other hand, Mr. T. H. Richardson, surveyor to the Hemsworth Rural District Council, said his estimate, based on many years' experience of similar road making at Hemsworth, was £400 below Mr. Chesney's final figure; and Mr. Edward Brooke, surveyor to the Ardsley Rural District Council, gave similar evidence.

The bench reduced the council's estimate by £400, to £4,594, suggesting that Mr. Chesney and Mr. Richardson should again meet together and apportion that amount. The bench considered that tar macadam and Leeds steel dross could safely be substituted for limestone, and that the pitching under the kerbstone was unnecessary. They ordered the costs of the first hearing to be divided, and those of Saturday to be borne by the council.

An Exceptional Opportunity.—In these days when the dangers of "blind alley" occupations for young people are realised, the announcement made in our advertisement columns by Messrs. Herbert Morris, Limited, is specially interesting. This firm, who are makers of lifting machinery to, *inter alia*, the Admiralty, the War Office, the India Office, and the Royal dockyards, offer free opportunities of training, with wages from the commencement, in their engineering works, drawing offices, clerical and commercial departments. These posts, which are to be filled at once, are intended only for those who are willing to work well and are desirous of getting on in the world; and the offer is one of which advantage will doubtless be taken by many parents who have the responsibility of giving their children a good start in life.

Municipal Engineering (Edited by Sydney G. Turner, Assoc.M.Inst.C.E. Price 3s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.).—This volume consists of model answers to questions set at recent examinations of the Institution of Municipal and County Engineers, and is the second edition. It is practically identical with the first issued. It is not suggested that it should take the place of recognised text-books, but it provides useful summaries of various subjects, as well as indications as to how different types of questions may be answered. Every effort has been made to render the answers as accurate and comprehensive as possible, though they contain more than a candidate would be expected to supply. The answers are founded upon examinations held in Birmingham, London and Manchester. The appendix contains examples of questions on sewerage, sewage disposal, tramway construction, bridges, water supply, road construction, buildings, sanitary science as applied to towns and buildings, drainage, and other matters.—*Local Government Journal.*

Sewage Disposal at Barnsley.

By J. HENRY TAYLOR, M.INST.C.E.

[The appended notes form part of an address which the author, the engineer for the undertaking which they describe, delivered at a recent meeting of the Association of Managers of Sewage Disposal Works held at Barnsley.]

In connection with the treatment of the sewage of Barnsley, I may mention that the earliest attempts or proposals for that purpose were made by the late Mr. Thomas Hawksley about forty years ago. He proposed to put down filters very much nearer to the town than our present works, but beyond his designs on paper no actual works were carried out by him. Then in the year 1876 Mr. J. Bailey Denton, who at that time was devoting nearly the whole of his time to preparing designs for the treatment of sewage in various parts of the country, was called in by the then Corporation of Barnsley, and they adopted his scheme of intercepting and outfall sewers and of the laying out of about 76 acres of land for the treatment of sewage by intermittent downward filtration.

The land for the purpose was purchased at a very high price, averaging about £296 per acre, inclusive of the costs of an expensive arbitration; but the quality of the land was not very suitable for the purpose, much of it being of a stiff clayey character. Partly on account of the character of the land and of its insufficient area for the quantity of sewage poured upon it, and partly in consequence of the land subsiding through the working of coal immediately under it, the results, so far as purification was concerned, were not good. Ultimately the Rivers Board of the West Riding came upon the scene, and although they exhibited a great deal of consideration for the Corporation of Barnsley, and Dr. Maclean Wilson, their chief inspector, was very patient and courteous, the pressure that they put upon the corporation, together with the fact that the effluent was undoubtedly bad, caused the corporation to undertake the works that are now completed.

NEW WORKS.

These were designed by myself, and have been about nine years in carrying out. The total cost has been between £37,000 and £38,000, including £5,000 for land. The whole of the work has been carried out by contractors. The two principal contractors, Mr. William Cunliffe and Messrs. Elvins & Sons, came from Birmingham, and they have both done credit to themselves by the excellent manner in which the works have been carried out and the good class of the works constructed by them.

Barnsley is a town containing a great variety of trades. . . . The estimated dry-weather flow of sewage that is treated from a population of about 51,000 is 1,250,000 gallons per day, and this contains about 5 per cent of liquid trade refuse from breweries, bleach works, and dyeworks chiefly.

The configuration of the district renders it necessary to have two zones or systems of collection of the sewage, the high-level district sending nine-tenths and the low-level one-tenth of the sewage. The high-level sewage is conveyed through the various branch and intercepting sewers into the straining tanks, and from the last named it is conveyed through a 20-in. metal syphon pipe, 2 miles long, to the detritus and septic tanks. Thence it proceeds on to nine circular sprinkler continuous filters, and subsequently into the humus tanks, and from these on to secondary filters, or on to about 40 acres of land which has already been prepared for irrigation purposes, with under drains about 6 ft. deep. The effluent then passes into the adjacent river Dearne.

The secondary filters were originally constructed as storm-water filters, and are now used either as storm-water filters, or for finally filtering the effluent from the primary filters. We have no storm-water settling tanks.

The low-level sewage is conveyed by the old intercepting sewer, which was laid nearly forty years ago, and is diverted into detritus and storage tanks at Cliffe Wood. Here it is pumped up by a suction gas engine and centrifugal pump over a standpipe 55 ft. high and connecting to the 20-in. high-level main, the sewage of the low and high level joining at the point and flowing together to the purification works.

The total area of the borough of Barnsley is 2,384 acres, 1,500 of which drain naturally into our present sewerage system and sewage works, the remainder of the area being chiefly agricultural land draining into the river Dove. The nett area of the buildings, yards and roads which drain into our sewers is about 400 acres. The average rainfall of Barnsley is about 23 in.

SEWERAGE.

Barnsley is chiefly sewered on the separate system, but the sewage proper includes surface water from some streets which at present are not separately drained and the drainage from the back roofs and back yards and back roads. It will readily be seen that when the dry-weather flow of sewage to be treated amounts only to 24 or 25 gallons per head per day, and that as this quantity includes some surface water and subsoil water, as well as liquid trade refuse, we are entitled to claim to be very largely on the separate system of sewerage.

Barnsley is partly on the water-closet system and partly on the privy and ashpit system, but as fast as we possibly can we are converting the whole of the privies into water-closets, with the result that at the present time five-sixths of the population are already on the water-closet system. For many years, owing to the rapid growth of Barnsley and district, the water supply was insufficient to allow of the adoption of water-closets universally, but owing to the enterprise of the corporation and the success of the waterworks constructed for the supply of the district, we are now able to give a free supply of water to the first water-closet in each house; where a person has more than one water-closet he pays the water rate for every one fixed after the first.

THE PURIFICATION PLANT.

The general description of the purification works themselves is as follows:—

There are four detritus tanks, each 20 ft. by 15 ft. by 3 ft., and eight septic or sedimentation tanks, each 80 ft. by 40 ft. by 7 ft. There are eight circular percolating filters, each 100 ft. in diameter, and one filter 120 ft. in diameter. The filtering material, which is 6 ft. in depth, consists of about 3 ft. of small broken gritstone in the lower and 3 ft. of small broken washed furnace slag in the upper part. Both the stone and the slag are graduated in size from 2½ in. to ½ in., the larger pieces being at the bottom of the filter and the smaller at the top.

The whole of the tanks and the floors of the filters are of cement concrete, 5 to 1, and the stone (except ashlar) for the whole of the works and filtering material has been obtained from the quarry which has been opened out for the purpose on the corporation's land immediately adjacent to the filters.

No precipitants are used in the works, and the whole of the sludge from the straining, detritus and septic tanks is disposed of on portions of the farm and other lands of the corporation—which are fortunately ample for the purpose.

The quantity of sludge taken out of the sewage at the screening chamber and the detritus and septic tanks I estimate at 1,450 tons per annum. We do not propose under present circumstances to press the sludge as we have ample agricultural and waste land near the works on which we at present store the material. We are hoping that when farmers have had opportunities of testing the sludge that they will readily come for it when it is in a dry state and use it as a fertiliser.

The chemical analysis some months ago of the crude sewage and of the effluent shows 86 per cent of purification; to-day, however, the percentage is higher.

The annual expenditure and revenue for the year 1911-12, including farming operations, was as follows:—

Payment of interest and sinking fund, which includes the old original works (which cost £45,000)	£3,155
Payment of other charges, such as material, labour, team labour, plant, seeds, rents, rates and taxes, insurance, horses' food and bedding, pigs and pigs' food, repairs and renewals	1,941
	£5,096

Brought forward	£5,096
The revenue from sale of crops, value of stores, &c., was	515
Nett annual working cost	£4,581
The interest and sinking fund payments are equal to a rate of ...	5d. in the £.
The general charges are equal to a rate of	3d. in the £.
Total	8d. in the £.

But after allowing for the receipts £515, the loss on working account is equal to 7¼d. in the £.

SOME RECENT PUBLICATIONS.*

The Rating of Gas and Water Undertakings. By Arthur Valon, Assoc.M.Inst.C.E. Price 3s. 6d. nett. London: Walter King.

The difficulty of applying the statutory definitions of "gross value" and "rateable value" to such special properties as gas and water undertakings, and so forth, has led to the adoption of a stereotyped artificial method of estimating the rent which the hypothetical tenant would pay. The valuation of such properties for rating purposes is, therefore, a highly technical matter, and the author of the present work has endeavoured to elucidate the various matters which have to be taken into consideration. He deals separately with each class of undertaking, and model valuations are given with full explanations of the figures used. The general procedure to be followed on making a rate or when appealing is set out; and although the work has no pretensions as a legal manual, the judgments in the leading cases are set out in full as appendices. Mr. Valon's book will be found a concise and useful guide to those who have to deal practically with a difficult subject.

Reports of Rating Appeals, 1909-1912. By E. M. Konstam and Harold R. Ward, Barristers-at-law. Price 16s. London: Butterworth & Co.

This volume forms a continuation of the series at first edited by Mr. Walter Ryde, K.C., in which the last collection of reports, by Mr. Konstam, appeared in 1908. To those whose business takes them into the Courts in which rating appeals are decided these reports will be well known and their value will be sufficiently appreciated. The present volume is similar to its predecessors both as regards general arrangement and the care and accuracy with which it has been produced. All the important rating cases for the period covered by the book are included, and among them are cases concerned with the valuation of railways, licensed premises and electrical undertakings. The case of *West Kent Main Sewerage Board* v. *Dartford Union*, in which the House of Lords decided that all sewers are rateable, is reported. Rating surveyors who wish to keep themselves abreast of the most modern developments in the law cannot well afford to do without this book.

A municipal engineer enquires the title, author's name, and price of a book containing tables of sinking funds, simple and compound interest, &c. The work consists entirely of such tables, and is, so our correspondent says, largely in use in the offices of borough engineers. Can any reader oblige with the required information?

Bridge Building.—Students, young engineers, and surveyors will find much useful information in "Preliminary Studies in Bridge Building," by Reginald Ryves, Assoc.M.Inst.C.E. (London: St. Bride's Press, Limited, 24 Bride-lane, E.C. Price 2s. nett.) The book is described as the "first of a series of small volumes, each complete in itself, dealing with the design of ordinary highway bridges of moderate span." Though highway bridges alone are referred to, the matter contained in this volume is largely applicable to railway bridges, aqueducts, and similar engineering undertakings. The five primary types of bridges are described, and the conditions determining the best site for each of the three types of streams are discussed in detail; while, in connection with wandering streams various modes of designing abutments or approach spans are dealt with. Improvements of fords and the effect of eccentric loading of vehicles on the girder loads are among the numerous other items touched on. —*Scotsman.*

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

FILTRATION OF WATER.

CONTROLLING ARRANGEMENTS ON SAND FILTERS.

Every engineer who has been concerned in the filtration of water by slow sand filters is familiar with the importance of being able to control the rate of filtration, and of having it under easy observation. We illustrate herewith the arrangement recently adopted at the Hereford Corporation waterworks for

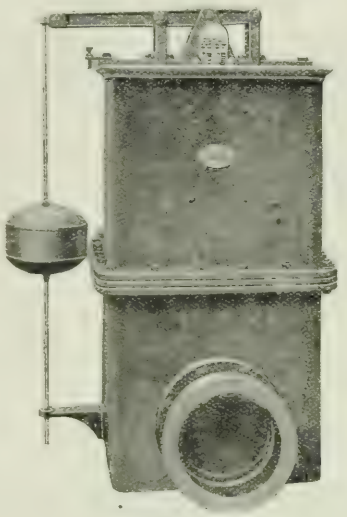


Fig. 1.

two new sand filters recently constructed by the city engineer, Mr. John Parker, Assoc.M.Inst.C.E. The arrangement forms the inlet to the filter for the water received from the subsiding reservoir, and consists of a cast-iron box (Fig. 1) divided into two chambers

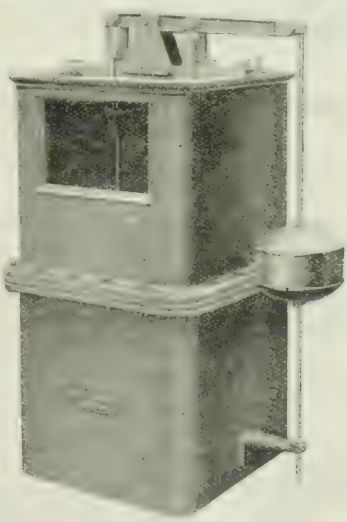


Fig. 2.

by a horizontal division plate near the middle. The opening in the lower chamber is connected to the inlet pipe to the filter, which is controlled by the usual sluice valve. In the division plate are two gun-metal valve seatings (one on the upper and the other on the lower face of the plate), provided with valves which are connected by vertical rods to a horizontal lever, fixed on the top of the upper chamber of the tank. The rods are connected to the lever at equal distances on each side of the fulcrum, so as

to be in equilibrium. At the end of the lever, and overhanging the water in the filter, is a vertical rod carrying a float which is adjustable along the rod.

To the interior of the upper chamber is bolter a small cast-iron box open at the bottom, containing a small copper float carrying an enamelled scale which passes through a slot in the cover placed about level with the top of the tank. The scale is graduated to indicate on one edge the gallons per hour discharged on to the filter, and on the opposite edge the rate in inches of depth per hour at which it is percolating through. On the outlet side of the tank (Fig. 2) is an opening 18 in. in width, with a weir edge over which the water is discharged on to the filter. The position of the small float is so arranged that when the water in the tank is at weir level the scale is at zero above the float-box cover.

To put the filter into operation the man in charge opens the inlet sluice, which is placed behind the gauge tank, with the float scale immediately in front of him, until the scale indicates that water is passing through the gauge opening at the maximum rate at which he desires the filtration should proceed. From that time the rate is automatically controlled until the surface of the filter has become so sealed as to be incapable of passing sufficient water to continue its use, when the bed is reskimmed. As the surface of the filter closes, and diminishes the quantity of water, it is capable of passing at the head at which it was started, the water over the sand rises till it reaches a few inches below the overflow pipes, when it causes the larger float to rise and reduce the opening of the valves, thus diminishing the quantity of water discharged on to the filter, so as to suit its diminishing capability of passing it.

Not only does the apparatus give perfect control over the rate of filtration from the time the filter is started until it requires reskimming, but as the scale at a glance indicates from time to time the diminished quantity taken by the filter, the person in charge knows precisely its condition and how soon it will need reskimming. The valves are arranged to close entirely before the water over the sand reaches the overflow pipes.

The apparatus has been in use at the Worcester waterworks for the past ten years, and was devised by Mr. T. Caink, Assoc.M.Inst.C.E., city and waterworks engineer of that city, and is manufactured by the Nevile Engineering Company, Worcester.

The width of outlet opening to the filter, and the graduations of scale, have to be adapted to the size of the filter to which it is applied.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. Thomas, M.Inst.C.E., County Surveyor, Buckinghamshire.

NORTH WALES DISTRICT MEETING, WREXHAM.

District Chairman—Mr. Wm. Jones, Assoc.M.Inst.C.E., Colwyn Bay.

A North Wales District meeting will be held at the Free Library, Queen-street, Wrexham, on Saturday, October 19th.

Programme.

11.30 a.m.—Meet at Free Library, Queen-street. Members will be received by the mayor.
11.45 a.m.—Inspect markets, fire station, electricity works and Willow depot.
1 p.m.—Luncheon at Wynnstay Hotel, by the kind invitation of the mayor.
2 p.m.—Drive to sewage farm.
3 p.m.—Return to Wrexham. Formation of District Executive Committee. Discussion on paper entitled "Wrexham and its Municipal Works," by Mr. J. England, borough surveyor (member).
4 p.m.—Light Refreshments, provided by borough surveyor.

In order that the necessary arrangements may be made, members must give notice of their intention to be present not later than to-morrow (Saturday).

J. England,
Hon. District Secretary.

Thomas Cole,
Secretary.
11 Victoria-street, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

President-Elect—Mr. Frank Latham, M.Inst.C.E.I., F.S.E., Borough Engineer and Surveyor, Penzance.

ANNUAL GENERAL MEETING.

The fourth annual general meeting of the Institution of Municipal Engineers will be held in London to-day (Friday) and to-morrow (Saturday).

Programme.

To-day.

11 a.m.—Meet in the council chamber, No. 4 Southampton-row, London, W.C.
11.15 a.m.—Annual general meeting:—
Minutes of last meeting.
Election of council for the year 1912-13.
Presentation of annual report of council.
Announcement of result of ballot.
Presidential address.
1 p.m.—Adjourn for lunch.
2 p.m.—Reassemble in council chamber.
2.15 p.m.—Discussion on the following papers to be presented to the meeting:—
"The Modernising of Building By-laws," by F. W. Platt (member).
"The L.G.B. Report on Intercepting Traps," by H. C. H. Shenton (member).
"The Influence of Town Planning upon the Public Health," by W. Louis Carr (member).
"Superannuation and Security of Tenure," by A. Winter Gray (member).

The papers will be taken as read.

5 p.m.—Close of meeting. Ladies return to council chamber.

Ladies' Meeting.

(Held concurrently with General Meeting.)

11 a.m.—Meet in the council chamber, No. 4 Southampton-row, London, W.C.
11.15 a.m.—Leave council chamber and proceed to the stores of Messrs. Selfridge & Co., Oxford-street, W.
11.30 a.m.—Meet at the Duke-street entrance of the stores, where visitors will be met by a representative of the firm and conducted round the building.
1 p.m.—Lunch.
2.30 p.m.—Meet at the showrooms of Messrs. Doulton & Co., Limited, Lambeth, S.E., who have kindly arranged to conduct the visitors through their works and showrooms.
4.30 p.m.—Leave Messrs. Doulton's works.
5 p.m.—Arrive at council chamber, Southampton-row.

6.45 p.m.—Reception by the president at the Holborn Restaurant, followed by (7 p.m. to 11.30 p.m.) social evening, with musical programme, at the invitation of the president. Morning dress.

To-morrow.

10.30 a.m.—Visit to Shakespeare's England, Earl's Court. Meet in booking hall, Earl's Court Station.
12.30 p.m.—Adjourn for lunch.
2.30 p.m.—Visit to the London Hippodrome, at the request of a number of country members.

EASTERN DISTRICT MEETING, GODMANCHESTER.

(Tuesday, October 15th.)

Programme.

11.30 a.m.—Meet at Godmanchester Station and inspect Roxmac road.
12.30 p.m.—Call at council's depot, where methods of sewer flushing will be shown.
Inspect reinforced concrete bridges.
1 p.m.—Lunch at the Horseshoe Temperance Hotel.
2 p.m.—Reception at the town hall by his Worship the Mayor (Mr. J. P. L. Durrell Stables, J.P.).
Inspect old charters, books and records.
3 p.m.—Walk round town, viewing sixteenth century architecture, tarviated roads, reinforced concrete posts, new system of constructing

cheap cottages and "exhibition" of cheap cottages.

4 p.m.—Tea at the Horseshoe Temperance Hotel.

PHILIP S. BENNETT,
Council Offices, *Hon. District Secretary.*
Ramsey, Hunts.

YORKSHIRE AND NORTHERN DISTRICTS.

A joint meeting of the above wil be held in Harrogate on Saturday, October 19th.

PROGRAMME.

(Arranged by kind permission of the Harrogate Corporation.)

11.15 a.m.—Meet at Harrogate Station.

11.30 a.m.—Drive by motor char-a-banc to Corporation Depot, Wetherby-lane, to inspect new tar-macadam mechanical mixing plant (supplied by Messrs. Ord & Maddison, Darlington), and stone-breaking machine in operation.
Light Refreshments.

12.45 p.m.—Drive to North sewage outfall works, new septic tanks and percolating filters, new aërating sprinklers and special apparatus for treatment of sludge.

1.30 p.m.—Drive to Royal Baths. There are eighty-six different treatments, the principal ones of which will be explained and viewed.

2.45 p.m.—Drive to Iron Gate reservoir. Sand-bed filters.

3.15 p.m.—Drive to Harlow Hill reservoir. Candy-Whitaker's mechanical filters.

3.45 p.m.—Drive to corporation stables and Town's Yard, Robert-street.

4.15 p.m.—Drive to corporation fire brigade station New Merryweather's motor fire engine.

4.30 p.m.—Dinner at North-Eastern Hotel, Station-square.

A short meeting of the Yorkshire members will be held to discuss proposed rearrangement of district.

Members are earnestly requested to advise the secretary as early as possible if it is their intention to be present.

H. J. FIRTH.
Hon. District Secretary, Yorkshire District.
JOHN ROBINSON.
Hon. District Secretary, Northern District.

SUBSCRIPTIONS, 1912-13.—Members and others are requested to note that annual subscriptions for 1912-13 are now due.

B. WYAND,
39 Victoria-street, S.W. *Secretary.*

ROYAL SANITARY INSTITUTE.

PROVINCIAL SESSIONAL MEETING, ALTON.

On Saturday, October 26th, a sessional meeting of the Royal Sanitary Institute will be held in the Assembly Rooms, Alton, at 11.15 a.m., when discussions will take place on "Housing Problems in County Areas," to be opened by Dr. Robert A. Lyster, county medical officer of health, Southampton, and "Municipal Work in Alton" to be opened by Mr. G. Bertram Hartfree, F.S.I., surveyor to the urban district council. Among those who are expected to take part in the discussion are Messrs. R. W. Cass, surveyor to the Farnham Urban District Council; C. G. Mason, ASSOC.M.INST.C.E., borough engineer, Guildford; W. J. Taylor, M.INST.C.E., county surveyor, Southampton; and F. C. Uren, M.INST.C.E.I., surveyor to the Aldershot Urban District Council.

The chair will be taken by Mr. H. Percy Boulnois, M.INST.C.E., chairman of the council of the institute.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Ltd. Price 10s. 6d.

THE LATE MR. G. EEDES EACHUS.

AN EDMONTON MEMORIAL.

A three-quarter size oil painting of the late Mr. G. Eedes Eachus, who was formerly engineer and surveyor to the Edmonton (Middlesex) Urban District Council, will be unveiled by Mr. H. T. Wakelam, M.INST.C.E., the county surveyor, in the council chamber of that authority on Monday evening next at 6 o'clock.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

HIGHWAYS FOREMAN.—October 12th.—Deptford Borough Council. £2 per week.—Mr. V. Orchard, town clerk.

SURVEYOR'S CLERK.—October 12th.—Frimley Urban District Council. £52 per annum.—Mr. T. C. Jones, surveyor, Municipal Buildings, Camberley.

HIGHWAY SURVEYOR.—October 14th.—Truro Rural District Council.—Mr. Coulter Hancock, solicitor.

INSPECTOR OF NUISANCES.—October 14th.—Northfleet Urban District Council. £130 per annum.—Mr. C. E. Hatten, clerk.

INSPECTOR OF NUISANCES.—October 15th.—Kettering Urban District Council. £130 per annum.—Mr. J. Bond, clerk.

GENERAL FOREMAN.—October 15th.—Whitefield Urban District Council. £2 per week.—Mr. Chas. Brad-haw, clerk. Applications to be endorsed "Foreman."

SECOND ASSISTANT.—October 15th.—Romford Rural District Council. £105–£120 per annum.—Mr. T. W. A. Greenhalgh, clerk. Applications to be endorsed "Surveyor's Assistant."

CLERKS OF WORKS (2).—October 16th.—Chapel-en-le-Frith Rural District Council. £2 10s. and £2 2s. per week.—Mr. J. B. Boycott, clerk, Union Offices.

SEWAGE WORKS MANAGER.—October 16th.—Padiham Urban District Council.—Mr. J. Gregson, surveyor.

INSPECTOR OF NUISANCES.—October 19th.—Patrington Rural District Council.—Mr. L. A. Milton, clerk.

COUNTY SURVEYOR.—October 19th.—County of the Soke of Peterborough. £200 per annum.—Mr. Walter J. Deacon, clerk, Cross-street, Peterborough. Applications to be endorsed "Application for County Surveyorship."

JUNIOR SURVEYOR AND DRAUGHTSMAN.—October 21st.—East Sussex County Council. £65 per annum.—Mr. F. J. Wood, county surveyor, County Hall, Lewes.

SURVEYOR'S ASSISTANT.—October 22nd.—Wath-upon-Dearne Urban District Council. £85 per annum.—Messrs. Nicholson & Co., clerks.

CHIEF ENGINEER.—October 28th.—Municipality of Karachi (India). 500–750 rupees per month.—Mr. Measham Lea, chief officer and chief engineer, Municipal Office, Karachi.

ASSISTANT SURVEYOR OF ROADS.—Public Works Department of the Gold Coast Government. £300—£350, with allowances.—Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W. Quote M 5,497 on left-hand top corner of application.

With regard to the Manchester vacancy noted in this column last week, it will be seen elsewhere in this issue that the terms of the appointment are being reconsidered by the city council.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

WANDSWORTH.—October 14th.—Competitive designs for public swimming bath at Balham.—Mr. P. Dodd, borough engineer, 215 Balham High-road, S.W.

GLASGOW.—October 29th.—Preliminary sketch designs are invited by the corporation for the extension of the municipal buildings. Honorariums of 100 guineas to five selected designs.—Mr. John J. Burnet, A.R.S.A., 239 St. Vincent-street, Glasgow, is assessor.—Applications to the clerk, Mr. J. Lindsay, town clerk.

LLANDUDNO.—October 31st.—Designs for laying out about 20 acres, for the urban district council. A premium of 50 guineas is offered.—Mr. A. Conolly, clerk.

HUDDERSFIELD.—October 31st.—Designs for laying out certain areas as a town planning scheme, for the corporation. Premiums of 100, 50, and 25 guineas. —Mr. J. Henry Field, town clerk.

ROSCREA.—November 1st.—Plans, specifications, and estimates of a complete sewerage scheme, for the No. 1 Rural Council.—Mr. Thomas Dooly, clerk, Roscrea Workhouse.

CARLISLE.—December 2nd.—School buildings, for the corporation.—City Surveyor, 36 Fisher-street, Carlisle.

ORSETT (Essex).—January 1st.—For the construction of a sewerage and sewage disposal scheme in the parish of South Ockendon, for the Orsett Rural District Council. Premiums of £50 and £25 are offered.—Mr. James Beck, clerk, 2 Orsett-road, Grays.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1339 Holborn), subject to later confirmation by letter.*

Buildings.

HARROW.—October 12th.—For the construction of two conveniences, for the urban district council.—Mr. J. Strachan, clerk.

CORNWALL.—October 12th.—For alterations to a school, for the Education Committee.—Mr. F. R. Pascoe, secretary, County Hall, Truro.

WEDNESBURY.—October 14th.—For the erection of a building and shed at isolation hospital, for the corporation.—Mr. T. Jones, town clerk.

TIPTON.—October 14th.—For setting a Lancashire boiler at gasworks, for the urban district council.—Mr. S. O. Stephenson, engineer, Gasworks.

HECKMONDWIKE.—October 14th.—For the erection of stone boundary walls at the cemetery, for the urban district council.—Mr. James Saville, surveyor.

ECCLES.—October 14th.—For taking down bowl-house and erecting new pavilion, bowl-house and shelter, for the corporation.—Mr. Edwin Parkes, town clerk.

SPALDING.—October 15th.—For building thirty-six cottages, for the urban district council.—Mr. H. H. Harvey, clerk.

WATFORD.—October 15th.—For the construction of a public convenience, for the urban district council.—Mr. D. Waterhouse, engineer and surveyor.

BRAY.—October 15th.—For the erection of sixty-four dwellings, for the urban district council.—Mr. P. MacDonnell, clerk.

STOCKPORT.—October 15th.—For the erection of shelter, tool-house and conveniences, for the corporation.—Mr. J. Atkinson, borough surveyor.

BRISTOL.—October 16th.—For the erection of muniment rooms, for the corporation.—Mr. P. Addie, city valuer, The Exchange.

HERNE BAY.—October 16th.—For the erection of a pavilion and concert hall, for the urban district council.—Mr. G. H. Beetenson, clerk.

LANCS.—October 17th.—For the erection of a school, for the Education Committee.—Mr. H. Littler, 16 Ribblesdale-place, Preston.

ELLOE.—October 17th.—For the erection of cottages, for the rural district council.—Mr. S. S. Mossop, clerk, Holbeach

DORSET.—October 18th.—For the erection of an elementary school, for the county council.—Mr. Clement G. Bone, secretary, County Offices, Dorchester.

WEST RIDING.—October 18th.—For alterations to a school, for the county council.—The Clerk, County Hall, Wakefield.

AYLESBURY.—October 18th.—For the erection of nurses' room at the isolation hospital, for the urban district council.—Mr. W. H. Taylor, engineer and surveyor.

BRECON.—October 18th.—For the erection of a public school, for the Education Committee.—Mr. C. W. Burt, surveyor, County Hall, Brecon.

SOUTH WESTMORLAND AND ULVERSTON.—October 19th.—For erecting a stone arch bridge, for the rural district council.—Mr. A. Milne, Lowther-street, Kendal.

IPSWICH.—October 19th—November 11th.—For the erection of a school, for the Education Committee.—Mr. J. H. Hume, secretary, Education Offices, Tower House, Ipswich.

MONMOUTH.—October 21st.—For the erection of a domestic arts centre, for the Education Committee.—Mr. C. Dauncey, secretary, County Council Offices, Newport.

PORTSMOUTH.—October 21st.—For the erection of a school, for the Education Committee.—Mr. G. Hammond Etherton, town clerk.

HENDON.—October 21st.—For the erection of fifty artisans' dwellings, for the urban district council.—Mr. H. Humphris, clerk.

HENDON.—October 21st.—For the erection of a fire station, for the urban district council.—Mr. H. Humphris, clerk.

SOUTHAMPTON.—October 21st.—For the reconstruction of Fore Bridge, Petersfield, for the county council.—Mr. H. Barber, clerk, The Castle, Winchester.

KNOWLE.—October 22nd.—For the erection of three pairs of semi-detached cottages at the county asylum, for the Visiting Committee.—Mr. J. R. Wyatt, clerk, Hants County Asylum, Fareham.

WILLESDEN.—October 22nd.—For the construction of a public convenience, for the urban district council.—Mr. O. C. Robson, engineer, Municipal Offices, Kilburn.

PERTH.—October 23rd.—For piling 230 yds. of the river bank with larch piles and pitching slopes, for the corporation.—Burgh Surveyor.

DEVON.—October 24th.— For alterations at certain county schools, for the Education Committee.—The Architect, 1 Richmond-road, Exeter.

NORTHUMBERLAND.—October 25th.—For the erection of out offices and alterations to school, for the Education Committee.—Mr. C. Williams, secretary, The Moothall, Newcastle-upon-Tyne.

NORTH RIDING.—October 29th.—For the erection of a school, for the Education Committee.—Mr. E. G. Fletcher, architect, Prince Regent-street, Stockton-on-Tees.

ESSEX.—October 30th.—For the erection of a school, for the Education Committee.—Mr. H. J. Goodwin, clerk, Education Offices, Loughton.

WANSTEAD.—November 7th.—For the erection of a fire brigade station, for the urban district council.—Mr. C. H. Brassey, surveyor.

Iron and Steel.

ROTHERHAM.—October 12th.—For excavating, laying, jointing, and filling in 21 miles of cast-iron spigot and socket pipes, the sizes ranging from 8 in. to 3 in., for the rural district council.—Messrs. Oxley and Coward, clerks.

ROTHERHAM.—October 12th.—For the supply of 1,330 tons of cast-iron spigot and socket pipes with special castings, for the rural district council.—Messrs. Oxley and Coward, clerks.

WARRINGTON.—October 14th.—For the supply of wrought-iron unclimbable hurdles and gates, for the corporation.—Borough Surveyor.

STOKE-ON-TRENT.—October 14th.—For the supply of second-hand tramway rails, for the corporation.—Mr. E. B. Sharpley, town clerk.

NEWTON ABBOT.—October 23rd.—For laying cast-iron water mains, for the rural district council.—Mr. F. Horner, clerk.

WINTERTON.—October 23rd.—For the supplying and laying water mains, for the urban district council.—Mr. Norman Gibson, clerk.

Roads.

HARROW-ON-THE-HILL.—October 12th.—For making up private streets, for the urban district council.—Mr. J. Strachan, clerk.

COCKERMOUTH.—October 12th.—For widening a roadway, for the rural district council.—Mr. J. H. Musgrave, clerk.

KENSINGTON.—October 14th.—For making up portion of a highway, for the borough council.—Mr. W. Chambers Leete, town clerk.

DARTFORD.—October 14th.—For making up certain private streets, for the rural district council.—Mr. Eustace J. Hobbs, clerk.

WANDSWORTH.—October 14th.—For repairing parts of two roads in Southfields, for the urban district council.—Mr. D. A. Nicholl, town clerk.

WEST SUSSEX.—October 14th.—For the supply of about 150,000 gallons of tar, for the county council.—Mr. H. W. Bowen, county surveyor, 23 North-street, Horsham.

BROADSTAIRS.—October 14th.—For the supply of granite-macadam, pit flints, pit gravel, hire of steam roller and scarifier, and laying limestone tar paving, for the urban district council.—Mr. H. Hurd, town surveyor.

MANCHESTER.—October 14th.—For work of asphalt paving, for the corporation.—Mr. Thomas Hudson, town clerk.

WARRINGTON.—October 14th.—For paving seven streets and seventeen passages, for the corporation.—Mr. Andrew M. Ker, borough engineer and surveyor.

LANARK.—October 14th.—For the construction of a new highway, for the Middle Ward:—Mr. W. E. Whyte, district clerk, Hamilton.

BURY.—October 14th.—For kerbing, flagging and paving, for the corporation.—Town Clerk.

SHEERNESS.—October 15th.—For the supply of basalt or granite, Kentish ragstone, hoggin and Thames ballast, for the urban district council.—Mr. V. H. Stallon, clerk.

GLYNCORRWG.—October 15th. — For making-up work in several streets, for the urban district council.—Mr. W. P. Jones, surveyor.

HORSFORTH.—October 15th.—For making up certain streets, for the urban district council.—Mr. H. Raven, surveyor.

WEMBLEY.—October 15th.—For the work of street improvement, for the urban district council.—Mr. C. R. W. Chapman, engineer and surveyor.

GUILDFORD.—October 16th.—For making up approach to isolation hospital, for the corporation.—Mr. A. D. Jenkins, town clerk.

CLACTON.—October 16th.—For making up a thoroughfare, for the urban district council.—Mr. D. J. Bees, surveyor.

STOKE-ON-TRENT.—October 16th.—For making up eleven private streets, for the corporation.—Borough Surveyor.

CHISWICK.—October 16th.—For making up Grantham-road, for the urban district council.—Mr. Ernest F. Collins, clerk.

LEWISHAM.—October 16th.—For making-up work with artificial stone, for the borough council.—Town Clerk.

CHELMSFORD.—October 17th.—For street works in two thoroughfares, for the corporation.—Mr. W. Smith, town clerk.

CROYDON.—October 17th.—For making up private streets, for the rural district council.—Mr. E. J. Gowen, clerk.

BLACKBURN.—October 17th.—For the supply of granite setts, for the corporation.—Mr. W. Stubbs, borough engineer.

CROYDON.—October 17th.—For laying 10,800 yds. of soft-wood paving, for the rural district council.—Mr. E. J. Gowan, clerk.

CHADDERTON.—October 17th.—For roads and street works, for the urban district council.—Mr. H. Hoyle, clerk.

PRESTON.—October 18th.—For making up several roads, for the corporation.—Borough Surveyor.

BIRSTALL.—October 18th.—For tar-paving work, for the urban district council.—Mr. T. H. Hailstone, surveyor.

BRITON FERRY.—October 19th.—For the supply of broken granite or basalt, for the urban district council.—Mr. Alex. Clarke, engineer and surveyor.

HUNSLET.—October 21st.—For making up work, for the rural district council.—Mr. W. B. Pinder, clerk.

BOOTLE.—October 22nd.—For paving and sewering, for the corporation.—Mr. J. H. Farmer, town clerk.

ROMFORD.—October 31st.—For the supply of Guernsey granite, for the urban district council.—Mr. J. Turvey, surveyor.

WANSTEAD.—November 7th.—For making up certain streets, for the urban district council.—Mr. Bruce Blewitt, clerk.

Sanitary.

STOKE-ON-TRENT.—October 14th.—For the supply of filter press and other incidentals, for the corporation.—Mr. E. B. Sharpley, town clerk.

BLEAN.—October 14th.—For emptying cesspools, for the rural district council.—Mr. J. E. Burch, clerk.

KIRKBY-IN-ASHFIELD.—October 15th.—For laying 4,378 yds. of iron and stoneware outfall sewers, with manholes and other works, for the urban district council.—Mr. E. Bertram Hibbert, clerk.

BLYTH.—October 15th.—For scavenging work, for the rural district council.—Mr. F. Hopkinson, surveyor, 66 Bridge-street, Worksop.

BINGLEY.—October 15th.—For the supply and erection of revolving sprinklers, and floor tiles, for the urban district council.—Mr. H. Bottomley, engineer and surveyor, Town Hall.

RUNCORN.—October 17th.—For providing and laying 1,400 lin. yds. of stoneware pipes and construction of manholes, for the rural district council.—Mr. Geo. F. Ashton, clerk.

BARNSTAPLE.—October 18th.—For drainage work, for the corporation.—Mr. E. Y. Saunders, borough surveyor.

MANCHESTER.—October 18th.—For carrying out sanitary alterations, for the corporation.—Chairman of Drainage Sub-Committee.

BOLTON-UPON-DEARNE.—October 21st.—For the construction of stoneware-pipe sewers and manholes, and erection of pumping station and filters, for the urban district council.—The Surveyor.

HAYES.—October 21st.—For the construction of percolating filters, sludge beds, and humus tank, and alterations at existing works, for the urban district council.—Mr. D. C. Fidler, engineer, Grange-road, Hayes.

MAIDSTONE.—October 22nd.—For the supply of disinfectants, for the corporation.—Mr. S. L. Monckton, town clerk.

CONGLETON.—October 24th.—For the construction of sewage purification works, for the rural district council.—Mr. H. Ferrand, clerk.

BEXHILL-ON-SEA.—October 26th.—For the construction of storm-water overflow sewers, enlargement of brick culvert, and extension of storage tanks, for the corporation.—Mr. G. Ball, borough surveyor.

BECKENHAM.—October 28th.—For laying a 12-in. diameter relief sewer, to include 9,001 ft. of 12-in. pipes and sixteen manholes, for the urban district council.—Mr. F. Stevens, clerk.

LICHFIELD.—October 31st.—For the construction of 7,828 yds. of 6-in., 9-in. and 12-in. diameter stoneware, cast-iron and steel pipe sewers, including 12-in. sewer in deep channel work, manholes, ventilating columns, tanks, bacterial filters and rotary distributors, for the rural district council.—Mr. Thomas Moseley, clerk.

Stores.

BRADFORD.—October 12th.—For the supply of stores, for the tramways department.—Mr. F. Stevens, town clerk.

Miscellaneous.

HOWDEN.—October 11th.—For the construction of a trial boring at South Newbold, for the rural district council.—Mr. Henry Green, solicitor and clerk.

BRISTOL.—October 14th.—For the supply of cement, drain pipes, and paints, for the corporation.—Mr. Lessel S. McKenzie, city engineer and surveyor.

ECCLES.—October 14th.—For the supply of a four-cylinder petrol-driven motor fire engine, for the corporation.—Mr. Edwin Parkes, town clerk.

HALIFAX.—October 15th.—For the supply of scavengers' brooms, for the corporation.—Mr. P. Saunders, town clerk.

BOOTLE.—October 16th.—For excavation and drainage in recreation ground, for the corporation.—Borough Engineer.

ATHY No 1.—October 16th.—For sinking wells and erection of pumps, for the rural district council.—Mr. M. E. Doyle, clerk.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.

BIRKENHEAD.—Accepted for making up two roadways, for the corporation.—Mr. C. Brownridge, borough engineer and surveyor:—
Seabank-road: W. H. Ratcliffe, Birkenhead £742
Marlborough-grove: W Bramwell, Birkenhead 142

CHELTENHAM.—For the construction of nine combined circular sewage tanks in three sets, and eight percolating filters 101ft. in diameter, with roads, drains, and conduits, for the corporation.—Mr. J. S. Pickering, borough engineer:—

	Complete Scheme.	Alternative Scheme.
Johnson Brothers, Gloucester	£21,194	£10,373
T. J. Mason, Stourbridge...	19,228	8,435
W. Cresswell, Cheltenham...	19,095	9,163
C. Chamberlain, Leicester	18,996	9,684
Pattinson & Sons, Limited, London ...	18,175	8,934
Currall, Lewis & Martin, Limited, Birmingham	18,127	9,095
Williams, Mark & Co., Cheltenham ...	17,552	8,487
W. Cunliffe & Sons, Limited, Birmingham	16,964	8,267
A. Hill & Co., Kidderminster	16,837	8,178
J. Riley, Cheltenham*	16,567	8,135
Tilt Brothers, Bromsgrove (withdrawn)	16,385	7,983

CHESTERTON.—Accepted for the construction of sewer, with manholes, for the rural district council:—
E. Bailey, Cambridge, £610.

LITTLEHAMPTON.—The following tenders have been accepted by the urban district council:—
Cleaning and repairing a sewer in South terrace (east-end).—G. E. Hayward, £73.
Paving, kerbing, and channelling in various parts of the town.—E. G. Holland, £462.
Horse shoes and shoeing.—H. Ide, £1 5s. per horse for six months.
Street-watering, carting flints and general carting.—H. Harris, 11d., 10d., and 10d. per hour respectively.

MOUNTMELLICK.—For extending water mains, sinking wells, and erection of a pump, for the rural district council:—
Cleaning the open drains in town of Mountmellick, in connection with the main drainage around the town.—M. Fitzpatrick, Mountmellick, £15; J. Aherne, Mountmellick, £15; P. Connolly, Mountmellick,* £15.
Extending the main waterpipes in connection with the Maryborough Waterworks, from Barrock-road to the houses in course of erection and known as "Kellyville," Maryborough. P. Kelly & Co., Maryborough,* £25.
Keeping the stench traps, grates, water-tables, channels, and laneways in town of Mountrath clean for one year.—W. J. Cooper, Mountrath, £7; W. Tynan, Mountrath,* £7.
The consideration of tenders for the sinking of wells and erection of pumps was adjourned to the next meeting of the district council.

TIPTON.—For the erection of sanitary conveniences, drainage, paving of playgrounds and other work at the Burnt Tree and Dudley Port council schools, for the Tipton Education Committee.—Mr. W. H. Jukes, surveyor:—

	Burnt Tree Schools.	Dudley Port Schools.
W. Cooper, Blackheath ..	£512	£325
Holland, Jnr., Dudley ...	422	247
G. Oakley & Son, Dudley	390	230
H. Golding & Son, Dudley	388	372
A. J. Crump, Dudley ...	385	223
H. Dorse, Hradley Heath	381	211
Jakeman & Round, Dudley	379	205
J. Sisman, Tipton... ...	370	214*
W. A. Hendrick, Tipton...	366*	207

Surveyor's estimate, £364 and £221.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

OCTOBER.

11 12.—Institution of Municipal Engineers: Annual General Meeting in London.
15.—Institution of Municipal Engineers: Eastern District Meeting at Godmanchester.
19.—Institution of Municipal Engineers: Joint Meeting of Northern and Yorkshire Districts at Harrogate.
19.—Institution of Municipal and County Engineers: North Wales District Meeting at Wrexham.
26.—Royal Sanitary Institute: Meeting at Alton; Discussions on "Housing Problems in County Areas" and "Municipal Work in Alton." Town Hall, 11.15 a.m.

SCHOLARSHIPS.

"WILLIAM LINDLEY BEQUEST" SCHOLARSHIP.

Applications are invited for this Scholarship, which is in the administration of the Committee of Management of the Benevolent Fund of the Institution of Civil Engineers, is tenable for three years, and is of the value of £40 per annum.

The main conditions are that the holder shall be the son of a Corporate Member or of an Associate of the Institution, between 16 and 20 years of age, who is desirous of entering the Civil Engineering profession, but whose means are inadequate to defray the incidental expenses. In the event of there being more than one suitable applicant, preference will be given to any candidate whose father's career has been devoted to the Sewerage and Water Supply of Towns, or whose inclination tends towards taking up that branch of the profession.

The Scholarship will be vacant on the 1st January, 1913, and applications should be addressed to the Honorary Secretaries of the Fund, 12 Dartmouth-street, S.W., not later than the 15th November next.

October 3, 1912.

PREPARATION FOR EXAMINATIONS.

ALGEBRA, Logarithms, Trigonometry, Graphs, Mensuration and Formulæ are some of the subjects included in our Standard Course of Engineering Mathematics, issued at a low inclusive fee, which may be paid by the easiest of instalments; 10 days' trial course, 1s.—Particulars and specimen lesson forwarded on application to the Correspondent School of Engineering Mathematics, Harley-road, Blackpool (late of Bilston).

(Continued on p. xxii.)

APPOINTMENTS OPEN.

WATH-UPON-DEARNE URBAN DISTRICT COUNCIL.

SURVEYOR'S ASSISTANT.

Applications are invited for the appointment of Assistant in the Surveyor and Water Engineer's Department. Whole time to be devoted to the duties of the office. Commencing salary £85.

Candidates must have had experience in a Municipal Engineer's Office.

Applications, in candidate's own handwriting, accompanied by not more than three (copies of) testimonials, to be sent to Mr. J. H. Drew, Engineer and Surveyor, Town Hall, Wath-on-Dearne, not later than Tuesday, the 22nd of October, 1912, endorsed "Assistant."

NICHOLSON & CO.,
Clerks to the Council.

October 8, 1912.

ASSISTANT SURVEYOR OF ROADS required by the Gold Coast Government for the Public Works Department for two tours each of 12 months' residential service, with possible extension. Age between 25 and 40, preferably unmarried. Strict medical examination and vaccination if necessary.

Salary £300 a year, rising to £350 by annual increments of £10. Whilst actually performing the duties of the office in the Colony a commuted allowance of £7 10s. a month will be paid in lieu of travelling, lodging and all other allowances. Free first-class passage out and home again on satisfactory termination of engagement. Half salary on voyage out, full salary from date of arrival in the Colony.

Two months' leave on full pay after 12 months' tour, increased to 4 months if returning to the Office, with full pay during voyage or voyages and free passages.

Candidates should have received a good technical education, and have had experience similar to that obtained in a large Municipal Engineer's Office, or in the Office of an Engineer in good general practice.

They should have had experience in Road Surveying in a tropical country, or on Railway Surveying in this country, and be experienced in the design and construction of large Engineering Works, including concrete, preferably reinforced and steel construction, in the preparation of Plans, Specifications, Bills of Quantities and Estimates, and be proficient in the use of surveying instruments, including the Mining Dial.

They should also be well up in Building Construction.

Application by letter (no special form required), stating age, whether married or single, giving full particulars of experience, accompanied by copies of testimonials (not originals), with names and addresses of referees of whom inquiries can be made as to capabilities and character, should be sent as soon as possible to the Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W.

Quote M 5,497 on left-hand top corner of application.

MR. FRANK LATHAM, M.INST.C.E.I., F.S.E.

President of the Institution of Municipal Engineers, 1912-13.

The Surveyor

And Municipal and County Engineer.

Vol. XLII. OCTOBER 18, 1912. No. 1,083.

Minutes of Proceedings

The Institution of Municipal Engineers.

The preliminary proceedings at the fourth annual general meeting of the Institution of Municipal Engineers, which was held last Friday and Saturday, were of a very pleasant and cordial character. The inauguration of Mr. Frank Latham, M.INST.C.E.I., the borough engineer and surveyor of Penzance, as president was signalised by the presence of the mayor of that town, who paid an eloquent tribute to the characteristic energy and ability which Mr. Latham has displayed in his present office. In the course of a general reference to the special privilege which attaches to mayors of finding fault with municipal engineers, his Worship pointed out that the exercise of the function of criticism ought to be like parental chastisement, and that the tendency to groundless complaint from outside sources should be jealously watched. The mayor further fully acknowledged the important and arduous nature of the duties of the modern municipal engineer, and, in speaking of the scope which the profession affords to a man of ingenuity and resource, he gave as an illustration Mr. Latham's well-known experimental work in regard to the force of the waves at Penzance. A cordial vote of thanks very fittingly expressed the members' warm appreciation of his Worship's presence at the meeting. Another pleasing feature of the opening proceedings was the well-merited presentation made to Mr. B. Wyand, the indefatigable secretary of the institution, and his wife.

The council of the Institution submitted their report upon the work of the past year, from which it appears that the Institution continues to progress. There has been a slight increase in the number of members, and as regards finance, there was an excess of income over expenditure for the year, notwithstanding the fact that the balance-sheet shows that a large number of subscriptions are overdue. In the body of the report the various items of the year's work are shortly reviewed, and mention is made of the appointment of delegates to the forthcoming International Road Congress, and to the Sectional Committee on the Standardisation of Road Materials which has been appointed by the Engineering Standards Committee. The mover and seconder of the adoption of the report concurred in complimenting the Finance Committee upon the manner in which they had carried out their duties and watched over the interests of the Institution. There can be no doubt that the position which the Institution has attained is due to their efforts, and to those of the officers who have served so well.

In another column will be found a verbatim report of the presidential address of Mr. Frank Latham, who put forward some most excellent suggestions for elevating the general status of the municipal engineer. Mr. Latham has considerable command of epigram, and some of his pointed sentences will be remembered for a long time by those who heard his address. For example, "the municipal engineer of to-day is the expert of less than a quarter of a century ago" is a sentence which sums up the generally recognised fact that works which would have necessitated the knowledge and experience of the specialist a quarter of a century ago are undertaken by the municipal engineer of to-day as a duty. This observation applies with almost equal force to both architectural and engineering work, and Mr. Latham did well to point out that the interests of the municipal engineer require watching in this respect, for the profession is so intimately associated with architecture, as well as with civil engineering, that no legal rights of status or protection should be granted to either one profession or the other without the rights of the municipal engineer being recognised on both sides. Dealing more directly with the affairs of the Institution of Municipal Engineers, the new president expressed his gratification at the variety and originality of the papers which have been read. "A paper which is a compilation, however much industry is spent about it, cannot be compared to that—however short it may be—which is prepared from the special knowledge of its author." This is a view with which we entirely agree. At the same time, however, we do not wish to underestimate the practical value of the more plodding kind of paper, and we fully realise that it is not given to all engineers to have the time or inclination to write papers which shall be worth reading on subjects requiring original treatment or research work in their preparation. Another of Mr. Latham's aphorisms was: "No man takes an advance step without criticism, and the more advanced such step may be the more severe will be the criticism." The man who contributes a new idea to the sum of professional knowledge in his paper, and thereby provokes criticism, may certainly congratulate himself upon having said something worthy of notice. We hope that Mr. Latham's remarks on the reading of papers will receive the attention and consideration which they undoubtedly deserve.

* * *

True Co-operation: the Penzance Policy.

An incident of the Institution of Municipal Engineers' meeting which we think worthy of special mention was the presentation made, during the progress of the "social evening" at the Holborn Restaurant, to the Mayoress of Penzance, and her most graceful acknowledgment of it in a little impromptu speech which was as admirably phrased as it was obviously heartfelt. It was the culminating incident which fittingly emphasised the happy relations between the mayor personally and as representing the Penzance Town Council and the engineering expert who so ably and loyally serves that body. It was further pleasing evidence of the kindly feeling shown by the mayor's long journey to be present at the congress in London and his close interest in all the proceedings of the day. We are glad of the opportunity to

express the hope that such true co-operation, such unity of purpose between administrators and their professional advisers, may become more general throughout the country than, unfortunately, it is at present. Mayors, councillors and engineers are, in their several capacities, working for the common weal; their work would be doubly effective if they were always in such perfect accord as are Mr. Frank Latham and the elected representatives of the ancient Cornish stannary town. How different from the experience illustrated in the farewell letter of an ex-town clerk quoted in Mr. Winter Gray's shrewdly practical paper on "Superannuation and Security of Tenure":—"So long as party strife continues in our business affairs it is hopeless to get the best results [says the writer]. The yearly recriminations of October are full of prejudice to the welfare of the city. The strife for party votes affects the work of the municipality all the year round. It makes the position of officials still more difficult than their actual duties would do. When men see their efforts handicapped it makes them despair. . . . The anxieties of official life, the constant strain, the feeling that a well-earned income is grudged by many of those who think they pay it, make the position of an official difficult indeed. . . ." Compare the conditions here indicated with the policy of Penzance, and who can question which is the better for the interests of the ratepayers?

* * *

Motor Omnibus Problems.

While the great development of motor omnibus traffic, more particularly in London and its suburbs, has given rise to serious problems which demand the close attention of engineers and accountants who are concerned in the matter of the transport of passengers in public vehicles, the difficulties which have to be met seem to fall within limits which nowhere close in so as to destroy the usefulness or to make impossible the economical management of this method of transport. Taking first the element of danger; it is difficult to believe that strict speed regulation and a somewhat low limit to the number of passengers carried in each vehicle would reduce the earnings of the motor omnibus below paying point, while both restrictions would reduce the rate of wear and tear of the roads and streets. The present state of affairs in this respect is no sure guide to the economic position, since it is brought about, not only by the competition with other modes of transport, but also by that between one "line" of omnibus and another. If a single vehicle, designed with a greater regard to the safety of passengers and the public than is now usual, and run at a slower speed, were to "cut in" as a competitor with other omnibuses, it might fail to pay; but it would not follow that omnibuses generally could not be run at a profit if they were all subject to similar restrictions. Somewhat higher fares and slower speeds might reduce the rate of the increase in numbers of omnibuses, but would hardly do more than that.

With respect to the punishment inflicted on road crusts and street pavements, it is safe to say that this could be reduced considerably by greater attention to certain details of construction of the vehicles as well as by a recognition of the necessity for designing the pavements of omnibus routes with features embodied specially to meet the effects of the dominant vehicle using the road. The modern form of granite block paving adopted in Holborn and the increase in the thickness of concrete foundations for wood paving in Hackney are examples of what is being done in this direction. Such thickening of the concrete crusts should go far to reduce the wear and tear of the carpet layers of asphalt or wood blocks, the difference between motor omnibus traffic and ordinary motor traffic being mainly a matter of wheel loads. The idea which was at one time held in some quarters, that the wear of the rubber tyres of motor omnibuses corresponded financially to the provision of rails for tramcars has proved to be fallacious, but it has been found, on the other hand, that the omnibus can bear the burden of the petrol tax, while a reduction of working expenses may yet be attained by the use of petroleum. This is to be avoided if possible, however, on account of the smell, which would be more difficult to keep under than is that of petrol. That some £65,000 a year is paid by the London General Omnibus Company towards the cost of road improvement in the British Isles is a fact of much significance, but it leads us to the conclusion that such moneys should be available, not only, as at present, for road improvement, but also for road maintenance. It is, in fact, abundantly clear that the time has now come when the Road Board should be empowered to use its funds either for maintenance or for improvement, each case being decided on its merits. It is probable that if the powers of the board were so extended further sources of revenue would be allotted for road purposes. We are unable to agree with the proposition put forward at a recent meeting of the Association of Municipal Corporations that the petrol tax proceeds should be allotted automatically to the highway authority "on whose roads the vehicles run;" to do so would be to revert in principle to the old toll-gate system, which, in spite of valuable features, must definitely be regarded as a thing of the past in these islands. At the same time, we hold the opinion, as expressed in these columns a few weeks ago, that the Road Board should be granted the powers necessary to enable it to deal adequately with the case of local authorities which have to maintain omnibus routes, especially since in these and similar cases the letter of the Act is at variance with its spirit.

As regards the methods to be adopted in the construction of road crusts and street pavements intended to withstand heavy omnibus traffic, it is important that specialisation shall be avoided, and there must be nothing corresponding to the rails of a tramway, in any shape or form. At the same time, in the development of the methods employed, the importance of the dominating element of traffic must not be overlooked. The matter is receiving attention from the responsible executive officials, and we have no doubt that important economies will be effected, relatively to the amount of traffic carried.

* * *

The Intercepting Trap.

Among the papers read at the annual general meeting of the Institution of Municipal Engineers last week, one of the most interesting was that by Mr. H. C. H. Shenton, dealing with the Local Government Board report upon the intercepting trap. We print the paper itself this week, and the discussion will appear in our next issue. The author raised certain points for discussion, but did not give any extended review of the report, and expressed the hope that the discussion would be taken up by members of the municipal engineering profession, and that they would, in particular, devote their remarks to consideration of the manner in which to act when it is finally established that intercepting traps are to be omitted on house drains. Although the discussion which followed the paper was excellent in its way, it did not follow to any great extent the lines suggested by the author, nor did many of the engineers actually holding office at the present moment contribute their observations. Most of the remarks were devoted to criticism of details of the report, and of the conclusions of the Local Government Board Committee, and may be summed up in the statement that the intercepting trap was introduced for the purpose of dealing with conditions which do not now exist, and may therefore have to be modified. It is quite certain that there is bound to be considerable difference of opinion among practical men with regard to the questions

dealt with in the report, but the committee obtained a large amount of valuable evidence from a number of witnesses possessing experience and knowledge of the subject, and if meetings arranged to discuss the report simply result in the bringing forward of the usual *pros* and *cons* of the subject, they will do no more than repeat the evidence already laid before the committee, and very little progress will be made. In view of the fact that the Royal Sanitary Institute have arranged a meeting to discuss the subject—and other institutions will doubtless follow suit—we would like to suggest that Mr. Shenton's recommendation should be adopted, and that the discussion should be confined to consideration of the means by which the conclusions of the report can be most suitably put into effect.

For our own part we should say that there will be a sort of transition period during which the intercepting trap will be omitted on many new house drains, but very little will be done to abolish existing traps. On the other hand, much immediate good will probably result from the report in greater care devoted to the construction of house drains, and particularly in the more general adoption of cast-iron drains. This alone will help to improve matters considerably, and if to this be added greater attention to flushing and cleaning, by the time the intercepting trap is becoming a thing of the past the condition of drains and sewers will have improved to such an extent that those who now insist upon the necessity for the intercepting trap will recognise that their arguments in its favour have lost their force. Those who study the report thoroughly will see that the omission of the intercepting trap is not a new departure, and that in a number of towns its omission has not caused any excessive increase in the death-rate, and when this is taken into consideration, in conjunction with the results of the investigations made by the Local Government Board Committee, it will, we believe, be admitted that nothing but good can result from the putting into effect of the whole of the recommendations contained in the report.

The contention that it is necessary for engineers to continue the long discussion, which has already occupied several years, as to whether intercepting traps should be abolished or retained, is, we consider, inadmissible. In order to come to a decision upon this important point, the Local Government Board have obtained an enormous mass of evidence from those best qualified by their knowledge to express an opinion. They have also made independent observations, and it is impossible to gainsay the evidence produced. It is not to be supposed that the Local Government Board issue a report of this kind in any doubting spirit, and it must surely represent the basis of a settled policy on the part of the board in the future. It therefore becomes the duty of municipal engineers to support the board, whatever their private opinions may be, and the only useful manner in which they can discuss the report is to consider how its teachings can be best applied, for, although the intercepting trap may be unnecessary, it is obviously very difficult to start working on new lines.

* * *

Modernising Building By-Laws. The substitution of a modern code for the Model Code of by-laws relating to new streets and buildings was the theme of Mr. F. W. Platt's paper read at the annual meeting of the Institution of Municipal Engineers. His observations were based upon the recent circular-letter of the Local Government Board to local authorities directing attention to the need of reviewing the existing codes of by-laws in operation in the various local governing centres of England and Wales. It is a great step in advance that the board have at last surmounted their very natural reluctance to modify or revise their code, upon which great care and thought had been expended. It must be recognised, however, that by-laws which were applicable to the conditions which obtained in 1877 are entirely unsuited to the totally different conditions of 1912. Modes of construction have changed and scientific knowledge has made rapid advances; and the demand of those who are engaged in constructional work that they shall be permitted to profit by the economies which modern improvements have rendered possible cannot be logically resisted. As Mr. Platt pointed out, the authors of the Model Code in drafting the earlier forms of by-laws had regard mainly to buildings of stone or brick construction, and apart from what is considered their respective character they are inappropriate to types of construction now in use, such as buildings of hollow blocks or slabs of terra-cotta, concrete, reinforced brickwork, and so forth; for hollow or half-timbered walls, and steel or other framed walls hung with tiles and slates, filled in where necessary with incombustible materials; for buildings where piers are employed, and where large window openings are needed; or for the thickness of walls of outbuildings. Moreover, the ordinary clauses for the laying out of roads do not permit of the class of roads which have been designed in some garden cities, neither do they differentiate between the type of paving needed for varying grades of roads or for exceptional arrangements which are demanded in certain cases by the configuration of the ground.

In considering the character of the changes that are required, it may be said at once that any new by-laws must be free from the defects of rigidity and applicability only to stereotyped forms of construction. Mr. Platt suggests that the new regulations must take into consideration the type and purpose of any proposed buildings, and the maximum stresses which are permissible in the materials to be used. We quite agree that so far as practicable matters of modern construction should be treated on these broad lines, rather than by the enforcement of tabulated sizes and thicknesses. Mr. Platt's paper, which is reproduced elsewhere in this issue, contained many valuable suggestions as to the revision of the by-laws in regard to ordinary types of building, but we must refer our readers for details of these to the contribution itself.

* * *

Superannuation. If any apology be needed for returning to this subject, it is amply afforded by the obvious importance of pertinacity in its advocacy and the need for keeping alive a vigorous public opinion in its support. At the recent annual meeting of the Institution of Municipal Engineers, Mr. A. Winter Gray recalled that one of the objects of the Institution is "to take such steps as may be deemed expedient with a view to obtaining security of tenure and superannuation for municipal engineering officials." It must be patent to everybody that in the matter of superannuation the case of the municipal engineer cannot be considered apart from that of other local government officers. This fact leads inevitably to the further conclusion that it is a duty incumbent upon municipal engineers and their staffs to join the National Association of Local Government Officers, which is the only organisation at the present time that appears at all capable of bringing the matter to a successful conclusion. Mr. Gray further advocates that the Institution before whom he read his paper should undertake propaganda work in the various districts. This is a matter for consideration; but we are convinced that the right policy is to keep the question of superannuation and the justice of the claim for it constantly before those who are concerned, whether as officers or members of local authorities, so that at all events there can be no mistake as to the keenness and unanimity of officers in their demand.

Institution of Municipal Engineers.

FOURTH ANNUAL GENERAL MEETING IN LONDON.

The annual general meeting of this institution was held on Friday and Saturday last, October 11th and 12th, in the Council Chamber, Southampton-row, London, W.C. The chair was taken in the first instance by Mr. E. A. Stickland, Assoc.M.Inst.C.E., borough surveyor of Windsor (the retiring president). The attendance included Messrs. Frank Latham (president of the institution), E. A. Stickland and A. E. Prescott (past-presidents), Henry C. Adams and Horace Boot (vice-presidents), T. Mundy (hon. treasurer), F. A. Bailey (Leek), A. R. Bleazard (Clitheroe), W. Louis Carr (Ruislip-Northwood), Horace Cubitt (London), A. J. Elson (Penge), F. E. Ennals (Billericay), William Finch (Cumberland), Thomas Knight (London), J. Lewis (Yiewsley), E. Madin (Irthlingborough), A. W. Nye (Shoreham), Arthur Palmer (Greenwich), F. W. Platt (Salford), L. Randerson

The Mayor of Penzance
(Councillor Howell Mabbott, J.P.).

(Meopham), Ernest E. Ryder (Bushey), H. C. H. Shenton (London), W. H. Scott (Ruislip-Northwood), H. Shepard (London), Ernest W. Veale (Farnham), E. Whitwell (Abersychan), Egbert G. Woodward (London) and B. Wyand (secretary of the institution). Among the visitors were Messrs. Howell Mabbott, J.P. (Mayor of Penzance), H. Percy Boulnois (London), E. R. Capon (Epsom), W. C. Easdale (London), H. J. King (Ruislip-Northwood), Baldwin Latham (London), A. J. Martin (London), R. V. Spencer Phillips (London), C. Chambers Smith (London) and H. D. Searles-Wood (London). The attendance in the evening was swelled considerably, some hundred and twenty members and friends being present.

WELCOME TO THE MAYOR OF PENZANCE.

The Chairman said he wished to present to the members his Worship the Mayor of Penzance (Mr. Howell Mabbott, J.P.). They were, he felt sure, highly honoured and very much gratified that the mayor of a far-distant town in the extremity of England should pay them the compliment of coming to the centre of the universe to attend their meeting. Mr. Mabbott had left a beautiful climate and a town free to the winds of heaven to come and be suffocated by a London fog, and he tendered that gentleman his sincerest thanks for his presence. The institution had chosen as their president for the ensuing year the surveyor of the town (Mr. Frank Latham) of which Mr. Mabbott was mayor, and he (Mr. Stickland) was quite sure that in doing so they had made a very good selection. The institution had now been in existence for four years, and it could claim that it was equal to any other and second to none. As municipal surveyors they were all trying to do their best for the community at large, and in pursuit of this object they received more kicks than half-pence; but so long as it was their duty to be thus circumstanced this was the greatest reward they could expect. He proposed a vote of thanks to the Mayor of Penzance for his presence at their meeting.

The Mayor of Penzance, who was received with applause, said he could quite agree with the remark their president made to him in the adjoining room, that mayors had a particular delight in finding fault with municipal engineers. He (the mayor) replied that that was a little pleasure and luxury quite their own, but that, as was the case with parental love, while they indulged in it themselves, they objected to other people doing it. He had, as the chairman had stated, come from a land of sunshine, and when he arrived in London one of the first things that suggested itself to him was that their institution should take steps to prepare some plan or specification to prevent the recurrence of fogs. When he made the suggestion to the president that gentleman replied that the matter required previous notice, and he (the mayor) thought he was doubtless right. When this institution selected his friend Mr. Frank Latham—and he was delighted to own him as a personal and dear friend—as their president they paid a compliment to the town of Penzance no less than to Mr. Latham, and immediately he knew he was their president-elect he felt it would be a privilege to be associated with their proceedings that day, and consequently he determined to come. Mr. Latham could not ask them to go west, though they might have gone further and fared worse, and as London was the only place that could take the place of Penzance—(laughter)—they were delighted to meet each other in the metropolis. Time had indeed worked wonders with them at Penzance, and their borough engineer had done his level best to efface some of the signs so often associated with a remote western town, and bring them into line with normal and sensible people. Mr. Frank Latham was, if he might say so, a confirmed bigamist, for years before he was wedded to a most estimable lady he had given himself absolutely, body and soul, to municipal engineering. He (the speaker) had a very great sense of appreciation of the duty of municipal engineers to the world, for the comfort, health, happiness and well-being of the nation practically depended upon their exertions and skill. The day of the village smith or carpenter becoming the municipal engineer and surveyor was past, and the day had come when municipal engineering would demand from them every particle of brain and thought they could bring to bear upon it. Although Penzance had just been discovered, the town had great scope for the services of a skilled engineer. Mr. Latham came to them many years ago. He found them evolving—how they would have evolved without him heaven only knew. He found a great sea front open to the wide Atlantic, and those of them who had any idea of the sea in its worst moods would have some notion of what he had to do. Could they conceive a sane man leaving his warm bed on a dark, stormy night, and, clothed in a sou'wester, hanging over a pier with some instrument of his own invention to discover the force of the waves coming from the Atlantic? Mr. Latham had again and again donned the dress of a diver and gone, like St. Paul, to the depths of the sea, and he had by his knowledge and skill devised roads that would not only stand the test of wear and tear, but he had invented methods to prevent dust being carried about in clouds, and this alone was a great boon to the people of Penzance. Then he had also had to deal with the question of extraordinary traffic. These and other problems Mr. Latham had solved for them. To know him was to love him. Ever courteous and affable, he had won the respect and esteem of his council, and though they did not expect to keep him at Penzance, they hoped the day was far distant when they would lose him. He had the greatest pleasure in bearing any little testimony he was able to bear to the worth

of the gentleman they would that day elect as their president. He should like to say that although Penzance was so very far from the metropolis there were possibilities for the development of engineering skill in the neighbourhood that could not be found in many other towns. It was an ancient town being transformed into a modern town, and Mr. Latham had exercised considerable skill in avoiding any act of vandalism when changes were to be made. They loved their narrow roads and their old buildings, but at the same time they wanted something that would be up-to-date. Mr. Latham was solving that problem by giving them not only comfort in their roads, but a supply of pure, clear, cool and delicious water. For boundless enthusiasm he did not think they had anyone in their institution who would surpass him, and if great interest in the affairs of the institution were useful to it then he was quite sure their choice that day would be a very bright one.

Mr. Frank Latham seconded the vote of thanks to the Mayor of Penzance for his presence. He was sure they all appreciated the effort that the mayor and mayoress had made to come such a distance in order to prove their interest in the fact that he (the speaker), the borough engineer and surveyor of Penzance, had been nominated and was about to be elected to the presidential chair of the institution. As for what had been said about himself, he confessed it might have made him slightly vain if he thought it was true. He knew Mr. Mabbott was a most truthful man (laughter)—but he (the speaker) certainly never thought he had done so much as had been suggested by that gentleman. What he had done had been done in the interests of the profession, but it appeared from the full-heartedness with which the Mayor of Penzance had spoken that he had been doing something to interest that gentleman as well as others. He could only thank him most sincerely for the manner in which he had spoken. A word or two of that kind helped to spur one on to further interest in good work. When the municipal engineer took up something new he was impelled to remember that such work cost money as well as energy, and sometimes one came off worst, especially when he was battling with the sea. It was doubtful at one time whether he should be able to take the presidency of the institution, but he had recovered from an accident that happened to him. He was sure they would agree that every official should act as much as possible in the interests of his work and the betterment of his town, and assist its progress in every possible way, even if he did have to incur risks in stepping a little beyond the margin of his ordinary duties. He thanked his Worship the Mayor for the manner in which he had spoken of him, though he was constrained to say that he only felt he had carried out his duty. If he had not done what the mayor had stated he had done he should have felt he had not altogether accomplished what he ought to have done.

PRESENTATION TO MR. AND MRS. WYAND.

The Mayor, having acknowledged the vote of thanks, proceeded to make a presentation to Mr. B. Wyand, secretary of the institution, and Mrs. Wyand, on behalf of the subscribers. Mr. Wyand, his Worship stated, had been indefatigable in his efforts in starting the institution, and his work had been eminently successful. The members recognised that while the man was the head he was not always the neck, and that the neck sometimes regulated the movements of the head. The wife took the place of the neck and he understood that Mrs. Wyand, in a spirit of genuine self-sacrifice, had rendered considerable assistance to her husband in carrying out the work of the institution. He had the honour, on behalf of the members, to ask Mr. Wyand to accept some little token of voluntary appreciation, and to express the pleasure and interest they felt in recognising the joint labours of Mr. Wyand and his wife on behalf of the institution. The members were deeply grateful for the patience Mrs. Wyand had exercised in rendering constant assistance in the office, and thus enabling Mr. Wyand to go out of doors in pursuit of his secretarial duties. His Worship concluded, amid applause, by handing a cheque to Mr. Wyand.

Mr. Wyand, who was warmly received, accepted the presentation with thanks on behalf of himself and his wife. He could not say it was quite unexpected, as he had an impression lately that "something was on." At the last council meeting, for example, he was turned out of the room. He thought it might be an increase of salary, or, perhaps, the sack, but it was not that (laughter). He had had always two fears of what might perchance happen to him. The first was that he would be the recipient of a marble clock which would not go and was too big for the mantel. That had not come off. The second fear was that he might become a millionaire, which would never come off. (Laughter.) He gratefully acknowledged the valuable assistance he had received from his wife, and once more returned thanks for the kind gift from the members, and the words to which the Mayor of Penzance had given utterance.

ANNUAL REPORT OF THE COUNCIL.

The annual report of council and balance sheet were next presented:—

ANNUAL REPORT AND BALANCE SHEET.

The council beg to report as follows:—

ROLL OF THE INSTITUTION.

At June 30, 1911, the roll of the institution was 860, consisting of 697 members, 65 associate members and 98 students. At June 30, 1912, the roll was 882, consisting of 712 members, 94 associate members and 76 students. During the year 28 members, 24 associate members and 2 students were elected, and 5 associate members were transferred to membership and 10 students to associate membership. The losses resulting from death, resignation and erasure by change of appointment and other causes amount to 18 members and 14 students.

FINANCES.

The accounts of the institution have been audited, as on the last occasion, by Messrs. Leake & Co., chartered accountants, and the balance sheet and income and expenditure account are herewith presented. The council are pleased to be able to show again an excess of income over expenditure on the year's working amounting in this instance to £47 8s. 5d., and making an accumulated balance of £234 7s. 9d., notwithstanding that during the year £50 has been laid aside as a provision against "irrecoverables."

MEETINGS.

Six general meetings, eleven council meetings, and twenty-three district meetings were held during the financial year. There were also ten meetings of the Finance Committee, one of the Examination Board, and two of the Special Purposes Committee. The general meetings were held at Windsor, London (3), Manchester and Hendon; the district meetings at Nottingham, Manchester (2), London (6), Worcester, Fontburn, Yarmouth, Edinburgh, Lewes and Seaford, Leeds, Brentwood, Newcastle (3), Birmingham, Heywood, Sunderland and Cinderford. All the other meetings were held in London. The attendance at Hendon was the record one of 358, while the number would have been largely augmented had it not been for the inclement weather. This meeting is notable, too, as the first held jointly by municipal engineers and aviators.

DISTRICT COMMITTEES.

At the meeting held at Edinburgh on July 29th a Scottish district was formed, and the number of districts fully constituted is now ten. The meetings have, as a general rule, been well attended and thoroughly appreciated by local members, and the palm for numbers again goes to the Northern and North-Western districts, where excellent organisations are maintained, and where considerable enthusiasm is displayed. Practical experience in the working of the district committees has shown certain amendments to be desirable, and several alterations in boundaries are under consideration. It is possible that within the next few weeks the north and south portions of Wales will be affiliated to the Western and North-Western districts respectively, while the Yorkshire district will become absorbed by the Northern and North-Western districts.

EXAMINATIONS.

The first examination of the institution was held in London on November 2nd, 3rd and 4th. The examiners were Messrs. Henry C. Adams, J. Rush Dixon and J. E. Edgcome and Capt. H. Riall Sankey, with Prof. Henry Adams as senior attending examiner. Candidates were examined in sixteen papers, with the result that one candidate was awarded the full Diploma in Municipal Engineering, one was certificated in Electrical and Mechanical Engineering as applied to Municipal Work, one satisfied the examiners in Building and Structural Engineering as applied to Municipal Work, and two satisfied the examiners in the General Paper. The candidate obtaining the diploma, Mr. A. Douglas Barron, obtained special mention for

excellence of work. It was considered better that future examinations should be held in the month of May, and arrangements were made for holding one in May next, but, owing to the dislocation of business and traffic by the coal strike at the time, it was postponed.

SPECIAL PURPOSES COMMITTEE.

A Special Purposes Committee, to which matters of importance can be referred for preliminary investigation and subsequent report to the council, was formed in February, and held two meetings up to the end of the financial year.

LIST OF MEMBERS.

It was decided to prepare a new list of members, with names arranged both alphabetically and topographically, to be issued immediately after the annual meeting and the election of the council for 1912-13.

INTERNATIONAL ROAD CONGRESS, 1913.

In response to the request of the General Organising Council of the International Road Congress, 1913, collecting a mass of valuable information as to the loads for which it is desirable to provide in the design of highway bridges, and it is hoped that a report on the subject will be issued shortly.

EXHIBITION OF NON-FERROUS METALS.

Mr. Henry J. Farmer was appointed to represent the institution on the council of the International Exhibition of Non-Ferrous Metals, which was held in London.

BENEVOLENT FUND.

A fund was organised in July on behalf of a member in straitened circumstances, and it is satisfactory to note that the assistance rendered helped to tide him over a time of ill health and unemployment—until, in fact, he had regained his health and had obtained a temporary post.

NATIONAL INSURANCE ACT, 1911.

The National Association of Local Government Officers became an approved society under the National Insurance Act, 1911, and many members of the

Dr. BALANCE SHEET, JUNE 30, 1912. *Cr.*

	£ s. d.	£ s. d.		£ s. d.	£ s. d.
To Creditors—			By Cash at Bank, &c.	—	13 13 10
General	289 17 3		By Debtors—		
Subscriptions received in respect of the year 1912-13	31 2 6		Subscriptions overdue	344 16 9	
		323 19 9	Advertisers ...	29 18 6	
To Income and Expenditure account—				374 15 3	
Balance as per balance sheet at June 30, 1911	186 19 4		*Less* Reserve against bad debts	50 0 0	
					324 15 3
Add.			By Stock of stationery, by-laws, certificates, &c. ...	—	18 10 0
Surplus of income over expenditure for the year ended June 30, 1912	47 8 5		By Office furniture, engraved plates, &c.	—	108 13 0
		234 7 9	By Library (excluding presentation copies) less depreciation	—	92 5
	£558 7 6				£558 7 6

Dr. INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED JUNE 30, 1912. *Cr.*

Expenditure.	£ s. d.	£ s. d.	*Income.*	£ s. d.	£ s. d.
To Expenses of management—			By Subscriptions Year ended June 30, 1912		
Salaries, secretary and assistant	200 10 0		654 members at £1 1s. ... £686 14 0		
Rent	20 0 0		5 members at 10s. 6d. ... 2 12 6		
Printing, binding, certificates, examination syllabus, &c.	68 2 1			689 6 6	
Examiners' fees	13 13 0		73 associate members at £1 1s.	76 13 0	
Stationery and books ..	45 3 7		6 associate members at 10s. 6d.	3 3 0	
Telephone	6 10 0				
Premises	2 2 0			79 16 6	
Postage...	58 16 4		79 students at 10s. 6d.	41 9 6	
Depreciation of library books ...	10 6 2				
Affiliation fees, N.A.L.G.O.	5 5 0				810 12 6
Other expenses	43 11 6		By Entrance fees—		
		643 19 8	Members	33 12 0	
To Meetings and conferences	—	39 9 0	Associate members	25 4 0	
To Institution premises	—	16 13 2	Students	3 3 0	
To Journal, Issues 10-13—					
Cost of production and distribution	111 17 2			—	61 19 0
Deduct.			By Examination fees	—	14 3 6
Advertisements and sales, less commission paid .	35 4 5		By Donations	—	2 2 0
		76 12 9			
To Depreciation of office furniture, &c. ...	—	11 15 6			
To Provision, reserve against loss	—	50 0 0			
To Balance, being surplus of income over expenditure for the Year ended June 30, 1912	-	47 8 5			
		£888 16 6			£888 16 6

We have examined the above accounts with the Books and Vouchers of the Institution, and certify that in our opinion they are correct. We have verified the balance of cash at the Bankers.

20 Abchurch Lane, London, E.C.
September 27, 1912.

LEAKE & Co. (Chartered Accountants), Auditors.

the following members were nominated to represent the institution at the congress to be held in London in 1913: Messrs. Henry J. Farmer, A. E. Prescott and E. A. Stickland. The president of the institution has been added to the list of honorary vice-presidents of the congress.

ENGINEERING STANDARDS COMMITTEE.

The Engineering Standards Committee convened in May a conference on the Standardisation of Road Material, and Mr. A. E. Prescott was nominated to represent the institution at the conference. Certain questions having been raised a Sectional Committee, of which Mr. Prescott is a member, has now been formed to deal with the subject.

LOADS ON HIGHWAY BRIDGES.

The Joint Committee of the Concrete Institute and the members of the Municipal Engineering Committee, to which the institution has sent three delegates, are

institution have availed themselves of the opportunity to join a society which is composed of local government officers alone.

SUPERANNUATION AND SECURITY OF TENURE.

The National Association of Local Government Officers has been active in many other directions, and in none more so than in the movement for securing superannuation and security of tenure for all local government officers. The council of the institution have been working whole-heartedly and unceasingly in the same direction, and realise that only by the co-operation of all bodies having the interest of the municipal engineering profession at heart can success be obtained. The first serious attempt to obtain these concessions for municipal engineers has been made by the institution, and a notable contribution to the campaign was the paper read by one of the members of the council at a general meeting of the institu-

tion held in London in February. The council hope ere long to be able to report considerable progress.

PREMIUMS FOR PAPERS.

The premiums for the year 1911-12 for papers read before meetings of the institution have been awarded as follows: President's premium (presented by Mr. E. A. Stickland)—Mr. A. Winter Gray, for his paper "Superannuation and Security of Tenure: The N.A.L.G.O. and its Bill"; Institution premium Mr. Horace Boot, for his paper "The Electric Trolley Omnibus System and Railless Traction."

LIBRARY.

Further additions have been made to the library during the past year, and a valuable collection of up-to-date books has been got together. The arrangements made for borrowing for extended periods and other facilities have rendered the library extremely useful to those studying the various branches of their profession for examination and other purposes.

PROVINCIAL COUNCIL MEETINGS.

The suggestion has been made that a certain number of the council meetings in each year might advantageously be held in the provinces, and the council would be glad to have the opinions of members on the proposal.

Mr. Frank Latham moved the adoption of the report, and in doing so stated that every item contained in it had been carefully gone through. He could personally assure the members that everything connected with the institution was in a very satisfactory state. They had met the working expenses, and had a balance at the end of the year. They had paid for their library, and further had allowed for £50 which they might not collect. This latter was really an asset, but they did not reckon it as one, in case they did not receive the subscriptions. The state of things which the report revealed was highly satisfactory on the whole, and he thought the Finance Committee were to be complimented upon the manner in which they had carried out their duties and watched the interests of the institution. He might say that the committee had regularly informed him, as hon. treasurer, as to how things stood, and he could testify, therefore, that the work had been satisfactorily carried out.

Mr. Mundy, in seconding the proposition, said he quite agreed that something was due to the Finance Committee for the satisfactory position of the institution. On looking through the report he was reminded of the many activities in which the institution was engaged, and one's mind was insensibly carried back to four years ago, and to the many opinions then expressed as to whether the institution was needed or not. He thought those who stated at that time that they would be an institution of mushroom growth had found out their error, for now the institution stood in a very sound condition indeed. The institution consisted of the younger members of the profession who had much vigour in everything they did. From what they had heard that day they would learn that the institution was progressing, and there did not seem to be any doubt that it would make a mark in the municipal engineering world. At any rate, it had taken a rightful place among the institutions of the country, and there was no fear of the future, for they intended to go on working all over the country, and endeavour to do good not only to the members alone, but also to the profession in general. The institution was really a child in a way, but, being full of vigour, they trusted that it would reach to a stage of great strength.

The adoption of the report was then agreed to.

The Chairman said it was with very great pleasure he had to announce that Mr. Frank Latham had been elected president of the institution for the ensuing year. They had heard already from the Mayor of Penzance such an eloquent tribute to his character that it would be absolutely ridiculous for him (Mr. Stickland) to attempt to say anything in Mr. Latham's favour. If that gentleman fulfilled and carried out the high ideals the Mayor of Penzance described Mr. Latham as possessing, the institution would be highly honoured in having such a president. On behalf of the members, he wished him a most successful and pleasant year of office, and he would add that if there was anything he could personally do to assist Mr. Latham he would be only too pleased to respond to his call at any time.

Mr. Frank Latham then took the chair vacated by Mr. Stickland, and was greeted with applause. He remarked that it was one of the most pleasurable moments of his life to feel that he occupied the chair of that institution. He thanked the members for the honour they had conferred upon him, and he particularly thanked the members who during the past three or four years assisted him in carrying out the duties of hon. treasurer. He was grateful for the opportunity of being able to assist in the work, and for being allowed to have his own way, or, rather, he should say, a little scope, as he was placed such a long way from the Metropolis. He trusted that during his year of office the institution would continue to have the same success it had enjoyed in the past. From the start when Mr. Pegge was president, to be succeeded by Mr. Prescott and Mr. Stickland, it had gone on, so to speak, by leaps and bounds, more so probably than any member ever anticipated. They had succeeded in placing the institution upon a firm foundation, and it only remained for the members to make known the usefulness of membership in order to vastly increase the influence of the institution.

The President next proceeded to deliver his presidential address in the following terms:—

PRESIDENTIAL ADDRESS.

It is with a sincere sense of appreciation that I thank the members of the Institution of Municipal Engineers for electing me to the honourable position of president for the ensuing twelve months. I fully realise the responsibility of the duties of this high position, which have been so ably performed by successive and highly esteemed presidents in the past, and I have no doubt that in being entrusted with the office I shall receive the cordial support and assistance of all the members, and that thereby the reputation and welfare of the institution will be preserved, while the best interests of its members will be promoted by me with all the zeal and assiduity which lie within my power to exercise. I, however, feel that my responsibilities will be heavy, and therefore ask your kind indulgence for shortcomings on my part while I occupy the position as official head of this institution, and may it be said, on the completion of my year, that, while governing from the West, I never allowed the sun to set on its best interests and welfare.

Perhaps it is my duty to refer to that side of the institution to which I have had the honour of holding the key ever since its promotion—I refer to its financial status. My regard for the institution and its objects have prompted me to a discharge of this responsible office of treasurer from a time when there was no necessity for a key for locking up its reserves. All this may long be forgotten, but I still owe a deep debt of gratitude to our secretary, Mr. Wyand, for his thoughtful management during those early days, and likewise to the Finance Committee which was necessarily formed when the finances became an important asset. So successful has this side of the institution become that we have been able to meet all expenses in the provision of a splendid suite of offices and boardroom in Westminster—equipped with an expensive and much-appreciated technical lending library—and in the regular publication of the institution *Journal*. All working expenses, together with the necessarily heavy expenses in connection with the holding of meetings in all parts of the country, have also been met.

The institution may be considered to be a well organised society in which every member shares the full privileges of the main body, while he is also one of a separate district, presided over by a member elected annually and resident in that district. The affairs of each district are conducted by an elected local district secretary and District Committee, who in turn are responsible to the main governing authority.

The country was judiciously divided into districts during the presidency of Mr. Pegge, the city engineer of Durham, by whose wholehearted interest the areas were so completely thought out, at that time, that scarcely any deviation has since been found advisable. It is with pride that I am able to say that the resources are sound, and this is the result of a conscientious committee, who have well assured themselves of the assets before incurring liabilities. In the nomination of Mr. Mundy to succeed me as your treasurer the council have made a wise choice. Mr. Mundy has been chairman of the Finance Committee, and he is thoroughly acquainted with the finances of the institution, and he will, I feel confident, continue his interest in this sphere to the entire approbation of the members.

As this institution has had a good share of technical writings from my pen, it has been suggested as a

diversion that I might on this occasion address the members on the conclusions I have arrived at with regard to elevating the general status of the municipal engineer. It is true that this subject has occupied my mind for many years, and I have held strong views thereon, which have only been strengthened by experience and observation during the time which has lapsed since the establishment of this institution.

Naturally, any views expressed on such a controversial subject may to some minds only be exposing one's own incapacity. On such a question one has to contend with various opinions, which, however opposite, may, nevertheless, be held with equal sincerity. But perhaps the most difficult obstacle to overcome with any argument is the prejudiced mind, which is content in these days of reformation, enlightenment, and social intercourse to hark back to the good old days of stereotype curriculum for every one alike, irrespective of temperament and abilities. That will not do to-day. Everything is progress, and stereotyped forms and hard-and-fast lines are dry provender for the activities of the modern student.

The municipal engineer of to-day is the expert of less than a quarter of a century ago. Works which would have necessitated the knowledge and experience of the specialist a quarter of a century ago are undertaken by the municipal engineer of to-day as a duty. Municipal authorities expect the best and most up-to-date advice from their engineering officers on all subjects, whether it be sewerage, water supply, sea defence, public buildings, or building and sanitary law. The experience required by the municipal engineer is extremely wide, and he has an every-day routine in which that knowledge has to be speedily directed from one subject to another by an active, level-headed mind. Nothing short of an early training and continual personal application and study throughout one's whole career will make the man ready to cope with all exigencies. There are few, if any, professions which require the same amount of personal tact, skill and determined research as that of the municipal engineer. He can never afford to be idle, or he will be behind the times of modern inventions and modern practice.

If the utility and antiquity of any service are proofs of its status, the profession of the engineer must claim a very high position. Engineering is the basis and foundation of development of every description. Wherever a village or town springs up, an artificial existence results, calling for the attention of the municipal engineer in preserving the health of the community. From the remotest ages of the world, wherever civilisation advanced to any degree of refinement, works of water supply and sewerage and measures for insuring cleanliness were universally adopted. Thus engineering is the basis and foundation of development of all possible descriptions.

The road to advanced civilisation commenced with the inventions of the engineer, and progress, refinement and health have gone hand in hand with the advance of engineering. Not only is this the case, but the engineer is directly responsible for the great scheme of intercourse and transport which prevails throughout all parts of the world, placing the remotest parts within easy touch of the great centres.

We have only to look back in history as far as the introduction of the turnpike system in England to realise the enormous advance in modern engineering. At that time the roads throughout England were so bad that in the North, in the year 1770, ruts 4 ft. deep were measured in their surface. The Newcastle road appears to have been in even a more disreputable condition; it was stated "a more dreadful road cannot be imagined." When it is remembered that everything that was transported on land in those days had to be sent by road, in the absence of railways and canals, it will be realised what a state existed.

In 1763 it took a fortnight to travel from London to Edinburgh. No wonder that it has been said: "Twenty miles of slough and an unbridged river between two parishes were greater impediments to intercourse than the Atlantic Ocean now is between England and America." The men who came forward one after another to make roads, bridges, canals, railroads, steamships, telegraphs were all engineers of natural ability, with love for their calling in life.

These men were the founders in modern days of that particular constructive and mechanical science of civil engineering which has advanced with such leaps and bounds as to have a universal application. By its cultivation and development such progress in wealth and civilisation and healthy conditions has been made throughout the world as without this would have been absolutely impossible.

These modern engineering instincts, however, did not spring up like Autochthones—from nothing of like character—on the contrary, we have evidence of the cultivation of similar arts and sciences from time immemorial. That the Ancients were well skilled in engineering matters is evident, and the Romans have likewise left sufficient evidence of their inventive abilities to prove the advance which that nation made in engineering. England was devoid of the engineer's services throughout the Dark Ages which followed the downfall of the Roman Empire, and even the great Roman roads of this country, and, in fact, throughout the whole world, were allowed to go to ruin. The world, however, was not devoid of engineering skill. At the breaking up of the Roman Empire the Roman Colleges of Artificers and Guilds of Builders and Masons became spread over Europe, and developed a mixed character of the practical and the religious. These instincts were in turn retained and imitated by the mediæval architects. Thus by the Normans and within the monasteries during those ages were retained the secrets of the science and arts of the Roman Guilds of Builders and Masons, but these were chiefly utilised in the building of religious edifices, strongholds and castles. These were indeed the works of constructive architects and masons of first-class order, which fact must have preserved for us the basis of an inventive mind, to be matured and developed by science as we now see it in the profession of the engineer. It will be evident that those guilds of constructive architects who could erect such magnificent buildings as cathedrals, castles, and strongholds in this and other countries must have possessed engineering instincts.

The civil engineer of to-day, however, does not profess to be an architect, but the municipal engineer cannot afford to neglect this very important and artistic side of his profession. A substantial knowledge of architecture is essential to his success, as buildings of various descriptions have to be designed and constructed under his supervision. He is called upon to advise his council on the laying out of estates and the examination of building plans, while he has the planning of many schemes which must necessarily call for artistic treatment at his hands. A municipal engineer engaged at any seaside resort would be quite unsuited to hold his position without a knowledge of architecture, by which he could design and carry out the works expected of him.

The interests of the municipal engineer require watching in this respect, for their profession is so intimately associated with architecture, as well as with civil engineering, that no legal rights of status or protection should be granted to either one profession or the other without the rights of the municipal engineer being recognised on both sides.

The present-day engineer's attention is so much engrossed by the scientific and mechanical sides of his profession that the very sentiment of the artistic is abandoned and neglected, and its place among the liberal arts is long since forfeited. The municipal engineer, however, must not be persuaded that he is essentially a civil engineer, his training must be broad and varied, and while a knowledge of the mechanical sciences is necessary, he must cultivate the artistic side. Architects to-day are mastering so many matters of extreme importance to municipal engineers, especially since the advent of reinforced concrete construction, that the municipal officer may be more fitted in many respects if drawn from the architectural profession than from that of pure civil engineering.

To be a competent engineer to a municipality a man must be cultivated in every direction—civil and mechanical engineering and architecture. He must be acquainted with the classical side of engineering. Water and sanitary engineering call for a keen interest in geology. Sea coast engineering demands a study of the phenomena of the sea. In fact most subjects if studied deeply have a most interesting classical side. But, apart from all the refinements of the mind, the official must be a business man and a gentleman of tact and thoughtful consideration.

As a matter of fact, the fascination attached to the scientific side of engineering may influence the student to the detriment of his practical training. This may be more particularly said of those whose scope for the practical is limited. But the practical cannot be limited to the student who couples the theoretical with personal research and experiments. Practical utility must follow, and its development is the most valuable and interesting of engineering pursuits. It behoves

the enterprising man to begin early to be constantly on the alert in observation, and the acquisition of the common-sense side of engineering. He should undertake personal observations and experiments, and allow the practical and scientific to run in harness together.

The engineer whose enthusiasm is awakened to the enormous scope of interest to which his profession lends itself is well able to look after himself as far as knowledge-seeking is concerned, and, to my mind, it little matters to which engineering society he devotes his attention since he is sure sooner or later to become a useful member of society. Institutions have undoubtedly raised the status of the profession as a body within the last quarter of a century. The reading and discussion of papers on advanced subjects has had its good effect; members who attend meetings or study the papers read are bound to obtain some advantage. By attending visits to works the member is enabled to learn, in a short time, many important matters, which it has taken years to invent and perfect. He sees the undertaking in actual progress, and his practical observations must be very helpful.

While on the subject of papers, I would express my own gratification in observing that the papers which have been read before this institution during the past three years have been conspicuously original. The variety of original subjects of these papers, covering a very wide range, even so advanced and up to date as railless electric traction and aviation, speak volumes for the progress of this institution, and the students must relish this literature with a keen sense of appreciation.

A paper which is a compilation, however much industry is spent about it, cannot be compared to that—however short it may be—which is prepared from the special knowledge of its author. A large majority of our members are young and aspiring engineers, and there is nothing which gives greater proof of the advancement of the thinking and progressive instinct of the profession than the demonstration just recorded. An engineer is a man who should invent and devise. He should strive to invent and to ascertain something original and worthy of his exertions. It is an axiom that inventive power is indispensable to success, so far as every branch of engineering is concerned.

By my remarks I do not desire to damp the ardour of young engineers desirous of preparing compilations. On the contrary, I believe in a great deal of this preparatory work; it tends to discipline the mind and to develop a capacity for advanced work, compelling the author to study and reflect and to exercise his mind to the advantage of his training, and to his own improvement. I especially appeal to the younger members to prepare papers on subjects coming under their notice. Let them remember that the highest is he who performs his part in life the best—not necessarily he who fills the most exalted position. Perhaps I should not suggest that there is too much fear of criticism among young engineers. I would, however, point out that criticism is not to be feared; it is rather to be sought after, as no man takes an advance step without criticism, and the more advanced such step may be, the more severe will be the criticism. Naturally everybody will endorse and agree with views which are common practice, but the student who will have the courage to launch new ideas will be criticised, and he may congratulate himself on the fact that his remarks are worthy of notice.

The fascination for writing papers on specialised subjects not only tends to improve the engineer's knowledge by the personal experiments, enquiries and accurate observations he must necessarily make to accomplish his task, but that knowledge is an asset to the profession and tends by the process of discussion to strengthen or correct the views of those directly interested. One paper will invariably lead to another, and all these will cause the author to exert his power of invention and to make himself master of his subject.

These papers are far-reaching in their influence, and give to each member the advantage of the experience of others. Not infrequently does the discussion open up new ground for research, and thus the principles of modern science become perfected. The advantages to be gained by municipal authorities from the discussion and ultimate conclusions deduced from papers written by their officers are sometimes extensive. The opinion of many trained minds is obtained on points of extreme difficulty and doubt, and more often than not a right course is deduced from the experience of a body of experts. An author's views may be so strengthened to the ultimate advantage of the community by whom he is employed. For this reason it would appear that municipalities would do well in encouraging their officers to take advantage of the benefits placed at their disposal, by giving them opportunity to attend meetings, and financially assisting to that end.

Young men who are desirous of improvement, and who should be encouraged in the early stages of their calling, have in many instances been in difficulties to know where to send for information. It is a most progressive policy in our institution to afford every facility for professional development during the most favourable years the student has to devote to study and groundwork. On the other hand, there is nothing more discouraging than to thwart the spirit of enterprise of a young engineer; it is tantamount to stifling the root at its planting and expecting the fruit to be the more abundant.

In every case industry merits its reward, but in engineering the student's qualifications have been too much measured by stringently framed rules, which is much too mechanical a method for measuring an engineer's capacity. Prescribed syllabus examination leads to a surface priming and cramming, with the result that when once an end is obtained the student feels a self-assurance that proficiency is arrived at, and his education complete, and there he stops. Should the spurs be won by perseverance and personal worth that man would plod on for years until he became saturated with interest in his studies, and inspired with a desire to go deeper in search of knowledge. It is this spirit of enterprising perseverance which benefits the profession permanently.

The society whose influence will be greatest is not necessarily that which has the largest number of members holding elevated positions, but rather that whose endeavours are greatest in uplifting the status and encouraging the young engineer, by giving facilities for intercommunication between aspiring pupils, assistants and elders, by giving opportunities to those who form the saplings of the profession to extend their knowledge and become interested in their calling, by cultivating a spirit of activity and competition. Such a society must succeed in improving the status of the rising generation of engineers. And such is the sole intent and purpose of this Institution of Municipal Engineers. This institution is a bureau for information. Any member can obtain information at any time on any subject by sending his enquiry to the secretary. The institution's lending library is also for the use of members, and volumes are dispatched to all parts of the country. The student requiring information on a given subject receives the latest and best literature thereon, besides (if desired) information gathered from other members who have had to do with works of the nature of that forming the subject of enquiry. It is extremely gratifying to note that the forward steps taken by the institution in purchasing a lending library have so extensively been taken advantage of by its members.

The student who will study a given subject, by gathering together notes of the views of different authors, will be enabled to draw his own deductions and conclusions in actual practice, it being remembered that engineering productions are susceptible of many variations in character, and their utility is capable of being estimated from the ingenuity and skill of the designer and executor.

Having this in mind, the institution has adopted a broad view of the question of examinations, with the intention of infusing a wholehearted interest into the studies of its members. The student is encouraged to master specialised subjects, and to make a success of such branches of the profession as may particularly appeal to the individual. One subject must naturally lead to another, so that in due course the student attains a high standard by a soundly developed and practical insight into the depth of his profession.

For all that I have said with regard to the important position which the engineer occupies, together with the immense amount of cultivation he has to undergo in becoming fit and suitable to improve the conditions under which a crowded nation lives in these progressive days, it is much to be deplored that there is a tendency, and an ever-growing tendency, in every direction, to underestimate the value of the engineer's labours. While this unsatisfactory condition exists the profession is being undermined, and its progress belittled, and its followers are losing the respect and worth which are so essential to encourage those high ideals which lead to the best results.

It cannot be expected that a man struggling for a bare existence can devote much of his scanty earnings to the interests of his professional instincts and inclinations. He lives in a sphere of uncertainty in neither being protected by State nor assured as to his prospects in life, while, on the other hand, his energies are not backed up by superannuation. The municipal engineer has to live among the work for which he is responsible. The slightest pinhole for agitation will be taken advantage of by an ever-clamouring section of the public. The whole business is surrounded with difficulties and worries which would be ameliorated, if not entirely overcome, by statutory measures to afford protection and security of tenure.

An official who is honestly conducting the affairs entrusted to his care is deserving of every respect and consideration, in fact, assuming he has been well educated, trained, and proved he is a professional man of status; but if some councils will not appoint men who are qualified and approved by engineering societies, and bound by their rules, the profession must suffer. The tendency of public opinion is to go with the lowest and most discreditable example, whose interest is better served in being free than fettered by the rules of an accomplished society.

It will be seen by referring to the institution's *Journal* of December, 1909, that members are asked to report to the institution all cases of unfair or unjust treatment wherein an official's honour is affected. Many cases have been so reported, and these, together with the outcome of every case, so far as it has been possible to follow, have been filed. It is becoming more important every day that the claims of municipal engineers to protection by security of tenure should become an established fact, and it is evident that a record of some of the glaring cases by which surveyors are sometimes persecuted should be kept by the institution, and, if necessary, referred to in urging the just claim to which the profession is entitled.

I cannot too strongly emphasise the fact that every engineer has a moral obligation to perform in maintaining the status of his profession. This obligation is sometimes more honoured in the breach than in the observance, in trading on the privilege of taking premium pupils. In the first place, no pupil should be admitted without showing proof of a sound education. When a vacancy occurs for a pupil the applicants might be called upon to sit for competitive examination, or, in the case of only one applicant, he should show sufficient proof of education.

My own experience has been that many aspiring candidates fail to attain the standard necessary in general education to qualify them to become pupils to the profession, and unless, therefore, they continue their ordinary educational studies after entering an office, their success must be extremely doubtful. There is even another important aspect: the majority of pupils are articled for a period of three years only. Where is the pupil who in three years could consider himself capable? Five or six years, according to their age, until they reach their majority, should be the rule, and, in order to encourage the longer period, the premium should be refunded as an incentive to the acquisition of extended knowledge by attending meetings, classes, lectures and visits beyond their own sphere of training. The engineer who is responsible for the training of pupils has in return a great deal of assistance and useful work from the hands of his pupils to fully compensate him for his pains. Besides, by extending a pupil's period of training a less number of pupils would be admitted, and hence there would be far less of the present-day overcrowding of the profession, which has such a detrimental influence from the point of view of remuneration.

I would here observe that the population of a town does not always indicate the extent of the duties and practical nature of the experience to be obtained therefrom. The engineer of a comparatively small town may have a more responsible position to hold in the discharge of his valuable duties, than those associated with the surveyor's office in much larger towns. It is advantageous in many comparatively small towns to engage an official who will be responsible for all departments of work, such as water supply, sewerage, harbours and docks, sea defences, buildings, roads, bridges and permanent way, and architectural work in erecting hospitals, baths, market buildings, pavilions, &c., besides being responsible for the ever-varying routine and correspondence associated with a many-sided office and for wages and much financial work. There is nothing overdrawn in this allusion, and the official will be a very busy man, and must be particularly smart in his profession. Where is the large town where such variety would not be specialised and placed under separate management and spread over several individual departments?

It is, therefore, often erroneous to measure the opportunities for a pupil's training by mere calculation of area and population, and I will go further, and say that it is equally a misconception among professional societies to set down rules and regulations based on similar calculations with a view to arriving at an engineer's worth or status. The actual work and responsibilities of every engineer are the only sure proofs as to his active capabilities.

I think I have addressed you rationally and to the point of my own convictions, and should I have overstepped the mark by inadvertently expressing myself in terms that may in any respect hurt the susceptibilities of any member of the profession, I must certainly express my regret; but I have spoken purely in the interests of the profession I love, and must disclaim any intention of wounding or trespassing upon the susceptibilities of any member of it.

VOTES OF THANKS.

Mr. A. E. Prescott moved a vote of thanks to the president for the excellent address they had listened to. Having occupied the presidential chair himself, he could truly say that the president-elect always found very great difficulty in preparing an address, inasmuch as it was not easy to cover new ground. When they came to consider the number of kindred institutions in existence, each with a president, and each president giving an annual address, the difficulty became apparent of producing an address that would prove interesting. For some time past Mr. Latham had written papers on municipal engineering and other scientific subjects for other institutions, and it was not, therefore, a difficult matter for him to prepare an address on this occasion; and he thought they would agree that the one they had listened to was brimful of interest. Unfortunately, or fortunately, they could not discuss a presidential address, and there were many things in Mr. Latham's address that they could discuss till to-morrow morning if they had the opportunity. A remark had been made by the Mayor of Penzance about public officials and criticism. Public officials were not afraid of criticism, but on the contrary welcomed it. Unfortunately, a good many ignorant people looked upon a municipal surveyor as an official of no importance. If they took the town clerk they would find that whether it was that he looked wise or felt wise, or because he possessed legal knowledge, councillors were sometimes afraid to tackle him. The same thing applied to the medical officer of health. In the case of the surveyor they found that some builder, on the strength of having laid a few drain pipes, immediately felt justified in discussing and criticising some large drainage scheme upon which thousands of pounds were to be spent, and to criticise the action of the surveyor in connection therewith simply because he was the surveyor. It reminded him of the Irishman who, on being told that certain work was being carried out by the board of health, remarked that "he had often heard of the board of health, but shure he'd niver seen it before." It was an illustration of the ignorance prevailing with respect to the work which municipalities carried on. The municipal engineer was brought in touch with a mass of varied work, and he was not afraid of criticism—he believed it was the best thing for him. All they asked was that it should be fair and honest. He was very pleased to see Mr. Frank Latham in the chair, and they were all pleased to welcome his uncle, Mr. Baldwin Latham, amongst them. If the nephew succeeded in making a name like his uncle he would be able to look back with interest to his term of office as president of this institution. He (Mr. Prescott) wished him a happy and successful year of office, and he was sure the interests of the institution would not suffer in his hands.

Mr. H. C. H. Shenton (Westminster) seconded the proposition, and remarked that the members were to be congratulated upon having Mr. Latham as their new president. There were differences of opinion with respect to what was called the hereditary principle. Mr. Latham came of an engineering family, and they had with them that day his uncle, Mr. Baldwin Latham, for whom they had all feelings of regard, and he might say affection, because in their student days they had read his works on sanitary engineering.

and probably consulted them when designing their works, while it was also probable that later they had made his acquaintance personally. Mr. Frank Latham had started life with what might be called reflected glory. He had proved he would have made his mark if he had not had such an advantage, and he (Mr. Shenton) thought the institution was in for a good time, because he was sure that under his guidance they would advance and do great things.

Mr. Baldwin Latham said it afforded him great pleasure to be present and to see his nephew occupying the position of president of that institution. He (Mr. Baldwin Latham) had occupied the position of surveyor in more than one town, and one of the things he tried while he was at Croydon was to induce the surveyors of the country to form themselves into such an association as this. He did not succeed; surveyors at that time were not ripe for combining, and since then many had bitterly regretted the failure of the proposal. He thought it was very important this institution should look after the interests of municipal surveyors, and it was equally important that the question of security of tenure should be seriously considered, and provision made for old age. The country had been induced to give an old age pension to many who probably never deserved it, but surveyors and inspectors of nuisances, who were intimately associated with the maintenance of the public health, were entirely neglected. The time was not long before it must be recognised that this neglect should cease. The profession of municipal surveyor was no doubt very important, and he always pitied the surveyor just before election time, because he knew from experience how often a certain class of ratepayers were desirous of bringing themselves prominently before their fellow-ratepayers by harassing officials, and promising to do great things when they were elected. As soon as the election was over things gravitated back to their normal position, and the surveyor had peace, and was able to carry out his duty. With reference to the question of architecture, he did not think he would ever have made an architect, but his brother, Mr. Frank Latham's father, had a decided call in that direction, and he had no doubt the mantle would fall upon his son. His (Mr. Baldwin Latham's) *forte* had always been investigating. He was still a pupil, still learning, and always carrying out some experiment or other. He had been carrying out experiments all over the country with respect to underground water, which was one of the most important matters of the present day with regard to public health. He knew Mr. Frank Latham was very fond of investigating and experiments, and it was only by investigation that progress could be made. He was glad to be with them and to support his nephew in the honourable position to which they had elected him.

The President, in reply, expressed his entire willingness to do everything in his power to forward the interests of municipal engineers, and especially the interests of this institution. They had had four years of uphill work, but such was his interest in the institution that scarcely a day had passed during that time but what the secretary had heard from him in his position as hon. treasurer; in fact, he believed Mr. Wyand had sometimes had two letters from him daily. He had to thank his uncle (Mr. Baldwin Latham) for the kind manner in which he had spoken; it was a great pleasure to him to see him present representing the family.

Mr. Horace Boot (Westminster) proposed a hearty and sincere vote of thanks to the retiring president. All of them who had worked with Mr. Stickland could not but admire the energy, ability and diplomacy with which he had managed the affairs of the institution during his term of office. Many times at council meetings he had been struck with Mr. Stickland's conduct in the chair. At these meetings members did not always see eye to eye, but the wonderful way in which Mr. Stickland managed to hold a meeting together and bring the members to one mind represented one of the highest forms of diplomacy which a surveyor could show. It had been a very busy year with them, and for the reason for this they must look to their retiring president. What, it might be asked, were the qualifications of a good president of their institution? Clearly one must be popularity, another progressive ideas, and there must also be engineering ability and tact. Mr. Stickland had displayed all these qualities. Among the many meetings he had attended was the aviation meeting at Hendon, which was the first of its kind ever held by any institution or society in the world. On that occasion they saw their president flying, and all of them hoped it might not be long before they found him flying from Windsor to a position of far greater importance.

Mr. H. C. Adams (London) seconded. Mr. Stickland when he took office declared that he intended to devote himself heart and soul to the business of the institution, and he had done so. He had not spared himself in anything, and it was to be hoped that now he had left the chair he would not be content with taking the rest he had so well earned, but that after he had completed his three years' term as a member of the council he would continue to render them all the assistance in his power for the rest of his life. During the year they had held many good meetings, but they had rather consolidated their position than opened up much that was new. They had had a tremendous lot of work to do on the council, and many things to consider, especially the organising of the districts. These were working smoothly, but the distances dividing the members were so great that it was a matter of some difficulty to bring them together. The question of superannuation and security of tenure had also been up, and the president had given them the benefit of his advice. Mr. Stickland had, in fact, been of the greatest service to the institution, and he was sure they were sorry to lose him from his presidential position.

Mr. A. E. Stickland thanked the members cordially for the appreciation they had shown of his services and their approbation of his conduct in the chair. He had sought to be broad-minded and fair, and to see that everybody had exactly the same kind of treatment: he did not believe in one person receiving one sort of treatment and another person another sort. With respect to the aviation meeting he did not wish to take credit for that. Mr. Wyand, the secretary, was the chief instigator of that gathering, and the credit was rightly due to him. When they were looking for new members he trusted they would be as broad-minded as possible, for there were many professional men who, in twenty or thirty years' time, they would regret had not been with them as members of the institution.

The Secretary, alluding to the aviation meeting, stated that as a matter of fact Mr. Stickland mentioned the subject of aviation in his address, and he afterwards discussed it with him.

ELECTION OF COUNCIL.

It was announced that the election for president, vice-presidents, treasurer and council had resulted as follows:—

President: Mr. Frank Latham, M.Inst.C.E.I., borough engineer and surveyor, Penzance.

Past-Presidents: John T. Pegge, city engineer and surveyor, Durham; A. Ernest Prescott, borough engineer and surveyor, Eastbourne; Ernest Albert Stickland, Assoc.M.Inst.C.E., borough surveyor, Windsor.

Vice-Presidents: Messrs. Henry C. Adams, Assoc.M.Inst.C.E., M.I.Mech.E., A.M.I.E.E., consulting municipal engineer, 60 Queen Victoria-street, E.C.; Horace L. P. Boot, M.I.E.E., M.I.Mech.E., consulting engineer, Tunbridge Wells Corporation electricity works; Arthur Bowes, Assoc.M.Inst.C.E., surveyor, Newton-in-Makerfield Urban District Council; H. J. Farmer, borough surveyor, Christchurch, and W. H. Matthews Jones, city engineer and surveyor, Chester.

Hon. Treasurer: Mr. Thos. Mundy [illegible], borough engineer, Woolwich.

Ordinary Members: Messrs. Jerrold Abbott, surveyor, Ashbourne Urban District Council; T. C. Barralet, surveyor, Godstone Rural District Council; Willie Bevan, borough surveyor and waterworks engineer Haverfordwest; A. R. Bleazard, borough engineer Clitheroe; Walter Louis Carr, engineer and surveyor, Ruislip-Northwood Urban District Council; Alfred H. Carrell, county road surveyor, Leicester County Council; Reginald G. Coates, district surveyor, Norfolk County Council; Frank Cutler, deputy borough surveyor, Deptford, S.E.; John Davison, borough surveyor, Morpeth; Arthur James Elson, deputy engineer and surveyor, Penge Urban District Council; Frank E. Ennals, surveyor, Billericay Rural District Council; Douglas C. Fidler, surveyor, Hayes Urban District Council; William Finch, county surveyor and bridgemaster, Cumberland County Council; Fredk. Hatcher, deputy borough engineer and surveyor, Neath; Ernest W. Hearn, borough surveyor, Chard; Henry Hulse, borough surveyor and engineer, Droitwich; R. Williams Jones, county surveyor, Carmarthen (Western); John Lewis, surveyor, Yiewsley

Urban District Council; Colin H. Macfarlane, burgh engineer, Rutherglen; H. W. Marsden, borough surveyor, Richmond, Yorks; John R. Mead, deputy borough engineer and surveyor, St. Helens; J. W. Moncur, M.INST.C.E., borough engineer and surveyor, Sunderland; A. W. Nye, surveyor, Shoreham Urban District Council; Ernest E. Ryder, surveyor, Bushey Urban District Council; H. C. H. Shenton, civil engineer, 28 Victoria-street S.W.; J. Taylor, sanitary surveyor, Uckfield Rural District Council; W. T. Unwin, town and district surveyor and architect, March Urban District Council; Ernest W. Veale, surveyor, Farnham Rural District Council; Henry J. Weaver, consulting engineer, Northgate Mansions, Gloucester, and Edward Whitwell, engineer and surveyor, Abersychan Urban District Council.

A number of letters of regret for inability to attend were received, and Mr J. T. Pegge, city engineer of Durham, first president, telegraphed hearty wishes to the new president during his year of office. The town clerk of Penzance, Mr. T. H. Cornish, and other official colleagues of Mr. Latham, also forwarded a telegram on behalf of the town hall staff offering hearty congratulations to the president upon the well-deserved compliment paid to him by the members of the institution. Mr. Cornish added that he deeply regretted being unable to attend the meeting.

In the evening a reception was held in the Throne Room of the Holborn Restaurant, Mr. and Mrs. Frank Latham and the Mayor and Mayoress of Penzance receiving the members and their friends. At the social evening which followed, some 120 being present, Mr. Latham occupied the chair and an excellent musical programme was given.

Mr. Latham welcomed his guests in a few words, explaining that it was an unwritten law of the institution that, on occasions of the present nature, speeches should be dispensed with.

An interesting departure from the rule took place during the interval, when Mr. Latham, on behalf of the institution, presented the Mayoress of Penzance with a silver clock as some expression of appreciation of the kindness of herself and the Mayor in undertaking the long journey they had for the sole purpose of attending that day's meeting.

The musical programme was thoroughly appreciated, every item, without exception, being distinctively good, and marked by a determined encore. The evening concluded at about 11.30, and the party dispersed to make its way home as best it could in the dense fog which had by then descended.

(To be continued.)

EASTERN DISTRICT MEETING AT CODMANCHESTER.

A meeting of the Eastern District of the institution was held at Godmanchester on Tuesday, when the members were received by the mayor, Councillor J. P. L. Durrell Stables. Some thirty attended, and the day was spent in a round of visits to the various works of the borough, under the conduct of Mr. C. Mayfield, the borough surveyor. Pressure of space prevents a full report of the proceedings, but it is hoped that this will be given next week.

Cleansing Work at Manchester.—Mr. R. Williamson, superintendent of the Manchester Cleansing Department, has this week issued the annual report of the work done. The gross expenditure of the department for the year ended March 31, 1912, was £218,000, and the gross income £73.132, the nett cost of the department being £145.000. From 141,057 dwelling houses, 4.511 lock-up shops and 4.371 workshops within the city there were collected and disposed of during the year 139.702 tons of ashes, 31,373 tons of nightsoil and pail contents, 16,544 tons of warehouse and trade refuse, 6 368 tons of slaughter-house refuse, 5.504 tons of stable manure, and 2.491 tons of fish refuse. The length of streets cleansed by the department was 542 miles, and during the year 709,000.000 sq. yds. of footpath and carriageway and 404.385 courts and passages were swept, 397,572 grids were opened, and 96.019 barrels of water and 3 444 tons of sand and chippings were used on the streets. The principal streets are swept every day, and afterwards kept in order by a staff of orderly youths. From the city thoroughfares and markets 81 551 tons of street sweepings and 4 293 tons of market garbage were collected and disposed of. The total weight of refuse collected and disposed of by the department during the year exceeded 290.000 tons, or nearly 1,000 tons each working day.

THE NORFOLK FLOODS.

DAMAGE IN THE CITY OF NORWICH.

Following upon the recent inundations in Norfolk, an exhaustive report as to floods and their prevention has been prepared by Mr. Arthur E. Collins, M.INST.C.E., the city engineer of Norwich. While we regret that, as the document in question has not yet been presented to the council, a copy is not available for publication, Mr. Collins has favoured us with the following statement as to the damage done in Norwich:—

"I may say the public works of the city, excepting the electricity works, suffered but very little from the flood. Some £700 worth of wood blocks were floated up from the streets and lost. I also had about £100 worth of cement spoiled, and a considerable amount of disinfectant, and so forth. None of the public buildings were injured, nor the bridges, public river-walls, and such like. Considerable damage was done to private structures abutting on the river or which got flooded by reason of the river flood, or by reason of the intense rains running down the walls and getting into the foundations.

"There were some cases of broken sewers due to subsidences from similar causes. In the chalk formation here trouble is often experienced by reason of collapse of ground over pipes or gaults in the chalk—that is to say, natural shafts in the chalk which gradually become filled by the falling away of the ground above until at last the caving-in extends through to the surface. Many previously unknown weak spots of this sort were found out by the flood, and holes many feet in diameter and several feet deep were formed. I have known the basement of a house to collapse into a place of this sort, leaving the house, which was one of a terrace, hanging up by its front and back walls, which abutted on to the adjoining property.

"The basement of the Technical Institute was flooded to a depth of about 8 ft. The windows of this basement, which overlook the river, were purposely made to withstand the pressure of water of a flood 18 in. higher than the historic flood of 1878, but the recent flood rose several feet higher than that, and the final damage was done by a barge washing down the river striking the window and breaking it, so that the building very rapidly became flooded. Not much damage was done beyond the ungluing of some furniture and covering the place with mud.

"The condition of some of the privately owned riverside buildings is very serious. The Norwich Mercury Printing Works, a comparatively modern building, with steam machinery and a tall furnace chimney, had its river foundation washed out and the end was caused to collapse to such an extent that pulling down operations on a large scale had to be carried out to prevent public danger. The adjoining building, a malting belonging to Messrs. Bullard's Brewery Company, suffered in much the same manner, and on the opposite side of the river one of the buildings of a large clothing factory was similarly affected. Lower down a smaller factory had its gable end washed away. Private river-walls along the river have suffered very serious damage.

"The damage to the county of Norfolk bridges has been of a very extensive character, and resulted almost entirely from the washing out of the foundations, which were not carried sufficiently deep; curiously enough, as far as I can see, the damage has been chiefly to bridges constructed from a quarter to half a century since, and not to old bridges nor yet to new ones. The Great Eastern Railway Company have suffered very serious damage from the washing out of bridges and from the flooding of their lines in the marshes. This flooding has not entirely cleared away yet, although sufficiently to allow traffic to be resumed."

The Concrete Institute.—A course of six educational lectures on "Concrete: Its Properties and Manufacture," will be given by Mr. H. Kempton Dyson, secretary of the Concrete Institute, at 5.30 p.m. on the following Tuesdays: November 12th, 19th, 26th, December 3rd, 10th and 17th. The lectures, which will be given in the lecture hall of the Concrete Institute, at Denison House, 296 Vauxhall Bridge-road, Westminster (close to Victoria Station), will be of approximately one hour's duration, and will be illustrated by diagrams, photographs, specimens and apparatus. There is no fee for the course; admission will be by ticket, obtainable on application from the secretary, the Concrete Institute.

The Local Government Report on the Intercepting Trap.*

By H. C. H. SHENTON.

The report of the Departmental Committee appointed by the President of the Local Government Board to inquire and report with regard to the use of the intercepting trap in house drains, deserves the close attention of the municipal engineer, and may be usefully discussed. It is probable that as a result of the evidence brought forward the Local Government Board will alter their Model By-laws to the extent of permitting, or even of demanding, the omission of intercepting traps in house drains. It is not the author's object to review the report, but merely to start a discussion among members of the municipal engineering profession, who collectively must possess far more knowledge of the subject than any other body of men.

The sanitary expert and the engineer in private practice view the matter from a special standpoint. Their knowledge is to a great extent limited to the drainage of the better-class houses, and they have, as a rule, a very limited knowledge of the conditions which exist in the mass of houses of the working classes. Neither have they the drainage of whole towns and districts under their control. They are, therefore, more likely to be surprised at the conclusions of the report than those men who have for years made a daily study of the conditions which exist in the sewers and drains of a town taken as a whole.

The private engineer who is a sanitary expert may design systems of drains perfectly, and may see to it that these are absolutely well constructed, properly ventilated and flushed. Moreover, he will very likely be able to see that they are cleaned periodically, and that they are frequently inspected. He may take special steps to avoid the troubles which are mentioned in the report. He may regard the blocking of an intercepting trap on his system as a thing never likely to occur, and, moreover, he will, without doubt, take such steps as will prevent any possibility of nuisance or danger to health, even if the trap does get clogged.

It is also quite reasonable to imagine that the owner of property who has carried out such a scheme on his drainage system would object to allow the sewers, which are not as clean as his drains, to be ventilated through them, but such cases are the exception and not the rule. The sanitary expert is better acquainted with these cases than with the drainage system of ordinary houses, and arguments in favour of the intercepting trap, which are based on the existence of the perfect system, designed regardless of cost, have practically no bearing upon the present case.

A considerable section of the report is devoted to the demonstration of the fact that the importance of sewer ventilation, and even of drain ventilation, is not as great as is generally supposed. Apparently there is no reason to omit the intercepting trap for the better ventilation of sewers. We are told that "if, therefore, the objection to the intercepting trap rested solely or mainly on its interference with sewer ventilation, we should be inclined to question the importance of such an objection."

It is, moreover, evident that if sewer gas is noxious we do not want outlets close to our houses. If, on the other hand, the sewers do not require this ventilation, one great argument in favour of the abolition of the intercepting trap falls to the ground.

There also appears to be no doubt that the intercepting trap is effective, for one of the conclusions contains the statement that "it seems to be established that the trap does serve as an effectual barrier to the entry of sewer air into the house drain, which is the fundamental advantage claimed for it. It is not liable to be forced and rendered useless, as has been supposed to be the case, by pressure of air from the sewer."

There is, however, one great and absolute objection to the trap, and that is its liability to become stopped up. The evidence brought forward in the report that this is overwhelming, and herein lies the need for alteration in the general practice. It is unnecessary at a meeting of municipal engineers to dwell upon the dangers resulting from a stopped drain. It would, however, be interesting to receive fresh evidence from the members present as to the prevalence of the stoppage of traps.

There is one point with which the report deals somewhat too lightly in the author's opinion, and that is the value of the trap as a barrier against rats. The report tells us that Mr. Patten Barber gave evidence to the effect that he had seen rats chased into the inspection chamber of a drain, where they escaped into the sewer through the trap, and conversely that Mr. Woods, sanitary inspector of Willesden, saw three or four rats come up from a sewer through an intercepting trap.

The author has recently had experience in Kensington of rats coming up through holes in the ground on the sewer side of a house interceptor. The examination proved that the connection was an old brick barrel of a defective nature, through which the sewer rats came. Although it was evident that the rats came up close to the interceptor, it did not appear that they had entered the house drains. The connection has now been repaired, and it has been assumed that the trap will exclude the rats from the house drains. If rats come through traps, how is it that they are practically unknown in London houses except where the drains are untrapped? . . .

Again, though the author has frequently seen rats in sewers, he has never, during twenty years' experience on and off of house drains, seen a rat on the house side of the interceptor, though in untrapped drains he has seen them.

The fact that rats have been known to pass through traps under certain conditions does not prove that the trap is, under ordinary circumstances, an ineffective barrier. . . . If the intercepting trap is not an effective barrier, neither is the gully or water-closet trap, and there is therefore every reason to expect that where there are many rats in the sewer, they will come into the houses. We know from experience that this is not so. The inefficiency of the intercepting trap as a barrier against rats, as stated in this report, is therefore a point upon which further evidence is desirable.

Another question, and perhaps the most important of all, is the manner in which to act when it is finally established that intercepting traps are to be done away with. The Model By-laws having been altered, and the local authority having decided to act upon them, what will then be the position? Houses situated in positions far apart will have to be drained. Are these houses alone to be new points at which the sewers are to be ventilated? It may well be that in a town where there are many houses without intercepting traps the ample ventilation given prevents the likelihood of any nuisance due to the escape of an unduly large volume of sewer gas or smell at one point, but when, say, one house drain on a long length of sewer is to be made to ventilate that sewer, may there not be a considerable nuisance at that point? It is common experience that when a new system of sewers is put into operation smells occur at unexpected points. Smell escapes and is noticeable at some open cover, and the inhabitants are not slow to complain. This is quite as likely to happen at an open cover near a vent shaft as elsewhere. Theoretical principles do not seem to prevent the inlet ventilator from acting as an outlet, or to prevent the bulk of the smell issuing at some point not intended instead of at several ventilators placed for its special accommodation. Is not the same thing very likely to occur if one or two house vent pipes are used for sewer ventilation at houses, and may not the municipal engineer have to deal with complaints, imaginary or otherwise, from local residents who are alarmed? The author, having had considerable trouble from objections raised to purely imaginary smells from sewer vent shafts, cannot avoid the impression that there must be possibilities of trouble for the municipal engineer in the application of the new method.

Again, would it be possible to remove all the traps in the town? It would be easy to make them inoperative as traps by removing the cleaning eyes, but this would not do away with the chief danger—viz., that of stoppage. However, it would be desirable to remove all cleaning eyes as a start, rather than to make a few house drain vent pipes the only new sewer ventilators.

The chief point, therefore, which the author wishes to raise for discussion is how best to apply the teachings of the report.

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* Paper read at the Fourth Annual General Meeting of the Institution of Municipal Engineers.

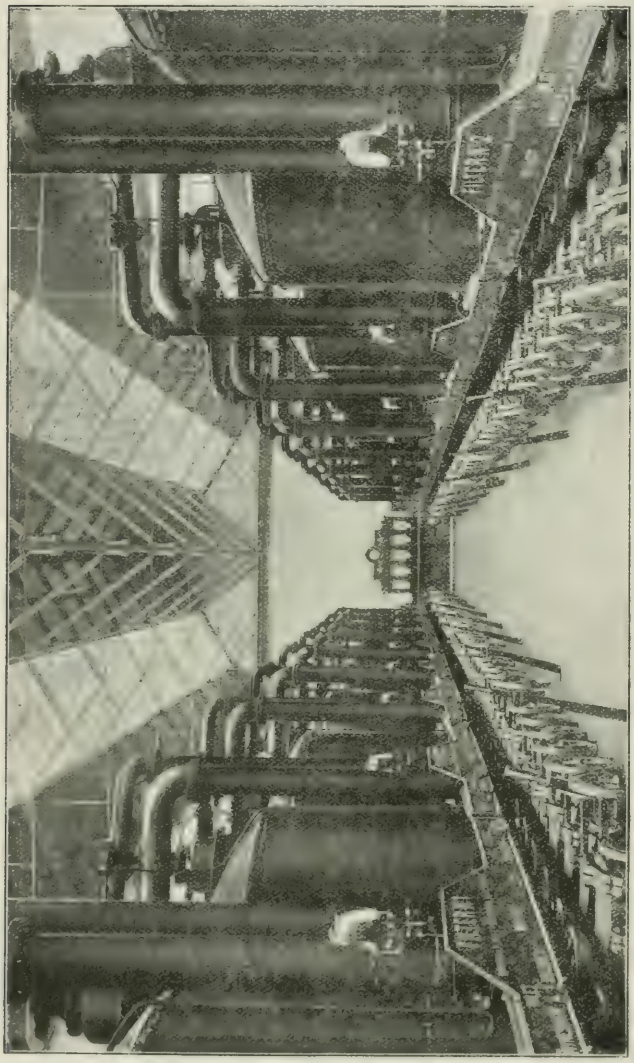
ASHTON-UNDER-LYNE, STALYBRIDGE AND DUKINFIELD WATERWORKS.

INSTALLATION OF PRESSURE FILTERS.

For the past fourteen or fifteen years the Ashton-under-Lyne, Stalybridge and Dukinfield (District) Waterworks Joint Committee have been treating certain water in the Swineshaw Valley with a neutralising reagent for the purpose of rendering the water non-plumbo solvent, but as the discoloration and turbidity was not in any way removed under this method of treatment, the joint committee decided, the period under observation were so satisfactory that the joint committee decided to take steps to deal with all the water supplied in their district. The joint committee visited and inspected similar plants installed by other water authorities, and, after careful consideration, decided to instal in both valleys mechanical filters of Messrs. Mather & Platt's well-known pressure type, fitted with patent washing apparatus.

The site of the filter house at Ashway Gap, Greenfield, being already fixed by the existence of the experimental plant, it was only necessary to extend the existing building by about 75 ft.

In the case of the filter house for the Swineshaw Valley supply, it was desirable to select a site conveniently situated to control all the three reservoirs in the Swineshaw Valley used for domestic and trade purposes. The site decided upon was at the toe of the Brushes reservoir embankment, owing to its sheltered and accessible position from an administrative point of view.



Interior of Brushes Filter House.

The two installations comprise thirty-six pressure filters, designed to purify collectively 5,352,000 gallons of water per day, and together form one of the largest pressure-filtration schemes in the country.

Each installation consists of two major parts—viz., the filters and the chemical plant.

Each of the filters consists of a closed cylinder, having parallel sides with dished ends top and bottom, and is constructed of riveted steel plates. The Ashway Gap cylinders were tested under a hydraulic pressure equal to 150 lb. per square inch, applied continuously for a period of one hour, and in the case of the Brushes cylinders the test was equal to 250 lb. per square inch, applied continuously for a period of three hours. The filtering medium, which is of an average thickness of 3 ft. 6 in., consisting of specially graded quartz crystals, rests on a steel false bottom, riveted to the shell of the filter, and fitted with circular phosphor bronze nozzles screwed in from the underside. Ready access to the nozzles can be obtained by means of the manhole placed in the collecting chamber, where they may be inspected or replaced without removing the quartz bed. The object of the nozzles is to ensure the effective use of the filtering bed; also to prevent particles of the filtering medium getting into the filtered water mains and to ensure the proper distribution of the water used for washing out the filter.

The unfiltered water enters at the top of the filter, and is evenly distributed over the bed, and after percolating through the filtering material, flows into the collecting chamber, and is then delivered into the filtered water mains, and thence direct to the service pipes for consumption.

For cleansing the filtering material a vertical tube is fixed in the centre of the bed, extending to within a few inches of the top level of the filtering material. Suspended in the tube is a steel shaft, on which are

to make extensive enquiries as to a more up-to-date plant by which the process of mechanical filtration and chemical treatment could be advantageously applied.

The results of the investigations were incorporated in a report presented by the engineer, when the joint committee immediately decided to put down a small experimental plant at Ashway Gap, for the treatment of the water from the Greenfield reservoir. Three pressure filters with a chemical apparatus capable of dealing with a maximum flow of 432,000 gallons per twenty-four hours were installed in June, 1909, under Messrs. Mather & Platt's patent.

The results given by the experimental plant during

fixed, a short distance above the top of the tube, two jets connected with the filtered-water main, and a propeller situated in the upper end of the tube. The shaft is driven from outside the filter by means of belting.

When it is required to wash the bed filtered water is admitted to the underside of the false bottom, and, rising through the nozzles, puts the bed in suspension. The shaft with the jets and propeller thereon is then caused to revolve at a high speed, and the quartz is thoroughly cleansed by being drawn up the vertical tube and passed over the top, where it comes in contact with clean filtered water issuing from the jets at a high velocity. The filtering medium then sinks in the filter, and the floating impurities are carried away with the wash water through the wash-out discharge pipe at the top of the filter.

The chemical apparatus consists of small vertical ram pumps in duplicate, driven by rotary water motors placed at the end of the filter-house on the unfiltered water mains; alumina tanks (built in ferro-concrete) provided with dissolving trays and hand agitating gear; and lime tanks (built of steel riveted plates) provided with agitating gear driven by a small Pelton wheel. The water motors driving the chemical pumps are specially designed to vary the speed in the same ratio as the rate of flow in the filters. Consequently the quantity of chemical solution pumped into the main is always in proportion to the quantity of water passing. The pumps are fed from the chemical tanks and deliver the solutions into the water on the inlet side of the water motor. A thorough mixing of the solutions with the water is thus ensured.

The Ashway Gap installation consists of eighteen filters, three 8 ft. 6 in. diameter and fifteen 8 ft. diameter, with chemical apparatus, housed in a building 111 ft. long by 36 ft. wide.

The water is conveyed to the filters by two 15-in. mains, one from Yeoman Hey reservoir, under a head of 20 lb. per square inch, and the other from Greenfield reservoir, under a head of 75 lb. per square inch.

The motive power used for driving the washing gear of the filters is obtained from a Gilkes Vortex turbine, working under a head of 130 ft., and driven by water taken from the compensation supply.

A runway for the conveyance of chemicals traverses the whole length of the house, and so allows the chemical tanks to be fed from the chemical stores in the basement by the use of a false bottom skip which discharges into hoppers fixed on the chemical tanks.

A sedimentation tank, with a capacity of 25,000 gallons, is provided outside the filter-house, and into this all wash water is discharged. After sedimentation the water is decanted automatically by means of a syphonic floating outlet, and the clear water is discharged into the compensation basin, while the sludge is pumped on to the land by a belt-driven 6-in. ram pump. The wash water as it comes from the filters is registered through a 6-in. Kent's waste-water meter.

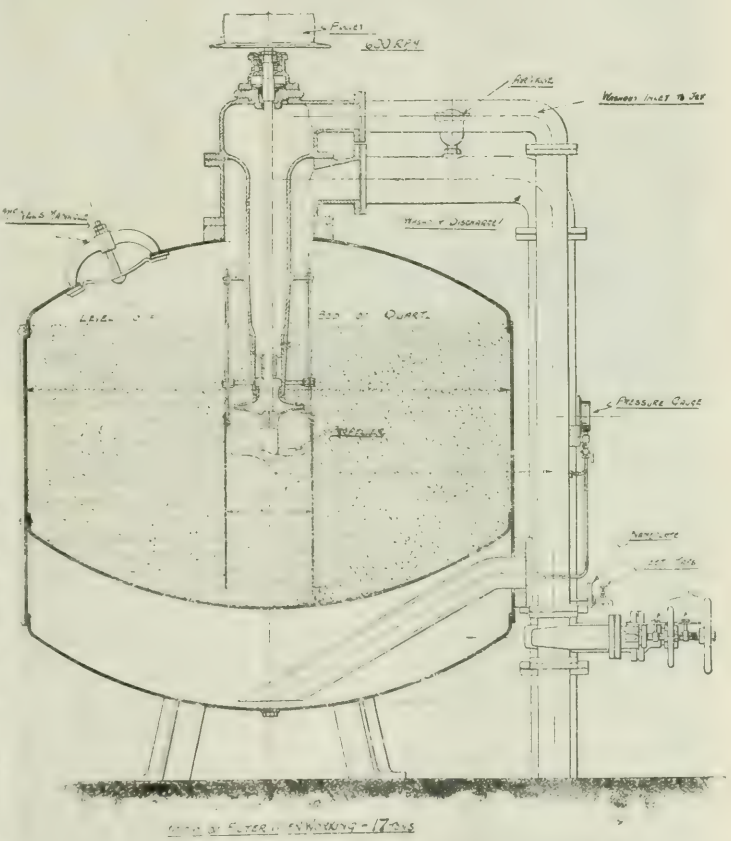
The plant is capable of filtering and treating 2,760,000 gallons of water per twenty-four hours.

The Brushes installation consists of eighteen filters, 8 ft. diameter, with chemical apparatus, housed in a building 126 ft. long by 36 ft. wide.

The water is conveyed to the filters by a 24-in. main from Brushes reservoir under a head of 20 lb. per square inch, and an 18-in. main from Swineshaw reservoirs under a head of 130 lb. per square inch. The motive power used for driving the washing gear of the filters is obtained from a "Gunther" Pelton wheel supplied in duplicate, working under a head of 300 ft., and driven by water taken from the compensation supply. The water, after it leaves the tail race, is registered over a V notch by a "Lea Recorder."

The capacity of the installation is equal to 2,592,000 gallons per twenty-four hours.

The estimated cost of the whole scheme is £30,000.



Sectional View of 8-ft. Diameter Mather & Platt Pressure Filter.

The works have been designed and supervised by the engineer for the joint committee, Mr. Fred J. Dixon, F.G.S., Assoc.M.Inst.C.E.; Mr. C. H. George, Assoc.M.Inst.C.E., has acted as assistant engineer.

The whole of the machinery and plant has been designed and the installation carried out by the contractors, Messrs. Mather & Platt, Limited, Manchester.

Professional Defence.—The question of forming a Board of Professional Defence for the purpose of advising and if necessary assisting members in cases involving matters of general interest to the profession on points of practice has been carefully considered by the council of the Society of Architects, with the result that an Advisory Committee has been formed. An adequate sum has been earmarked to form the nucleus of a Defence Fund. Cases submitted to the secretary will be brought before the board, who will advise the council as to the course to be adopted.

The Modernising of Building By-Laws.*

By FREDERICK W. PLATT.

The recent circular letter of the Local Government Board to local authorities directing attention to the need of reviewing the existing codes of by-laws in operation in the various local governing centres of England and Wales is deserving of much attention.

By this letter the board recognise that the use of modern materials and modern methods of construction is neither adequately nor precisely sanctioned in the Model Code, which was first issued in 1877, and has from time to time been extended and revised, but is still mainly in its phrasing identical with the original issue.

That the board have until now shown reluctance to modify or revise their code, upon which great care and forethought had been expended, is not to be wondered at; for anyone whose duty it has been to draft a building by-law will know how difficult it is to find words which, while being precise and fulfilling the conditions of statute law, furnish that *via media* which reasonable persons feel they can support. The Model Code has, on the whole, been serviceable. It now needs modernising, and the intention of the board to do so is greatly welcomed.

By-laws dealing with new streets and buildings may be made under sec. 157, Public Health Act, 1875; sec. 23, Public Health Acts Amendment Act, 1890; and sec. 24, Public Health Acts Amendment Act, 1907.

The object of making rules or by-laws might shortly be said to be this: That every individual who decides to lay out any land for building purposes or to erect buildings thereon shall, in such laying out and subsequent development, provide at each building a quota of open space for traffic purposes and for domestic purposes, shall construct each building so as to provide against fire, be healthy in itself, be properly drained, be responsible for its share of the outfall sewer, so that all would collectively form a properly developed town.

That by-laws can be drafted which will be sufficiently comprehensive and explicit to furnish all the guidance needed to attain this is certain. They will not check building, as is popularly supposed. They will ensure good building!

The authors of the Model Code in drafting the earlier forms of by-laws had regard mainly to buildings of stone or brick construction, and apart from what is considered their respective character they are inappropriate to types of construction now in use, such as buildings of hollow blocks or slabs of terra-cotta, concrete, reinforced brickwork, &c.; for hollow or half-timbered walls, and steel or other framed walls hung with tiles, slates, &c., filled in where necessary with incombustible materials; for buildings where piers are employed, and where large window openings are needed; or for the thickness of walls of outbuildings.

Again, the ordinary clauses for the laying out of roads do not permit of the class of roads which have been designed in some garden cities, neither do they differentiate between the type of paving needed for varying grades of roads or for exceptional arrangements which are demanded in certain cases by the configuration of the ground. In a few words it might be said that the Code is voluminous without being comprehensive, and is too restrictive. It deals with details rather than types.

What form should modernising take? Take the question of walls, floors and roofs—that is, to ensure "due stability" in them! Should not the knowledge of the behaviour of materials be utilised in determining the various sizes of the respective parts rather than tabulated sizes of the thickness of each wall or of the materials being set out in the form of a by-law? For example, the present Model Code prescribes that buildings shall be enclosed with walls termed external, party, cross or return walls constructed of hard incombustible materials such as good bricks, &c., and then proceeds to give the thicknesses of the walls according to the particular height the wall is to be erected, neglecting entirely whether any loads were to be transmitted to such walls from floors or subsequent loading when in use.

In this matter of loading it is common practice to find that the joists of buildings of the cottage type were rarely built into party walls, but often are supported upon a wall half-brick in thickness and an external wall, the thinner wall thus carrying a greater proportion of the weight of the building than the thicker external wall. Obviously such an external wall, if built of the by-law thickness, might be either too thick when not loaded or too thin when loaded. The Code does not recognise a wall half-brick in thickness, nor does it, under such conditions as here mentioned, prohibit its use. Another fallacy is where almost the whole of a storey is required as an opening. The Code here requires sufficient piers to be provided, or in some cases storey posts, but never states what a sufficient pier or storey post is, or how such is to be determined.

Again, modern buildings of the warehouse type are rarely simple in construction. They are often built upon highly valuable land which leads to a varying distribution of the loads supported by the floors, whose strength has to be determined by the loading circumstances of each particular case. To apply a model code based upon a universal system of high loading to such buildings would result in unnecessary expense being incurred in the thickness of the walls or strength of the floors, without necessarily providing uniformity of strength throughout the building.

Therefore, if full advantage is to be taken of this opportunity to revise an existing code of by-laws, consideration should be given to the desirability of including in the revised code power to determine that the various parts of at least buildings of the "public" or "warehouse" class should be so designed that when loaded as intended the buildings would be in equilibrium throughout. Obviously much care would be needed to draft governing regulations. The following points, however, might form the subject of consideration:—

(1) The type of building and the purpose for which it would be erected.

(2) The type of material to be used in its erection.

(3) The maximum stresses permitted in such materials.

(4) The method of calculation to be followed in determining the resistance of the materials, and the effect of the loading on the various parts for the determining of both external and internal forces.

(5) The extent of the details required from the building owner to enable the local authority to be satisfied that due stability would be obtained, and the nature of the declaration that the building would be duly supervised during construction.

(6) The nature, type and extent of the tests to be made during and after erection to ascertain that the above conditions were fulfilled.

(7) The guarantee that the building would not be internally stressed to an extent exceeding the designed resistance.

Some such regulations would at once provide all the power that a local authority needed to ensure "due stability" in every portion of buildings other than those of the domestic type, and would remove from the Code all those cumbrous rules respecting thickness of walls and their attendant variations, consequent upon some contingency often more or less remote.

In matters of means of egress, disposition of seating in public assembly rooms, position of staircases, situation and type of sanitary accommodation in buildings, all could be more usefully regulated by taking into account the type of construction of the building as well as the nature of the business or undertaking to be carried on therein. What always obtains under the Model Code is that a minimum of structural stability, based upon an ordinary use, is prescribed; and this becomes in practice an actual maximum.

Domestic buildings would require different treatment to public or warehouse buildings. They are subject to greater changes and different usage. Yet modernising even in their "structural stability" by-laws is possible. Why should walls require footings if resting upon sufficient concrete or rock foundation? Why should parapet walls be needed, with all the risk

* Paper read at the Fourth Autumn Country Meeting of the Institution of Municipal Engineers.

of conveying moisture into the houses? Why should window frames be required to be set back 4½ in. from the face line of buildings? Why should overhanging eaves be prohibited, considering all the protection from dampness they afford to the walls beneath them? Many other questions could be usefully asked by those revising by-laws.

And the inquisition could be carried on throughout those by-laws which are made for "purposes of health." Why should isolating traps with their ground level inlets be demanded? Why should not power be obtained to enable a regulation to be made governing the cubic contents of a room, and prescribing the ratio between height, length and width of all living-rooms instead of the present one dealing only with height? Should not a regulation be possible requiring all dwelling houses to be provided with a pantry or larder, and also that all living-rooms should have at least one window in them through which the sunlight can pass every day the sun shines? By-laws dealing with the construction, direction, width, length and paving of streets should be carefully modernised. Should not regulations be made enabling the owners of streets to complete them with dustless paving rather than with the ordinary sett paving, which is often laid with open insanitary joints?

The limitation of the number of houses or other buildings in a row should be considered, and rules prescribed to direct that the course of streets should be such as to enable the maximum amount of sunlight to pass into the buildings erected upon their sides; and to further make provision for the encouragement of open spaces at the front in addition to the land set apart for street purposes, the latter of which might be reduced in width if additional space were provided for use as garden land in front of buildings. Some balancing clause, whereby this type of laying-out would be made possible, would have an encouraging effect upon the minds of persons who would be considering the development of land, especially if the effect of the clause would be to reduce the cost of street works, which oftentimes are greater than the value of the land for which the works are undertaken.

Many other points might be adduced to show the need of modernising, but one question should be kept foremost in the mind of those considering the subject, and this is it: That the local circumstances should be fully considered before determining the phrasing of any particular regulation.

While much might be learned by a careful perusal of other local authorities' by-laws, it would not be wise to blindly follow a by-law made for similar purposes by another authority, unless it was found to precisely and definitely express the exact needs of the authority desiring to adopt it. For experience does not confirm the desirability of accepting without question a by-law or regulation made by another authority upon some subject which is under consideration. This, together with a code of by-laws framed upon the knowledge obtained of the behaviour of materials under modern loading, would place a local authority in possession of by-laws freed from the objectionable features attributed to the present Code—namely, their elasticity and applicability only to stereotyped forms of construction. Some local authorities might urge that a code based upon these suggestions would be expensive to administer, because a technically trained staff would be required for the work; but as buildings in themselves are an essential indication of a town's prosperity, and are vitally necessary not only for the town's business but also for the housing of the population engaged in such business, it is not unreasonable to claim first importance for the subject. That men in the service of local authorities are capable of administering a code of by-laws based upon technical knowledge is beyond doubt; and it is not too much to say that such a code would receive the approval not only of the members of professional societies engaged in construction, but also of all whose desire it is to have well-developed towns with soundly constructed buildings therein.

"THE SURVEYOR" BOOK DEPARTMENT.

In response to suggestions from numerous readers, resident in remote districts at home and abroad, who find it difficult to procure the books they require, we have decided to establish a department for the supply of technical and scientific books, a selected classified list of which will shortly be published in our advertisement pages.

SANATORIA AND ISOLATION HOSPITALS.

"PERMA" BUILDINGS.

As the passing of the National Insurance Act will, in many parts of the country, necessitate the erection of additional buildings for use as sanatoria and isolation hospitals, not a few authorities will have to consider whether a suitable building cannot be obtained that, while not being so expensive as a finished brick structure, will be permanent, warm in winter and cool in summer, and will generally meet the needs for which such buildings are intended.

Mr. Lloyd George gave the probable cost at about £100 per bed, but the claim is made that what are known as "Perma" buildings can be erected at one-half this expenditure. These buildings are constructed of "Hy-Rib" reinforced-steel sheets with cemented surfaces, the exterior walls being finished with pebble dash. The roofs are covered with red asbestos slates, laid diagonally, plastered underneath, and interlined with inodorous felt, with half-timbered gable ends. The floors may be constructed of pitch-pine blocks and laid on a concrete foundation. The buildings

Type of "Perma" Building.

are well ventilated. All the interior partitions are constructed in a similar manner to the exterior walls. The interiors are decorated with "Walpamur" or "Alabastine" water paint, and finished to selected art tints.

The special advantages of these buildings are stated to be: (1) Low cost, as they can be erected complete at an outlay of about £50 per bed; (2) they are warm in winter and cool in summer, owing to cavity walls; (3) they can be speedily erected, and are artistic in appearance; (4) they are permanent, and absolutely rigid; (5) the Local Government Board will advance twenty years' redemption loan on this construction; (6) they are perfectly sanitary and well ventilated.

The buildings will be erected in any part of the country by Messrs. F. H. Heath, Limited, 22 Bridge-street, Manchester, who will be pleased to answer all enquiries, and to give any further information required.

Messrs. Heath also erect these and other buildings in composite asbestos and wood and iron.

Alterations at the London Guildhall.—The Corporation of the City of London have decided to proceed with the rebuilding of the structures on the east side of Guildhall-yard, including the art gallery, at an estimated cost of £68,000.

South American Water and Drainage Contracts.—In connection with the extension of the waterworks and drainage system, embracing an area of more than 38,500 acres in the northern and western limits of the city of Buenos Ayres, contracts have been awarded the Cleveland Bridge and Engineering Company (Limited), Darlington, for the manufacture and erection at Caballito, Buenos Ayres, of an elevated water reservoir, composed of three tiers of wrought-iron tanks supported on cast-iron quadruple columns. This reservoir will have a capacity of 16,000,000 gallons, and in its construction more than 15,000 tons of cast iron and steel work will be used. The contract for mild steel pipes, varying from 4 ft. to 5 ft. 1 in. in diameter, required for this reservoir, has been given to Messrs. Head, Wrightson & Co. (Limited), Thornaby-on-Tees, who have also received an order for the metallic lining for the main sewer of the new system.

LOWER THAMES VALLEY DISTRICT SURVEYORS' ASSOCIATION.

ANNUAL MEETING AT TWICKENHAM.

The annual meeting of the Lower Thames Valley District Surveyors' Association was held at the Town Hall, Twickenham, on Saturday, the 5th inst., when there was a good attendance.

The following gentlemen were appointed as officers for the ensuing year: Messrs. H. F. Coales, Assoc.M. Inst.C.E. (surveyor to Sunbury-on-Thames Urban District Council), president; R. Wilds (surveyor to Walton-on-Thames Urban District Council), vice-president; J. W. Croxford (surveyor to Brentford Urban District Council), honorary secretary and treasurer; J. A. Webb (surveyor to Hendon Rural District Council) and F. Sadler (surveyor to Acton Urban District Council) honorary auditors.

A vote of thanks was passed to the retiring president, Mr. E. Willis, Assoc.M.Inst.C.E., surveyor to the Chiswick Urban District Council, for the excellent work which he had done during his year of office in furthering the status of the association.

The honorary secretary's report for the past year was then read. This mentioned, *inter alia*, that during the session the association had held seven meetings and five visits in all, the undertakings inspected including Surbiton sewage disposal works (in course of construction), the Metropolitan Electric Supply Company's works at Willesden, Willesden Isolation Hospital, the sewage recorder at Willesden, and the Brentford gasworks.

The association felt some regret that none of their members were elected to the council of the parent institution—the Institution of Municipal and County Engineers—as had been the case in previous years, though this could be attributed to the new mode of election. It was noted with satisfaction, however, that at the Eastern District meeting of the institution held at Grays, Mr. E. Willis, the ex-president, Mr. A. Gladwell and Mr. S. H. Chambers, all members of the association, were elected to act on the District Executive Committee. Mr. W. R. Hicks, of Ealing, who is chief assistant to Mr. Charles Jones, a member of the association, was also elected on this committee.

During the season three most interesting papers were read and discussed—*viz.*: "Notes on the Latest Sewer and Drain Definitions Approved by Parliament," by Mr. Willis; "A Few Notes on Drainage and Sewage Disposal for Small Towns and Villages," by Mr. J. A. Webb, of Hendon; "Some Notes on the Laying Out, Making Up and Construction of Private Streets," by Mr. R. H. Jeffes, of Malden. Other topics which had been raised, briefly summarised, were as follows: Clinker concrete, Ceresit, labour and wages, accident on highway due to hot ashes, procedure in connection with audit of accounts, the raising of loans, subsoil in private streets, kerbing existing in private roads, various points raised by architects under by-laws, treatment of road surfaces, tradesmen's signs, apportionment of private streets, motor-omnibus traffic, and the question as to whether a [illegible] can be regarded as a sewer.

The association, it is suggested, should congratulate itself as being, if not the first, at least one of the first, to take up that all-important matter of the excessive wear and tear to roads due to motor-omnibus traffic, and that a great deal of the energy now being directed by public bodies to this matter can be indirectly traced to the action taken by the association, who, throughout the whole of the session, have had this matter under very serious consideration, and in January last passed resolutions in regard to the matter, copies of which were forwarded to the Institution of Municipal and County Engineers, and regret is expressed that the institution could not see its way to take action in the matter upon the [illegible] by the association. A deputation waited upon the committee, who had this matter under consideration, and, after a conference of considerably over an hour, the committee regretted that they were unable to advise the institution to act [illegible]

[illegible]

local authorities enabling them to define the route (other than county main roads) to be taken by any service of motor omnibuses or other motor vehicles licensed for hire or for the carriage of goods into or through their respective districts."

(2) "That a copy of the above resolution be sent to the Institution of Municipal and County Engineers, and that the council of the institution be requested to consider the subject-matter of such resolution, and take such action as they may deem necessary."

The thanks of the association were tendered to Mr. F. W. Pearce, of Twickenham, for the assistance he had given the association in the arrangement of meetings and so forth; to the president and vice-president for the arrangements made during the session; to the president, Mr. Webb, and Mr. Jeffes for the excellent papers given; and to the honorary secretary for work done in connection with the association during the year.

Further business, dealing with means of escape in case of fire from factories, and the laying out of large estates by trustees, and considering how the by-laws relating to roads, streets and drains would be affected, was considered.

CORRESPONDENCE.

"Be calm in arguing; for fierceness makes
Error a fault and truth discourtesie."
—Geo. Herbert, *"The Temple."*

TOWN PLANNING: WHOSE WORK?

To the Editor of The Surveyor.

Sir,—The letter on town planning by Mr. Wilkes in your issue of the 4th inst. deserves the careful consideration of all municipal engineers, for undoubtedly the persistent claim of the architectural profession to be alone considered capable of producing a satisfactory town planning scheme is one that municipal engineers should contest.

While there can be no doubt that in any large scheme there is room for the combined efforts of the engineer and architect, the main question to decide is, whose is the more important part? and if one only is to be entrusted to design and lay out a scheme, should that one be the engineer or the architect?

Speaking broadly, the engineer is admittedly the more practical and scientific, while the architect is stronger ideally and artistically. Each has the defects of his virtues, and though there are a few men in each profession who possess both the necessary scientific and artistic qualifications, it can be laid down as a general rule that the engineer is weak æsthetically and the architect is weak constructionally.

Which, then, is the more important side of this question, the practical or ornamental? Each town planning scheme of any size must primarily make provision for its water supply, sewerage and sewage disposal, laying out and construction of roads, bridges and tramways, lighting by gas or electricity, supplying hydraulic or other forms of power, laying out parks, recreation grounds and open spaces. All these are essentially the work of the municipal engineer, and it is only when these, wholly or in part, have been carried out that the architect is called upon to play his part of providing the various buildings for residential, industrial or other purposes.

The town planning schemes carried out in this country on any large scale are chiefly the work of the engineer, for the greater number of so-called town planning schemes for which competitions have been held, with few exceptions, have been confined to the laying out and development of a building estate by some enterprising landlord or building company.

The main features of most of the garden "city" or garden "suburb" schemes is the effort to cheapen road making. While one can sympathise with their efforts to lower the cost of road making, there is no doubt that in many cases the roads are being made ridiculously narrow, and with materials which would disgust the merest tyro in road engineering. These schemes are essentially promoted by building speculators, and the competitors nearly all belong to the [illegible] profession, [illegible] is hardly likely to find his ideas square with those of the architectural assessor.

Almost the only complete town planning schemes on large scale which have taken place in recent years are those for the laying out of Delhi and the Federal Capital of Australia.

That the Government did not agree with the claim

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
Appointments Vacant	553
Ashton-under-Lyne, Stalybridge, and Dukinfield Waterworks	534
Assistants' and Students' Section	540
Correspondence	538
Influence of Town Planning upon the Public Health	547
Institution of Municipal Engineers:—	
Annual General Meeting	521, 524
Notices	553
Institution of Municipal and County Engineers' Notices	552
Local Government Board Inquiries	542
Local Government Board Report on Intercepting Traps	533
Lower Thames Valley District Surveyors' Association	538
Meetings	536
Modernising of Building By-laws	523, 536
Motor Omnibus Problems	522
Municipal Competitions Open	535
Municipal Contracts Open	554
Municipal Work in Progress and Projected	544
Norfolk Floods	532
Personal	546
Recent Publications	552
Road Maintenance and Control	552
Royal Sanitary Institute	554
Sanatoria and Isolation Hospitals	537
Superannuation and Security of Tenure	523, 550
Tenders for Municipal Works or Supplies	555
The Intercepting Trap	522, 533
Town Planning: Whose Work?	538
True Co-operation: The Penzance Policy	521
Worcestershire Roads	549

set up by the architectural profession was shown by their selection of the city engineer of Liverpool as the man to start the work of laying out Delhi; and anyone who knows Mr. Brodie will agree that his will not be the least important part in carrying out this scheme.

The winning schemes for the Australian Capital afford an interesting study, as they evidently owe their selection to the architectural influence among the assessors. The engineering chairman of the board did not agree with the selection of any of the three premiated schemes, and it is difficult to see how they could appeal to an engineer, for each of the schemes largely ignores the physical difficulties of the site in the laying out.

The winning design scored over the other competitors by submitting a scheme for a population three times larger than that asked for in the conditions issued to competitors, which conditions appear to have been strictly adhered to by the other competitors. Instead of being submitted on the contour map to a scale of 400 ft. to an inch issued by the Federal Government, which covered an area of 4 miles square, the winning design covered an area of some 9 miles by 7 miles, and the industrial and residential areas were to a large extent outside the required map. There can be little doubt that in an English competition this scheme would have been immediately ruled out.

The scheme is a clever one in many respects, but it is one which looks better on paper than it will look when laid out. From an English point of view the American gridiron system has not much to recommend it, especially when in several cases it appears as if a "rack" railway will be necessary to negotiate the gradients in some of the streets. The position of the railway, fixed by the local engineers with a proper regard to the levels of the ground and due economy, has been altered to a position necessitating deep cuttings or sharp gradients and a large number of bridges, and is grotesquely extravagant from an engineering and economic point of view. The same disregard for engineering difficulties is to be seen in the construction of the circular lakes which form so important a part of this scheme. The bed of the Molonglo river in this, and, to some extent, in the second scheme, is utilised for roads, railway cuttings and building sites; and the natural beauties of the wooded river are sacrificed to and swamped by the miniature Lake Michigans which the author has designed as the result of his Chicago experience.

Space forbids my enlarging on other objectionable features of these schemes, but I hope I have said enough to show that the architect is no more likely to be successful in town planning than the engineer, and that, taken on the whole, there is no one so well fitted by training and experience to carry out this work as the municipal engineer.—Yours, &c.,

A. J. Price.

Lytham.
October 16, 1912.

SEWAGE DISTRIBUTION AT ILKESTON.

To the Editor of The Surveyor.

Sir,—In your report of the discussion at the East Midland District meeting of the Institution of Municipal and County Engineers at Ilkeston on the 28th ult., you state that I mentioned that the system of distribution on the beds at Croydon is similar to that adopted at Ilkeston. The purport of my remarks was to point out that exactly the contrary to this was the case, that the works at Ilkeston were the only ones that I was aware of where the distribution had been carried out by electrically driven distributors in this way, hence they were in contrast to those with which most of us are familiar—*i.e.*, revolving sprinklers actuated by their own head, in a similar way to those seen at a previous meeting at Croydon, and at many other works elsewhere.

The system of distribution as adopted at Ilkeston is extremely interesting. Of course, it is an innovation, and, like every other such, must be given the test of time, and I have no doubt that many who were present at the inspection of the works will look forward with interest to another inspection in the future when the distributors have been some years in operation.—Yours, &c.,

E. Witton Booth.

25 Cross-street,
Manchester.
October 11, 1912.

NON-SLIPPERY WHINSTONE.

To the Editor of The Surveyor.

Sir,—I notice in your issue of the 11th inst. that Mr. Howard-Smith expresses the opinion that the Corporation of Portsmouth are to be congratulated if they have discovered what he considers a *rara avis* in whinstone—*viz.*, a non-slippery one. As Mr. Smith claims that his experience of this class of paving material has been fairly wide, I can only conclude that he has been singularly unfortunate in the choice of whinstones. The writer has seen many miles of streets paved with whinstone setts during the last thirty years, but has never observed slipperiness to be one of the defects of such paving.

The term "Scotch granite," as applied to whinstone, is known only south of the Border, and he must be ignorant indeed who cannot tell Scotch whinstone from Scotch granite.—Yours, &c.,

"Scotch Whinstone."

October 15, 1912.

THE CROMPTON PAVEMENT.

To the Editor of The Surveyor.

Sir,—Referring to the first paragraph in the letter from Mr. Cecil Nathan under this heading in your current issue, why my expression of doubt as to the utility of mixing cement and liquid "bitumen" (*i.e.*, British) should have raised the ire of that gentleman I cannot imagine.

Mr. Nathan wishes to impress us that he knows everything, or next to everything, about bitumen. Surely evidence of this by a direct answer to my question would have been more to the point than an exhibition of mere perspicacity!—Yours, &c.,

W. J. Howard-Smith.

Westminster.
October 16, 1912.

National Association of Local Government Officers.—At the seventh annual meeting of the National Council of this body on Saturday last, at the London Guildhall, approval was given to a resolution requesting the council to take all necessary steps to secure the introduction of a superannuation Bill and to press forward its promotion. Sir Homewood Crawford, the city solicitor, who presided, said he considered it was in the interests of the ratepayers generally that officers should be entitled to superannuation, as it added to efficiency. At the annual banquet, held in the evening at De Keyser's Royal Hotel, the association was congratulated on its increase in membership in the past six years from 6,000 to 32,000.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

The following books have been chosen in respect of the September premium:—

Mr. F. E. Yewdall, of Richmond, elected to have "Essentials in Architecture," by John Belcher, R.A. (Batsford).

"Town Scavenging," by Hugh Watson (St. Bride's Press).

"Chadwick Lectures," session 1907-8, by W. D. Scott-Moncrieff (St. Bride's Press).

Mr. Isaac W. Smith, of Clapham Junction, decided upon

"Mechanics Applied to Engineering," by Prof. Goodman (Longmans).

"Foundations and Concrete Work," by E. Dobson (Crosby Lockwood).

These books have been duly forwarded.

QUESTIONS.

This week answers are invited to the following questions:—

276. Roof Design.—It is found necessary in designing the steel trusses for a roof to adopt some system of wind bracing. Explain in detail how the cross-sectional area of the wind ties is determined. (H. F. W., *Tottenham.*)

277. Sewage Disposal.—What main principles should be kept in mind in arranging the sewage disposal of the following: (*a*) A village of 800 inhabitants (purely agricultural)? (*b*) A town of 2,000 inhabitants (industrial)? (*c*) An infectious diseases hospital of 100 beds? ("Charger.")

278. Mechanics.—Give an expression for the tension of the bucket rod or piston rod in a common suction pump. The barrel of the pump is 8 in. diameter, and the stroke of the bucket or piston is 10 in. Find the work done per stroke in ft.-lbs. when the spout is 16 ft. above the surface of the water in the well. (A.M.I.C.E., October, 1901.)

279. Paving.—What is the best material for paving carriageways of steep gradient? Give reasons. ("Muneng.")

280. Building Construction.—The walls at the base of a high brick tower are 3 ft. 9 in. thick. Describe, with drawing, what footings should be provided, the thickness of concrete, and the distance below the surface. (T. R.)

281. Surveying.—Upon what trigonometrical rule does triangulation depend? Prove that the sides of a triangle are proportional to the sines of the angles opposite to them.

Design for a Highway Bridge.

F. N. (*Dornoch*) submits the following designs and calculations for a highway bridge, in reinforced concrete, assumed to be loaded with two 12-ton road rollers over a clear span of 33 ft. 6 in., and would be glad to receive the views of readers of the Assistants' and Students' Section who are experts in this class of construction.

Calculations for Floor Slab.

[Note.—5 tons is the assumed weight of the front rollers and 3·5 tons the weight of either of the hind rollers.]

Dead weight of slab = $\frac{8}{12} \times 156$ lb. = 104 per ft. super. of slab.

" " macadam = $\frac{9}{12} \times 100$ lb. = 75 " "

superimposed load = $\frac{5 \text{ tons}}{4·33}$ = 2,587 " "

2,766 Total load in lb. per ft. super.

$$\text{B.M.} = \frac{2{,}766 \times 4·33 \times 4·33 \times 12}{12} = 51{,}863 \text{ inch-lb.}$$

Neutral axis from compression face =

$$\frac{*·5625}{12}\left(\sqrt{\frac{30 \times 7 \times 12}{·5625} + 225} - 15\right) = 2·5 \text{ in.}$$

$$\text{Radius arm} = 7 - \frac{2·5}{3} = 6·17 \text{ in.}$$

$$\text{Compression in concrete} = \frac{2 \times 51{,}863}{6·17 \times 12 \times 2·5} = 560 \text{ lb. per sq.-in.}$$

$$\text{Tension in steel} = \frac{51{,}863}{6·17 \times ·5625} = 15{,}000 \text{ nearly (lb.).}$$

[*Note.—·5625 = the calculated sectional area of steel in one foot run, short way of mesh, expanded metal, sheet No. 30 in company's trade list. Had sheet No. 31—*viz.*, ·5 sq.-in. per foot run—been used the stresses in concrete and steel would have been 581 lb. and 16,730 lb. respectively. Tension strips, 2 ft. wide, of same sectional area as reinforcement in lower portion of slab, are provided. See Fig. No. 4.]

Calculations for Beams of T-shaped Cross-section, as shown in Fig. 4.

Assuming the greatest super. load that would come over each of the central beams to be as shown in Figs. Nos. 2 and 3—*viz.*, front rollers of 12-ton roller, say 5 tons, and ½ of each hind roller, 3·5 tons—then the diagram of bending moments shows the greatest bending moment to be 10 × 5·66 tons = 56·6 tons under the 5-ton load.

Therefore the equivalent distributed will be:—

$$\frac{56·6 \times 8}{35·5} = 12·76 \text{ tons.}$$

Dead weight of floor slab = $\frac{8}{12} \times 4·33 \times 156$ lb. = 443 lb. per ft.

" " " macadam = $\frac{9}{12} \times 4·33 \times 100$ lb. = 325 "

" " " beam = $1 \times \frac{26}{12} \times \frac{13}{12} \times 156$ lb. = 366 "

Super. load = $\frac{12·76 \times 2{,}240}{35·5}$ = 805 "

1,939 "

$$\text{B.M.} = \frac{1{,}939 \times 35·5 \times 35·5 \times 12}{8} = 3{,}665{,}437 \text{ inch-lb.}$$

Depth of beam from centre of steel to compression face = 32 in.

Since the depth of the neutral axis from the compression face falls below the thickness of the floor slab, I have taken the radius arm as:—

$$\text{Radius arm} = 32 - (·4 \times 8) = 28·8 \text{ in.}$$

$$\text{Area of steel required} = \frac{3{,}665{,}437}{28·8 \times 16{,}000} = 7·96 \text{ sq.-in., say 8.}$$

$$\text{Compression in concrete} = \frac{2 \times 3{,}665{,}437}{52 \times 8 \times 28·8} = 612 \text{ lb. per sq.-in.}$$

$$\text{Neutral axis} = \frac{8}{52}\left(\sqrt{\frac{30 \times 32 \times 52}{8} + 225} - 15\right) = 10·08 \text{ in.}$$

Calculations for shearing stress in beam:—

$$\text{Total shearing stress} = \frac{1{,}939 \times 35·5}{2} = 34{,}417$$

Therefore

Area of steel per foot run required

$$= \frac{(34{,}417 - 40 \times 32 \times 13)\ 12}{28·8 \times 16{,}000} = ·5 \text{ sq.-in. nearly.}$$

Say, for reinforcement in beam, 4 bars in number:—

2 square bars 1·5 diameter, placed at outer side of beam and each provided with expanded metal web 24 in. wide, the web to have an area of ·25 square in. per foot run.

Two 1·5 diameter squares = 4·500 square in.

" 1·5 " rounds = 3·534 " "

Total 8·034 " "

[Query: The bridge consists of four spans, 33 ft. 6 in., 33 ft. 6 in., 30 ft. 6 in. and 20 ft. respectively, over three ashlar (granite) masonry piers, each 5 ft., what objections would there be to making the beams continuous throughout and calculating for a

$$\text{B.M.} = \frac{\text{WL}}{12}?$$

[None; if the piers can be relied upon not to settle materially.—Ed.]

F. N. would be glad to have readers' opinions as to the following design and calculations also:—

Figures 1a to 6a show an alternative scheme of recon-

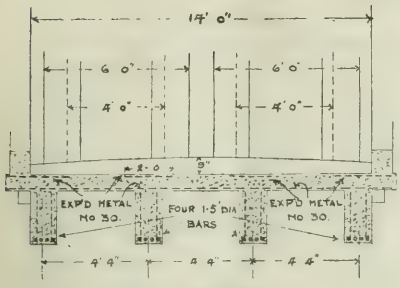


Fig 1.—Cross Section.

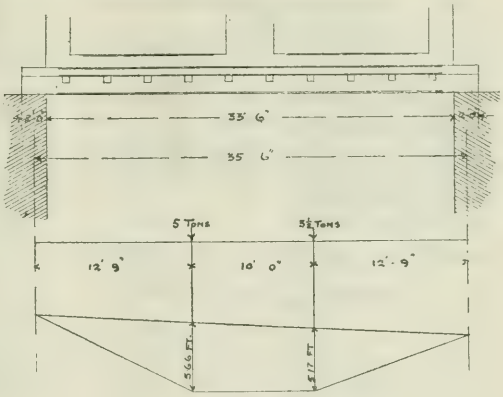


Fig. 2.—Elevation.

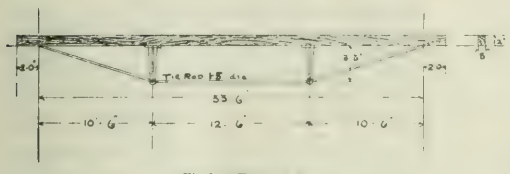


Fig. 1a.—Existing Beam.

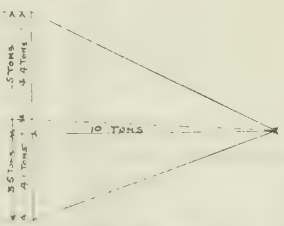


Fig. 3.—B.M. Diagram.

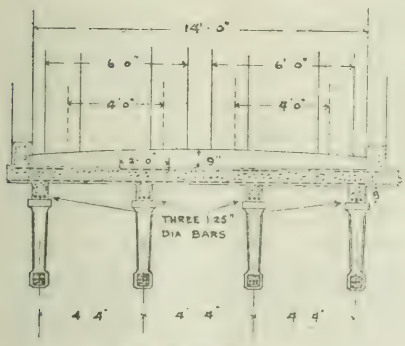


Fig. 2a.—Cross Section AB.

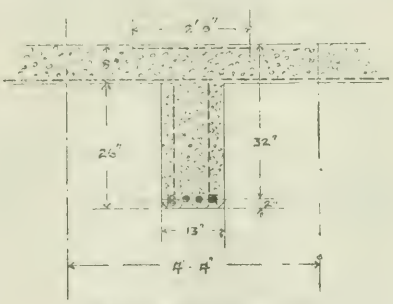


Fig. 4.—Section of T Beam.

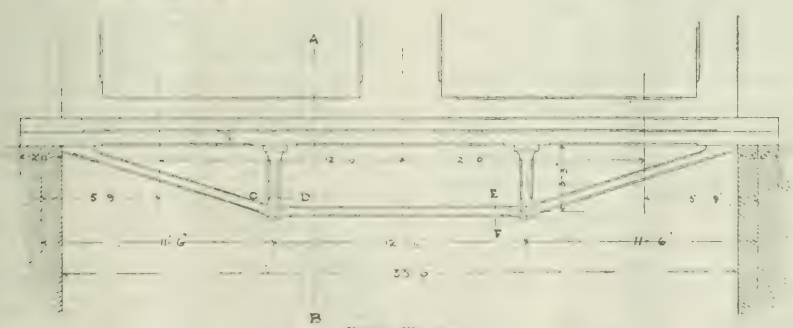


Fig. 3a.—Elevation.

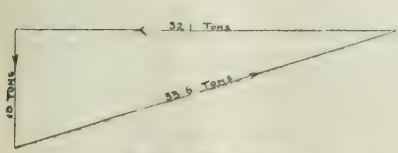


Fig. 4a.—Stress Diagram.

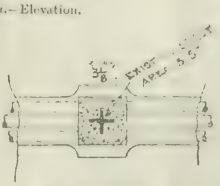


Fig. 5a.—Section C D.

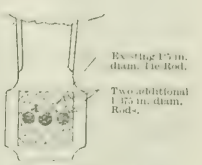


Fig. 6a.—Section E F.

Design for Highway Bridge.

struction in reinforced concrete, span and loading assumed to be the same as in the foregoing article.

Fig. 1a shows the existing trussed wood beam of the bridge to be reconstructed, with 12-in. × 8-in. timber top member; cast steel struts as shown in Fig. 5a, the minimum area of strut being 3·5 in. and single tie rod of 1·5 in. diameter (round) as shown in Fig. 6a. Fig. 2a and 3a show the proposed design and dimensions of reconstruction, incorporating all existing steel.

Floor slab to be same as calculated in preceding article—*viz.*, 8-in. thick and reinforced with ·5625 square in. of steel per foot run (expanded metal, sheet No. 30), with tension strips of same proportion.

Calculations for beams :—

$$\text{Dead weight of floor slab} = \frac{8}{12} \times 4{\cdot}33 \times 156 \text{ lb.} = 443 \text{ lb. per ft.}$$

$$\text{,, ,, ,, macadam} = \frac{9}{12} \times 4{\cdot}33 \times 100 \text{ lb.} = 325 \text{ ,,}$$

$$\text{,, ,, ,, beam} = 1 \times \frac{8}{12} \times \frac{8}{12} \times 156 \text{ lb.} = 69 \text{ ,,}$$

$$\text{,, ,, ,, existing steel in tie rods and struts} = 45 \times 6{\cdot}008 \text{ lb.} \times \frac{1}{35{\cdot}5} = 13 \text{ ,,}$$

$$\text{,, ,, ,, additional steel in tie rods} = 45 \times 2 \times 5{\cdot}049 \text{lb.} \times \frac{1}{35{\cdot}5} = 8 \text{ ,,}$$

$$\text{,, ,, ,, concrete in ties and struts} = 45 \times \tfrac{1}{2} \times \tfrac{1}{2} \times 156 \text{ lb.} \times \frac{1}{35{\cdot}5} = 50 \text{ ,,}$$

$$908 \text{ ,,}$$

$$\text{Total distributed dead load} = \frac{908 \times 35{\cdot}5}{2{,}240} = 14{\cdot}4 \text{ tons.}$$

Super. ,, load (from preceding article) 12·76 tons
Total ,, ,, ... 27·16 tons

Therefore the loading at either of the struts to the total load will be in ratio as their position is to the total span :—

$$\text{Load at struts} = \frac{12}{35{\cdot}5} \times 27{\cdot}16 \text{ tons} = 9{\cdot}20 \text{ tons, say 10 tons.}$$

$$\text{,, ,, ,, ,,} = 9{\cdot}20 \text{ ,,}$$

$$\text{,, abutments} = \frac{27{\cdot}16 - (9{\cdot}2 + 9{\cdot}2)}{2} = 4{\cdot}38 \text{ ,,}$$

$$\text{,, ,, ,,} = 4{\cdot}38 \text{ ,,}$$

Total ... 27·16 ,,

Scaling a load line (Fig. 4a), 10 tons, equal to the loading over either strut and completing the polygon with its sides parallel to the top member of the beam and the inclination of the tie rod, the stress diagram gives the strain on the various members thus :—

Compression on beam = 32·1 tons.
,, ,, struts = 10·0 ,,
Tension on horizontal portion of tie rod = 32·1 ,,
,, ,, inclined ,, ,, ,, = 33·6 ,,

$$\text{Compression on concrete per sq.-in. of beam} = \frac{32{\cdot}1 \times 2{,}240}{16 \times 8} = 562 \text{ lb.}$$

This gives an easy compression in beam without considering any portion of floor slab at either side of beam.

$$\text{Area of steel required in tie rods} = \frac{33{\cdot}6 \times 2{,}240}{16{,}000} = 4{\cdot}704 \text{ sq.-in.}$$

Existing tie rod (round) 1·5 in. diam. = 1·767 ,,
Required 2 bars (round) 1·375 in. diam. = 2·953 ,,
Total area of steel ... 4·720 ,,

Calculation of stresses in portion of beam between struts, *viz.*, 12 ft. – 6 in. span.

Dead weight of floor slab = 443 lb. per ft. run.
,, ,, macadam = 325 ,, ,,
,, ,, beam = 69 ,, ,,

Super load, say 5 tons at centre,
i.e., 10 tons distributed

$$\frac{10 \times 2{,}240}{12 \cdot 5} = 1{,}792 \text{ ,, ,,}$$

$$2{,}629 \text{ ,, ,,}$$

$$\text{B.M.} = \frac{2{,}629 \times 12{\cdot}5 \times 12 \cdot 5 \times 12}{8} = 616{,}172 \text{ inch-lb.}$$

$$\text{Lever arm} = 14{\cdot}5 - (4 \times 8) = 11{\cdot}3 \text{ in.}$$

$$\text{Compression on concrete} = \frac{2 \times 616{,}172}{11{\cdot}3 \times 24 \times 8} = 568 \text{ lb. per sq.-in.}$$

$$\text{Area of steel required} = \frac{616{,}172}{11{\cdot}3 \times 16{,}000} = 3{\cdot}41 \text{ sq.-in.,}$$

say 3 – 1¼ in. diam. round bars.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Chester-le-Street R.D.C. (October 9th. Mr. W. H. Collin).—£12,200 and £630 for the purposes of a scheme under Part III. of the Housing of the Working Classes Act, 1890, for the provision of working-class dwellings in the township of Great and Little Usworth.—Mr. J. Turnbull, representing the council, said the money was required to take over fifty houses built by the county council in 1906, and to build an additional fifty-seven. There was a great and urgent need for the additional houses, as many men were having to walk long distances from their homes to work. The scheme would be self-supporting, and the houses would be let at 6s. 6d., 5s. 8d. and 5s. 4d. per week. Each one would be self-contained, would have a garden, a bath, and hot and cold water. Dr. Hill, county medical officer of health, had condemned about seventy houses, and there were others not scheduled, but not fit to be inhabited. A miner stated that 250 men had to walk from 4 to 6 miles to work at Usworth owing to lack of houses.

Bridlington T.C. (October 8th. Mr. W. H. Collin).—£4,700 for the erection of workmen's dwellings in Bridlington.—There was considerable opposition. One objector stated that the scarcity of workmen's houses was due in some measure to rural workers being unable to secure cottages near their work, and that bicycles enabled them to cover the few miles between their work and their homes in Bridlington. One councillor advocated cheap back-to-back houses, as the rents proposed, from 4s. 6d. to 5s. 6d., could not be paid by the poor people dispossessed through the council condemning the cottage homes in which they now live.

Dudley T.C. (October 8th. Mr. R. H. Bicknell).—£1,136 for works of sewerage and surface drainage, the erection of boundary walls in Gads-lane, and the provision of buildings and plant at Russell's Hall for the manufacture of tar-macadam.—Mr. J. S. Morris, deputy town clerk, stated that the loan for which sanction was now required was made up as follows: £100 for sewerage works, £122 surface-water drainage, £825 building and plant for the manufacture of tar-macadam, £64 boundary walls in Gad's-lane, and £24 cost of obtaining loans. The amount required for the manufacture of tar-macadam was made up of £533 for buildings and £290 for plant.

Forehoe R.D.C. (October 1st. Mr. W. H. Collin).—£1,500 for the purchase of land and the erection of working-class dwellings.—In the course of the proceedings the inspector pointed out that the scheme was going to involve the district in about £24 a year. Explaining the figures in detail, he mentioned incidentally that he had struck an average for repairs on the whole of the loan period of sixty years, and that worked out at about 30s. a year per house. Mr. Tofts thought that was excessive, this being a class of house which required very little upkeep. The inspector pointed out that with only £1 a year allowed for repairs there was still a deficit of at least £20 a year. Practically £3 a house was coming out of the ratepayers' pockets. It was just a question whether a smaller house would not better answer the purpose. He did not mean a house with fewer bed-rooms. Mr. Tofts said there was an objection to smaller houses. Many of the houses were too small already. The inspector: If the ratepayers do not object to pay £25 a year for this present scheme, and another £20 for the further instalment of the scheme, it is nothing to do with me.

Hornsey T.C. (September 24th. Mr. R. H. Bicknell).—£2,500 for the construction of additional works at the Burghley-road sewage pumping works.—Mr. E. J. Lovegrove, borough engineer and surveyor, said that the work it was proposed to carry out under the loan was an improved arrangement for lifting into the outfall sewer the sewage of a low-lying area at the north-eastern corner of the borough. The new plant comprised two ejectors, each 150 gallons per minute, with a total capacity of 432,000 gallons per twenty-four hours. The storage tanks capacity was 261,000 gallons. There were also two 6-horse power electrically driven air compressors, with automatic controlling gear for maintaining a pressure of about 13 lb. per square inch. It was estimated that the new intercepting sewer and ejector chamber would cost £1,520, and the machinery, including two pneumatic

ejectors, two air compressors with automatic controlling gear, and so forth, £980, making a total of £2,500.

Neath R.D.C. (September 26th. Mr. H. R. Hooper).—£11,229 for purposes of drainage in the parishes of Neath Higher, Blaengwrach, and Cwmgwrach.—Mr. Edward Powell appeared on behalf of the district council, and there was no opposition to the scheme.

Rochdale T.C. (October 4th. Mr. P. M. Crosthwaite).—£2,049 for the construction of the sewer from Collinge-street to the main sewer in Valley-road.—The application was the sequel to certain difficulties encountered and penalties incurred in carrying a sewer under the canal at Hartley Bridge. The borough surveyor, Mr. S. S. Platt, explained the details of the work, and the inspector visited the site.

Saltburn U.D.C. (October 8th. Major C. E. Norton).—£3,500 for the purchase of the Brine Baths.—These were erected in 1890, at a cost of over £7,000, and the council have decided, subject to the approval of the Local Government Board, to purchase them for £2,500, and use them as a town's undertaking. Several of the councillors, who are unanimously in favour of the scheme, gave evidence as to the advisability of the council acquiring the baths.

APPLICATIONS FOR LOANS.

Beckenham U.D.C. £600 for a road improvement scheme.

Gravesend T.C.—£550 for road widening.

Heywood T.C.—£6,375 for granite paving works.

Kirkby U.D.C.—£11,810 for sewage outfall extension works.

Luton R.D.C.—£2,000 for a sewerage scheme.

Newport (Mon.) T.C. £3,220 for electricity supply purposes.

Northam U.D.C.—£350 for works of road making.

Pembroke T.C.—£1,500 for a new engine and pump at the Milton station.

Skegness U.D.C.—£1,100 for a sewage disposal scheme.

Stone R.D.C.—£2,800 for works of sewerage.

LOANS SANCTIONED.

Barnsley T.C. £800 for the improvement of the cattle market.

Barrow-in-Furness T.C.—£21,484 for the extension of the electricity works.

Birkenhead T.C.—£34,421 for new gas retorts and £3,500 for foundations.

Birmingham, Tame and Rea Drainage Board.—£6,000 for additional bacteria beds.

Buxton U.D.C.—£2,875 for alterations at the pumping station.

Cambridge T.C. £3,583 for the improvement of Market-hill.

Chingford U.D.C.—£1,230 for making up roads.

Darwen T.C.—£250 for a new humus tank at the sewage works.

Driffield R.D.C.—£835 for a motor fire engine.

Essex C.C.—£14,295, the council's share of the cost of the new bridge at Colchester.

Harrington U.D.C.—£8,500 for the gasworks extensions.

Harrogate T.C.—£4,170 for waterworks and £1,682 for alterations to the Victoria Baths.

Headington R.D.C.—£920 for street improvement works.

Isle of Wight R.D.C. £1,047 for a sewage disposal scheme.

Kingstown U.D.C.—£3,750 for work of tar-macadamising.

Loughborough T.C.—£700 for destructor buildings.

Nelson T.C. £21,225 in respect of the gasworks undertaking.

Rotherham T.C.—£14,000 for laying water mains.

Wednesbury T.C.—£1,800 for the provision of open spaces.

Winchester T.C.—£4,361 for the provision of a cemetery.

Yarmouth T.C.—£4,990 for police station and fire station extension.

FORTHCOMING INQUIRIES.

OCTOBER.	£
19.—**Wellingborough.** For works of street improvement (Mr. F. H. Tulloch)	3,500
22.—**Abertillery.** For open spaces, and the provision of a fire brigade station and public conveniences (Mr. R. H. Bicknell)	12,172
22.—**Briton Ferry.** For housing purposes (Mr. W. H. Collin)	16,386
22.—**Cardiff.** For the purposes of a water supply and wood paving (Mr. H. R. Hooper)	63,713
22.—**Finchley.** For the provision of a public convenience (Mr. H. Shelford Bidwell)...	1,650
22.—**Maesteg.** For the extension of the town hall and markets (Mr. W. H. Collin) ...	5,510
22.—**Northam.** For works of sewerage (Mr. A. G. Drury)	4,600
22.—**Prudhoe.** For the provision of stores and recreation ground (Mr. Courtenay Clifton)	1,527
22.—**Southgate.** For road and swimming-bath purposes (Major J. Stewart)	9,412
23.—**Birmingham.** For the approval of a town planning scheme (Major C. E. Norton)...	—
23.—**Blaydon.** For private street works (Mr. Courtenay Clifton)	2,100
23.—**Hendon.** For street improvement works (Mr. H. Shelford Bidwell)	6,584
23.—**Hyde.** For the provision of baths (Mr. M. K. North)	6,000
23.—**Leominster.** For the provision of workmen's dwellings (Mr. W. H. Collin) ...	1,040
23.—**Llandaff.** For electricity purposes (Mr. H. R. Hooper)	900
23.—**Neath.** For works of sewerage (Mr. R. H. Bicknell)	750
24.—**Easington.** For a housing scheme (Mr. Courtenay Clifton)	23,700
24.—**Leigh.** For private street works (Mr. M. K. North)	2,080
25.—**Totnes.** For works of water supply (Mr. A. G. Drury)	1,420

The Late Mr. Eedes Eachus.—On Monday evening last, at Edmonton Town Hall, Mr. H. T. Wakelam, M.INST.C.E., county engineer of Middlesex, unveiled in the presence of a large gathering a portrait in oils of the late Mr. G. Eedes Eachus, formerly engineer to the urban district council. In performing the ceremony Mr. Wakelam said he had the privilege of knowing Mr. Eachus for some twenty-five years, during twelve of which he was associated with him in his work there, and he had many opportunities, therefore, of realising the extreme kindness of heart which was one of his characteristics. Mr. Eachus's appointment dated back to the 'seventies, when Edmonton and Southgate were under one authority, and the many important works which he carried out during his connection with the district had proved of the greatest benefit. When he (Mr. Wakelam) first attended the meetings of the Institution of Municipal and County Engineers Mr. Eachus was one of the most prominent members of that body, and he remembered how attentively his observations on different subjects were received. He was a man of great engineering ability—one who could not only formulate schemes but carry them out—and his attainments were such that it might very appropriately be said of him: *Si monumentum requiris, circumspice.* A tribute to the qualities of the deceased official was also paid by Mr. W. H. Prescott, engineer and surveyor to the Tottenham Urban District Council, who said that, speaking as a neighbouring engineer, and on behalf of the profession of which Mr. Eachus was so distinguished a member, he would like to say how deeply grateful municipal engineers were to those who had been responsible for arranging such a worthy memorial to one of their number. Mr. Eachus had the deepest sense of honour, and his sole endeavour throughout had been to do his duty to the community he served. He was one of the most sound and cautious of engineers he (Mr. Prescott) had ever met, and it would be difficult, if not impossible, to find one with a greater capacity for taking infinite pains.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Boston £6,650, Cambridge £14,000, Easington £12,000, Folkestone £20,000, Lancaster £16,000, Wood Green £6,428; housing and town planning—Swansea; roads and materials—Newcastle-on-Tyne; sewerage and sewage disposal—Bentley £12,458, Cheltenham £16,567, Stockport £61,000; water, gas and electricity—Newton Abbot, Thakeham. Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

BUILDINGS.

Altrincham U.D.C.—Plans have been approved for a shelter for the Broadheath Recreation Ground, at an estimated cost of £350.

Barry (Glamorgan) U.D.C.—Shelters are to be provided by covering the roof of the bathing-houses, at an estimated cost of £1,200, and it has been decided to apply for powers to erect a sea-wall and promenade.

Bishop Stortford U.D.C.—A swimming bath is to be erected at South Mill, at a cost not exceeding £1,000.

Boston T.C.—The cost of the new Town Bridge is estimated to be £6,650, towards which the Holland County Council will contribute £2,000, leaving £4,650 to be met by the town council.

Bournemouth T.C.—The tender of Messrs. Jones & Seward, at £2,434, has been accepted for the erection of a new fire station.

Bradford T.C.—The Health Committee recommend the council to extend the accommodation of the new milk depot and infant consultation premises at an estimated cost of £1,500.

Brixham (Devon) U.D.C.—The tender of Messrs. W. Hill & Co., at £40,096, has been accepted for the extension of the breakwater. Towards the cost the Development Commissioners will make a grant of £10,000, and grant a loan for the remainder at 2½ per cent interest.—The tenders of Messrs. W. Hill & Co., at £291 and £208 respectively, have been accepted for erecting a new landing stage at the outer pier, and fender piling the end of the pier.

Cambridge T.C.—It has been decided to carry out extensions to the town hall at an estimated cost of £14,000.

Cardiff T.C.—The Finance Committee have approved the construction of a footbridge over the canal at the Old Sea Lock, at an estimated cost of £200.

Coalville U.D.C.—The surveyor, Mr. L. L. Baldwin, has received instructions to report upon the question of providing a mortuary.

Easington R.D.C.—Designs for a new hospital have been prepared by Mr. H. Hedley, of Sunderland. The estimated cost of the building is £12,000.

Ellesmere Port U.D.C.—It has been decided to limit the number of houses built hereafter to twenty-four to the acre. The present average in streets within the district is forty.

Folkestone T.C.—The General Purposes Committee recommend that prizes of 100 guineas, 50 guineas and 25 guineas respectively be offered to designers for the best set of plans placed first, second and third by the adjudicator for a band pavilion to be erected on the Leas. The maximum cost of the building is specified at £20,000.

Hampton U.D.C.—The surveyor, Mr. S. H. Chambers, is preparing, for the consideration of a committee, plans for a reading room to be erected on land adjoining the fire station.

Harrogate T.C.—It is proposed to build a shelter in the Valley Gardens.

Lancaster T.C.—A school for 960 children, and containing provision for cookery, laundry and manual training classes, has been opened. The total cost is £16,000, or £2,000 less than the original estimate.

Louth T.C.—The tender of Messrs. Mawer Brothers, at £128, has been accepted for the erection of a new 14 ft. span bridge in Hubbard's Valley.

Lynn T.C.—The question of spending a sum of £2,300 in one instance, and £1,500 in another for providing new baths is under consideration.

Mold U.D.C.—The new town hall, constructed at a cost of £5,000, has been formally opened.

Monaghan C.C.—The county surveyor, Mr. J. J. Hannigan, has received instructions to prepare an estimate of the probable cost of converting the old fever hospital at Monaghan into a county sanatorium, and of the cost of acquiring new ground and building a new sanatorium.

Penzance T.C.—The borough surveyor, Mr. F. Latham, has prepared a plan for the improvement of the convenience near to the Davy Monument, the estimated cost being £110.

Rochdale T.C.—A band stand, to cost £380, is to be built in Falinge Park.

South Shields T.C.—The borough engineer, Mr. L. Roseveare, has prepared plans for a tuberculosis dispensary, estimated to cost £350.

Staffs C.C.—The Education Committee have accepted the tender of Mr. W. Alcock, of Cheadle, at £3,923, for the erection of a school at Cheadle.

Sutton Coldfield T.C.—The tender of Mr. J. C. Hill, at £478, has been accepted for the erection of a lodge at Boldemere entrance to the park.

West Riding C.C.—The Public Health and Housing Committee have been authorised to purchase a site for a sanatorium at an estimate cost of £5,000.

Wood Green U.D.C.—Extensions to the town hall are contemplated at an estimated cost of £6,428.

Yarmouth T.C.—The tender of Mr. J. E. Pestell, at £4,526, has been accepted for carrying out extensions to the police and fire stations.

HOUSING AND TOWN PLANNING.

Neath U.D.C.—A letter has been received from the Local Government Board drawing the attention of the council to the scarcity of working-class houses in the council's area. The board understood that there was overcrowding, and inquired if the council had taken into consideration the Housing of the Working Classes Act (1890). The board also pointed out that the medical officer's report did not contain the necessary information required by the district regulations, and requesting that these statements be supplied. The matter is to be considered by the General Purposes Committee.

Northwich U.D.C.—The question of promoting a housing scheme is under consideration.

Prestatyn U.D.C.—The surveyor, Mr. F. Wilkinson, has been instructed to take the levels of three sites offered for the erection of workmen's dwellings.

Rhymney U.D.C.—The plans for the proposed housing scheme, which is estimated to cost £6,800, have been approved by the Local Government Board.

Swansea T.C.—It is intended to build between 200 and 300 workmen's dwellings provided official sanction is given to the purchase of the necessary land.

REFUSE COLLECTION AND DISPOSAL.

Bangor T.C.—A contract for horse scavenging at £312 a year has been accepted.

ROADS AND MATERIALS.

Bristol T.C.—It has been agreed to carry out street widenings in various parts of the city at an estimated cost of £1,612.

Chester-le-Street U.D.C.—The tender of Messrs. Thompson & Son, at £2,657, has been accepted for works of private street improvement.

Dawlish U.D.C.—A High-street improvement scheme is to be carried out at a cost of £229.

Dewsbury T.C.—The borough surveyor, Mr. H. Dearden, has been authorised to carry out several footpath improvements.

Durham T.C.—The tender of Mr. H. Meredith, at £420, has been accepted for works of street improvement.

Edinburgh T.C.—A street widening improvement is to be carried out at Redbraes, Broughton-road.

Hanwell U.D.C.—The tender of the Improved Wood Pavement Company, at £452, has been accepted for wood paving Boston-road, and the surveyor, Mr. Sidney Barnes, has been instructed to prepare a plan for the general widening of the same road.

Horsham U.D.C.—The scheme of the surveyor, Mr. R. Renwick, for making up East-street and West-street, at a cost of £446, has been approved.

Lynn T.C.—The borough surveyor, Mr. A. J. Smith, has received instructions to prepare a plan showing the laying out of part of the council's estate at the Loke-road end of the proposed new road for building purposes.

Monaghan U.D.C.—At the meeting last week, the surveyor, Mr. McCarthy, in his quarterly report, stated that he had discovered that the Great Northern Railway Company was responsible for the maintenance of a large portion of the streets of the town surrounding their premises. They should have maintained the road from the time the station was opened in Monaghan, but it was only lately it was discovered, and now they were looking after it. The warmest thanks of the council were given to Mr. McCarthy for having made this discovery and saved the ratepayers from a great burden.

Newcastle-on-Tyne T.C.—The question of laying out Eldon-square, at an estimated cost of £3,600, is under consideration.

Steyning East R.D.C.—Upon the recommendation of the surveyor, Mr. G. W. Warr, it has been agreed to seek urban powers for the purpose of making up the portion of Dyke-road between Tongdean-road and Tongdean-lane, in order to enable the widened portion of the highway to be made up at the expense of the frontagers.

Tavistock R.D.C.—With respect to the detailed work of road maintenance a resolution has been adopted that the rural district council act in as close co-operation with the county council surveyors (Messrs. S. Nigram and C. G. S. Acock) as possible, and accept their suggestions.

Teddington U.D.C.—The tenders of Messrs. Free & Son, Maidenhead, for the High-street and Twickenham and Manor roads improvements have been accepted—*viz.*, High-street, £376; Twickenham and Manor roads, road work, £123, tar paving, £29.—A bicycle has been bought for £8 for the use of the road foreman.

SEWERAGE AND SEWAGE DISPOSAL.

Andover T.C.—The tender of Messrs. Parkinson & Hodgens, at £5,128, has been accepted for alterations and extensions at the sewage disposal works.

Bentley (Yorks) U.D.C.—The council have accepted a tender for the construction of new sewerage and sewage disposal works. The price is £12,458, and includes the making of new works on the Tollbar estate, enlargement of the present works in Arkseylane, and the installation of new pumps at Bentley-road. This tender is subject to the approval of the Local Government Board.

Cannock R.D.C.—The scheme of the surveyor, Mr. H. M. Whitehead, at £1,630, has been accepted for sewage treatment at Huntington.

Carrick-on-Suir U.D.C.—The medical officer of health, Dr. Stephenson, reports that there is scarcely a section of the Public Health Acts or By-laws enforced in the town. Nuisances are to be seen in all quarters of the town, in streets and yards, and no notice seems to be taken of them. Notice has been given for the adoption of a housing scheme by the council.

Cheltenham T.C.—The tender of Mr. J. Riley, at £16,567, has been accepted for the construction of three sewage tanks and eight filter beds at the sewage disposal works.

Dartmouth T.C.—A pumping scheme for the remedy of storm floodings, prepared by the surveyor, Mr. J. Silley, is to be carried out at an estimate cost of £235.

Downham Market U.D.C.—The necessary land is to be purchased for a projected sewage disposal scheme.

Leeds T.C.—Negotiations are in progress between the Sewerage Committee and a Canadian firm for the shipment of sludge received at the sewage disposal works to be used as manure in the fruit growing industry. If an agreement can be arrived at it is stated that there will be a yearly saving to the corporation of nearly £1,000. In Leeds every year 35,000 tons of sludge are shipped to a process of mechanical pressing which renders it suitable for manurial purposes. During the winter months there is a demand from farmers for this sludge, but the disposal of the surplus in the summer is still difficult.

Nelson T.C.—An extensive sewerage scheme is to be carried out, including the construction of a high-level sewer.

Stockport T.C.—The sewage works at Cheadle Heath are to be enlarged at a cost of £61.000.

Teddington U.D.C.—Of the twelve tenders received respecting the extension of the sewage disposal works three have been referred for report to the surveyor (Mr. M. Hainsworth) and the consulting engineer (Mr. Wm. Fairley).

Worcester T.C.—Drainage works costing £2 040 are to be carried out at Barbourne and Astwood.

WATER, GAS, AND ELECTRICITY.

Exmouth U.D.C.—Consideration is being given to a report by the surveyor, Mr. S. Hutton, recommending the extension of water mains during the next three to five years, at an estimated cost of £1,200.

Hove T.C.—A proposal is under consideration recommending the council to give notice to the Hove Electric Lighting Company of their intention to exercise their right of purchasing the undertaking.

Howden (Yorks) R.D.C.—It has been agreed to apply for a provisional order to acquire a site in Dale Plantation, near South Newbald, for a new water scheme.

Llanfairfechan U.D.C.—Consideration is being given to a report by Mr. Walton, consulting engineer, Manchester, detailing a proposed scheme for the electric lighting of the town, and for the supply of electric power. The suggested scheme would cost £5.000.

Newport (Mon.) T.C.—The tramway undertaking showed a profit of £1,339 last year.

Newton Abbot U.D.C.—The council have approved of a scheme prepared by Mr. Clark, engineer, for the Newton Abbot and Brixton water supply. The estimated cost is £4,250.

Phillack U.D.C.—The council have accepted the tenders of Mr. C. L. Duke, of Sun Buildings, Plymouth, for laying water mains (£1,285) and constructing reservoirs (£698).

Port Glasgow T.C.—It has been decided to enter into an agreement with Greenock Corporation, by which Port Glasgow Town Council will apply for an Electric Lighting Order authorising them to supply electrical energy for all purposes within the burgh of Port Glasgow. They will ask for power to transfer the Order to the Greenock Corporation within twelve months, Greenock Corporation to undertake to accept such a transfer.

Scunthorpe U.D.C.—The engineer, Mr. C. C. Gray, has been asked to prepare plans for providing the Trentside district with a water supply.

Thakeham R.D.C.—The council have decided to adhere to their resolution to carry out the chalk scheme of water supply for Torrington, at an estimated cost of £5.172, instead of the scheme suggested by the Local Government Board for obtaining the supply from Hythe beds between Storrington and Washington.

MISCELLANEOUS.

Beeston U.D.C.—After a comparison of workmen's wages paid by neighbouring authorities it has been decided to increase the foremen, horsemen and engine-men's wages by 2s. a week, and all the other employees of the council by 1s.

Birmingham T.C.—In a special report the Tramways Committee express an unfavourable opinion with regard to motor omnibuses as a substitute for tramways, but recommend that Parliamentary powers should be obtained to run a service of buses if they are required. The committee unanimously recommend the council definitely to authorise the construction of all the tramways referred to in the new Act, including the proposed Hagley-road lines.

Maldens and Coombe U.D.C.—It has been agreed to purchase a first-aid motor fire engine, with chemical extinguisher and escape, at a cost not to exceed about £700.

Winchester T.C.—A motion has been passed that all contracts for work or supplies of material required by the council above the value of £50 should be open to public tender exception only to be made in cases of urgent necessity; and that contracts above £50 in value should only be accepted subject to confirmation by the council.

PERSONAL.

Mr. D. Edwards, borough surveyor of Taunton, has had his salary increased by £25 per annum.

Mr. B. Archer, assistant surveyor to the Wellingborough Urban District Council, has been voted an increase of salary.

Messrs. Ralph B. Chandler, assistant city engineer, Saskatoon, Sask., Canada, and Wm. C. Cross, ASSOC.M.INST.C.E., Birmingham, have been elected members of the Royal Sanitary Institute.

Mr. F. W. Richardson, who, prior to the absorption of his district by the City of Birmingham, filled the position of borough engineer of Aston Manor, was married recently to Miss A. G. Duggan, of Birmingham.

Mr. A. P. I. Cotterell has been appointed joint engineer with Mr. H. T. Mather, the surveyor to the Surbiton Urban District Council, in connection with and until the completion of the contracts with Messrs. Dick, Kerr & Co., Limited, in relation to the new sewerage and sewage disposal scheme.

Mr. E. P. Richards, whose appointment to the position of chief engineer to the Calcutta Improvement Trust was noted in our issue of August 30th last, took up his new duties on the 17th ult. On leaving Madras Mr. Richards was accorded a most enthusiastic send-off, and his departure, which was much regretted by all who had served under him during his comparatively short stay in the city, was made the occasion of a presentation which took the shape of an exquisite casket of silver, sandalwood and ivory, accompanied by an address. Mr. Richards' salary at Calcutta, which commences at £1,600, will be increased at the end of a year to £1,680, and advance annually by increments of £80 until £2,000 is reached, when, after a further twelve months, fresh terms, it is understood, will be offered.

Mr. William A. Macartney, assistant engineer to the Corporation of Partick, has been appointed burgh surveyor and sanitary inspector of Johnstone, in succession to Mr. John Stevenson, who, it may be remembered, met his death through falling from a train when returning from his holiday. Mr. Macartney is a native of Dunoon, where he received his early training and was chief assistant prior to his appointment as assistant engineer at Partick six years ago. In his capacity as assistant engineer at Dunoon much of the responsibility of the construction of the esplanade, harbour and promenade, which involved a cost of £40,000, devolved upon him. He is an associate member of the Institution of Civil Engineers, and holds the diploma of the Incorporated Sanitary Association of Scotland. He will take up his new duties next month.

FOR OTHER ADVERTISEMENTS

See End of Paper.

BOROUGH OF EALING.
PRIVATE STREET IMPROVEMENTS.

The Town Council of this Borough hereby invites Tenders for the Making Up of the following:—

Haslemere-avenue.
York-road.

The Drawings and Specifications may be seen, and Forms of Tender, together with Schedule of Quantities and other particulars, obtained from Mr. Charles Jones, M.INST.C.E., Borough Engineer, Town Hall, Ealing, W., any day during office hours, upon payment of a deposit of 10s. 6d. for each road, which will be returned upon receipt of a *bonâ-fide* Tender.

Sealed Tenders, in the envelopes provided, endorsed "Tender for Making Up," must be delivered at my office not later than 9.30 a.m. on Tuesday, the 5th day of November, 1912.

The Council does not bind itself to accept the lowest or any Tender.

The Tenderer whose offer is accepted shall be held to have bound himself to an agreement, and may be compelled to carry out the obligation arising from his Tender, even though he may not have signed a formal contract.

Dated this 16th day of October, 1912.

(By order of the Council)
GEO. E. BRYDGES.
Town Clerk.

Town Clerk's Office,
Town Hall, Ealing, W.

CITY OF SHEFFIELD.
TO CONTRACTORS, &c.

The Improvement Committee of the City Council are prepared to receive Tenders for the Widening of the South-West Approach of Hillfoot Bridge, Sheffield.

Particulars and Forms of Tender, together with Conditions of Contract, may be obtained from Chas. F. Wike, Esq., M.INST.C.E., City Engineer and Surveyor, Town Hall, Sheffield, on payment of the sum of One Guinea, which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders, in official envelope provided, to be delivered at the City Engineer and Surveyor's Office not later than 10 o'clock a.m. on Thursday, the 31st day of October, 1912.

The Committee do not bind themselves to accept the lowest or any Tender.

Any person or firm sending in a Tender will be required to sign a schedule to such Tender, stating the names of the various classes of labour which he or they intends or intend to employ, together with the places where such labour will be employed and the rates of wages, hours of labour, and conditions of employment to be paid and observed in respect to each class of labour, all of which, as shown in such schedule, shall comply with the City Council's form of clause respecting wages, hours and conditions of labour, and prohibition against assigning or subletting, a copy of which appears in the Conditions of Contract.

(By order)
R. M. PRESCOTT,
Town Clerk.

Town Hall, Sheffield.
October 16, 1912.

BOROUGH OF EALING.

The Town Council of this Borough hereby invites Tenders for the Supply of Iron Fencing.

The Schedule of Quantities and Forms of Tender may be obtained from Mr. Charles Jones, M.INST.C.E., Borough Engineer, Town Hall, Ealing, W., any day during office hours, upon payment of a deposit of 10s. 6d., which will be returned upon receipt of a *bonâ-fide* Tender.

Sealed Tenders, in the envelopes provided, endorsed "Tender for Wrought-Iron Unclimbable Fencing," must be delivered at my office not later than 9.30 a.m. on Tuesday, the 5th day of November, 1912.

The Council does not bind itself to accept the lowest or any Tender.

The Tenderer whose offer is accepted shall be held to have bound himself to an agreement, and may be compelled to carry out the obligation arising from his Tender, even though he may not have signed a formal contract.

Dated this 16th day of October, 1912.

(By order of the Council)
GEO. E. BRYDGES.
Town Clerk.

Town Clerk's Office,
Town Hall, Ealing, W.

URBAN DISTRICT OF FINCHLEY.

ENGINEER AND SURVEYOR'S DEPARTMENT.

JUNIOR ENGINEERING ASSISTANT.

The Council of the above-named district invite applications for the post of Junior Engineering Assistant in the above Department, at a commencing salary of £70 per annum.

Candidates must have had previous experience in a similar capacity, and preference will be given to those with some knowledge of Architecture and Town Planning.

Applications, endorsed "Junior Engineering Assistant," on forms provided (which may be obtained from the undersigned), and accompanied by copies of three recent testimonials, must reach me not later than 12 o'clock (noon) on Monday, the 28th instant.

Canvassing, directly or indirectly, will disqualify.

E. H. LISTER,
Clerk of the Council.

Council Offices,
Church End,
Finchley, N.
October 17, 1912.

The Influence of Town Planning upon the Public Health.*

By W. LOUIS CARR.

I propose to try and explain how a scheme prepared under the Housing and Town Planning Act can influence the public health of a community, such as that of the district of Ruislip-Northwood, in the county of Middlesex, of which I am surveyor. We were the first urban district council to obtain authority from the Local Government Board to prepare a scheme, and now we have on exhibition a draft town planning scheme, including "General Provisions," for the consideration of the various owners included in the area. After due consideration of the objections raised by owners, we shall shortly forward to the Local Government Board for their approval this draft amended as far as may be advisable.

The routine methods of procedure to obtain the sanction of the Local Government Board to prepare a scheme are set out in "Town Planning in Practice" (price 1s.), a booklet issued by the National Housing and Town Planning Council, and as these are of a more or less legal nature I do not propose to deal further with them. The powers given by this Act are intended to be applied to land in any stage of development.

(1) An already developed area—probably a town built many years ago not on satisfactory lines. The Act in this case enables the authority to gradually remodel such town.

(2) Areas partially developed, or ripe for development, where a growth of the population is in evidence. The Act in this case gives power to an authority to frame such "General Provisions" as will ensure the future growth of a district on more satisfactory lines than those haphazard developments which the past has taught us to be expensive, unsatisfactory and insanitary.

The first-mentioned class of land—namely, the already developed areas—I do not intend to touch upon, but will confine myself to the second class—namely, a partially laid out and growing district. A scheme prepared under the Act has a bearing upon the public health of the district as regards the following points among many others:—

(1) Roads (their width, construction, convenience to the community, relaxation of by-laws, &c.).
(2) Sanitation (sewers, refuse collection, &c.).
(3) Cemeteries.
(4) Sewage disposal works.
(5) Sites for public buildings.
(6) Open spaces (private and public).
(7) Building lines.
(8) Space about buildings.
(9) Limitation of numbers of buildings per acre.
(10) Height of buildings.
(11) Character of buildings.
(12) Protection from fire.
(13) Sanitary convenience and amenity (such as offensive trades, advertisement hoardings, fences and trees, streams, &c.).
(14) Allotments.

(1) ROADS.

With regard to item (1), roads can be divided up into—

(*a*) Main trunk and traffic roads.
(*b*) District roads.
(*c*) Local traffic (cross or side roads).
(*d*) Non-traffic or occupation roads.

(*a*) *Main Trunk and Traffic Roads* are means of communication between one large centre and another, and there are main trunk routes throughout the country that have in most cases been constructed many years ago for coach traffic, or in European countries for military purposes, such as the military roads in France and Germany, or the old Roman roads in England. Examples of main traffic roads in this country are the Great North Road, the Holyhead Road and the Bath Road. These main roads in the past were often too narrow, as some portions of the Great North Road still are, but for the future, in view of the increased speed of modern vehicles, no main traffic road should be of a less width than 80 ft.

(*b*) *District Roads.* These roads connect one important part of an authority's district with another, or with the district roads of an adjoining authority, and link up the various railway stations; especially is this so in the case of a large area such as ours, in which we have five stations on different companies' lines. The widths of these roads should not be less than 60 ft.

(*c*) *Local Traffic (Cross or Side Roads).*—These roads connect up one district road with another in the same area, and should be of a width of 40 ft.

(*d*) *Non-Traffic or Occupation Roads.*—These are roads constructed for the convenience of the inhabitants of the houses abutting upon the road, and not for the purpose of either main or through traffic. They may be constructed of a less width than 40 ft.

The influence of roads upon the public health of the community is affected by their width, the material of which they are constructed, their scavenging, and their maintenance. It must not be lost sight of that a road is an open space and a public promenade as well as a means of access and thoroughfare. The metalling that is used for the construction of a road should be of a hard, impervious nature, and the road should be efficiently drained, scavenged and maintained. In dry weather, if the metalled portion is not treated with some dust palliative, such as tar or Akonia, plenty of ordinary street watering should be done. Dust from roads is one of the most serious causes of the spread of disease. Dust infects food with living organisms, causes inflammatory troubles of the nasal organ, eyes, throat and lungs, and, indirectly, is one of the principal causes of infantile diarrhœa.

(2) SANITATION.

Under this head one can secure that necessary drainage is provided for the portion of a district partly sewered and developed, but the great advantage of the provision referred to in Schedule 4 of the Act is seen when, as in my district, one is enabled to schedule a site for a sewage works to serve a particular portion of the area and lay down the principal lines of outfall sewers. I am sure that by so doing a large number of cesspools will remain unbuilt, thus securing better health, and it will enable a builder to so erect his houses or cottages that when the drainage system is constructed no difficulty will be met with in securing sufficient fall for the drainage of such premises. A scheme of this character practically also brings land which, without possible means of drainage, would have lain idle for years into the building market.

(3) CEMETERIES.

Sites for future cemeteries should be appropriated under the scheme. This most important matter should be reported upon by the medical officer of health and surveyor, especially as to securing suitable land with good drainage, aspect, situation, size, &c. It is very difficult to secure a site for interments when a district has commenced developing. The old method of setting aside about an acre or so adjoining a church is now generally unsatisfactory except in country villages, owing to houses being erected abutting on and round such burial grounds.

(4) SEWAGE DISPOSAL WORKS.

Sites for the above should be secured in the most advantageous position according to the contours of the land, for as soon as this is fixed satisfactory development may be obtained.

(5) SITES FOR PUBLIC BUILDINGS AND FOR SPECIAL PURPOSES.

If these can be obtained in a town plan the benefits to posterity are many and obvious. Perhaps the chief beneficiaries under a town-planning scheme are the ratepayers, inasmuch as they will be able to purchase land for the above purposes at a much cheaper rate than when development has taken place. Such matters as sites for places of public worship, institutes, golf links, allotments, storeyards, refuse destructors, and other necessary adjuncts all require careful provision and consideration.

(6) OPEN SPACES: PRIVATE AND PUBLIC.

(*a*) *Private Open Spaces.*—It should be the aim of every local authority to apply the Act to try and secure, when any estate is being laid out, that one-tenth of such lands in a suitable position should be set aside for the purpose of an open space to be maintained by the landowner, with a proviso that in the event of such owner allowing the open space to

* Paper read at the Fourth Annual General Meeting of the Institution of Municipal Engineers.

become untidy and a nuisance the council may take over such open space and keep the same in proper order and repair. Great advantages to any estate may be gained by arranging houses round open greens planted with shrubs, &c. In return for these the council is empowered by the Act to frame relaxed by-laws as to the width of roads, so as to allow an owner to set aside these open spaces without any loss to himself. In woods, for instance, a certain amount of copse may be preserved as an amenity to the whole estate.

(*b*) *Public Open Spaces.*—Under a town planning scheme these open spaces may be obtained at a much lower figure before any rapid development takes place than afterwards. This provision of the Act is one of the many advantages to be derived to a district by preparing a scheme.

(7) BUILDING LINE.

I believe in foreign countries the building line is one of the chief and most important features of their town plan, and bears more relation to the other provisions of a scheme than anything else. On existing main roads, and those the council consider are likely to become main roads in the future, a building line should be fixed and shown on the map, when it can be enforced under the Act. A minimum building line for the whole area to govern the width between buildings should also be defined—probably 60 ft. is the least. As to building lines on any new streets of a width of 40 ft., I suggest that the limitation of the number of buildings per acre is the most satisfactory way of controlling this. For instance, in the case of a 40-ft. road in an area scheduled at eight buildings per acre the building line would probably be 15 ft. from the boundary of the street, 35 ft. from the centre of the road, and 70 ft. between houses on either side. Building lines will also require to be determined for streets over 40 ft. in width, for the projection of shops (in shopping centres), corner sites, bay windows, and certain public buildings to project beyond the general building line.

(8) SPACE ABOUT BUILDINGS.

The proportion of site covered by buildings has to be settled, due regard being given to distinguishing the space to be allowed for a shop, warehouse or dwelling-house. The space at the rear of buildings is a most important health matter, and a considerable amount of thought must be given to it. Reference may be made to the dark and ill-ventilated kitchens to houses, owing to the window opening opposite a high brick wall, perhaps only some 2 ft. away. A clause should be inserted in any town planning scheme which will obviate this. The least distance, in my opinion, should be 5 ft.

(9) LIMITATION OF NUMBER OF BUILDINGS TO THE ACRE.

This is one of the most complex problems arising from any application of the Act, and requires separate consideration for every district. Each district will have to consider its own particular amenities; no standard can be fixed. In a manufacturing district the circumstances will be found entirely different from those of a residential such as mine. At the same time the question of any part of an area at present residential being converted into a large manufacturing centre must be considered. My council are dealing with this question as follows: (*a*) The lands belonging to any owner which are contiguous, and which are not greater than 5 acres in extent, shall form a "land unit" within the several restricted areas. (*b*) In all other cases the lands which belong to the same owner, and which are comprised within each of 5-acre squares, shall form a "land unit" within the several restricted areas. (*c*) Provided that any lands comprised in any such square, which are not greater than 2 acres in extent may, where such lands immediately adjoin other lands belonging to the same owner, be included with, and shall, together with such other lands, form a "land unit," but in no case shall any "land unit" be greater than 7 acres in extent. The several restricted areas in my district are four, six, eight and twelve to the acre, and on 1 acre in a "land unit" not more than twenty buildings may be erected as dwelling-houses, and not more than twenty-four buildings of any other kind. Here is an example. On a 5-acre estate in a restricted area of eight to the acre the owner may, if he wishes, build twenty houses on 1 acre, leaving the remaining twenty to be built on 4 acres. A landowner may take advantage of this very materially; he may have quarry workings, say, and build round the outside of them, and leave the remainder as open space.

(10) HEIGHT OF BUILDINGS.

Provision under this heading should be made governing the measurement of the height of buildings in streets, for corner buildings, and storeys in domestic buildings in restricted areas where the limit exceeds eight to the acre.

(11) CHARACTER OF BUILDINGS.

Areas should be scheduled for warehouse and factory sites, shops and business premises, compulsory and optional. As regards the size of living-rooms and bed-rooms, we are, in our scheme, suggesting that every new dwelling-house shall be provided with at least one living-room having a floor area of not less than 144 sq. ft., and containing not less than 1,152 cub. ft., and one bed-room having a floor area of not less than 135 sq. ft., and containing not less than 1,080 cub. ft. No bed-room or other habitable room in any such dwelling-house shall have a floor area of less than 70 sq. ft., or contain less than 500 cub. ft. In a restricted area above eight to the acre no domestic building shall be constructed for the use of, or be occupied by, more than one family, except in the case of a dwelling-house, or flats or chambers specially planned for the purpose, and every person who shall intend to erect a new domestic building, or alter an existing building within such restricted areas, shall, before commencing to erect or alter such building, deliver to the council a statement in writing declaring whether such building is intended to be constructed for the use of, or occupied by, more than one family. In our "General Provisions" we propose to limit the grouping of buildings to eight erected under one roof, or without a break in building down to the level of the ground level, and no such break shall be of less width than 4 ft.

External elevations to buildings should be governed to a certain extent by the local authority, subject to referring any dispute to the Royal Institute of British Architects.

All the above provisions as to "character of buildings" will tend to stop the miserable housing seen in different parts of England at the present time, and better lighting, ventilation and drainage are to be hoped from such clauses framed under the Act.

(12) PROTECTION FROM FIRE.

More efficient means of escape from buildings occupied by more than one family should be provided, and general provisions framed to cover such a necessity.

(13) SANITARY CONVENIENCE AND AMENITY.

(*a*) *Offensive Trades.*—In any community of any size it is necessary to settle upon certain places in the district where such trades can be carried on. The trades mentioned in sec. 112 of the Public Health Act, 1875, are those especially requiring consideration. These trades, offensive as they are, may be necessary in a district (1) for the purposes of the district itself, (2) for the purpose of manufacturing articles for export from the district; and provision must be made for them. The prevailing winds should be taken into consideration when dealing with the sites. One might say that in a high-class residential district like mine it would be unnecessary to schedule any part for the carrying on of offensive trades, but if all districts refused to allow these trades to be carried on except the purely manufacturing districts, the growth and extension of trade might be seriously retarded.

(*b*) *Advertisement Hoardings.*—Under amenity one is enabled to control the at present most objectionable feature in a district—hoardings painted in hideous colours in all sorts of unsuitable places; for instance, the wooden cows one sees erected in fields quite spoil the surroundings. No bill or advertisement should be exhibited on any hoarding visible from any highway or public waterway or railway, unless so placed as not to disfigure the natural beauty of the landscape.

(*c*) *Fences and Trees.* The height of fences around houses ought to be regulated both in the front (where it abuts possibly on to a street), the rear and the sides. High fences may certainly keep neighbours from overlooking each other's premises, but it also retards the free current of air and the sunlight. I have known many gardens kept in quite a damp condition owing to high fences on either side. Trees are a great amenity to a district, and, if possible, all trees of a certain girth should be retained, provision being made in the case of building operations or other circumstances for trees to be removed.

(*d*) *Streams and Watercourses.*—This question requires

careful consideration, and the surveyor should carefully watch these so that by keeping them clear water can be got away quickly. In a district where the subsoil is clay it is very important that surface drainage be specially attended to. This matter is attenuated when there is a dual system of sewers.

(c) *Food Store.*—A provision should be made for this in every house, so as to prevent food being covered with flies, and in places where no dust can fall upon it. In my inspections I have found food in all manner of places, and it will place no appreciable hardship on the landlord to provide a proper store.

(14) ALLOTMENTS.

I consider provision should be made for these in lieu of the large depth of narrow garden given in some districts such as ours. These gardens are not so suitable, and, further, by this means cheaper cottages may be secured.

AGREEMENTS WITH LANDOWNERS AND OTHERS.

I would now draw attention to one of the most important points in any scheme—that is, the securing of the co-operation of landowners in the district. Ample power is provided by the Act for entering into agreements with them for, say, relaxation of by-laws in return for some concession such as open spaces, wider roads or a wider building line.

RELAXATION OF BY-LAWS AS TO NEW STREETS.

A council should provide for some relaxation of the Model By-laws to apply to all their area, whether town planned or not, and Model By-laws are issued by the Local Government Board, in which may be filled in the desired width and form of construction. Here is an example of a by-law as to construction and lay-out approved in a certain district by the board: 36-ft. street (not greater than 900 ft. in length), with 24-ft. carriageway, 16 ft. metalled; two 6-ft. paths, 5 ft. metalled; turning places for vehicles every 300 ft apart, the space between the metalled portions being suitably laid out with grass, trees or shrubs.

As regards the relaxation of by-laws in a town planning area, these will have to be framed so that they are capable of dealing with all cases of estate development, and by-laws will be put into the "General Provisions" for dealing with these. The width of any new street will be probably determined by its length, allowing for suitable turning places for vehicles, width of metalled roads and paths. A 20-ft. street will probably be laid out with a 14-ft. metalled carriageway and a 24-ft. street with a 16-ft. metalled carriageway. This would allow two vehicles to pass.

In conclusion, I may say I hope that from this paper will have been gleaned some little idea of the advantages that may be gained from a judicious application of the Town Planning Act, and also some idea of the difficulties besetting the path of a local authority starting to prepare a scheme. I would also like to close this very brief paper by impressing upon my audience that the keynote of the Act is for a local authority, in using the power bestowed by the Act, to relax, mitigate or waive immaterial by-laws in return for more material advantages which can be given by the landowner, so that the public may gain certain advantages without anyone being the worse or out of pocket.

It must also be borne in mind that the temptation to a public body to misuse or absolutely apply these new powers is very great, but unless they keep strictly within the bounds of reason and fairness the whole Act will be rendered nugatory and void. It must be remembered that a person developing an estate has to make it a profitable undertaking, and if the profits are unduly taxed by unfavourable impositions, a state of stagnation will arise, or the development of a district will be seriously retarded and hindered, and its last state rendered worse than its first. The aim of all parties must be to give away what is unnecessary if any advantage can thereby accrue to the other parties, and to secure from them some tangible benefit in return; in other words, to obtain a *quid pro quo*.

APPENDIX.

Some particulars of the Ruislip-Northwood town planning scheme:—

Area of district	6,585 acres.
Area in town planning area and scheme	5,690 ,,
,, ,, ,, ,, ...	40 ,,
	outside authority.
Area of excluded portions in town planning area	195 acres.
Areas for proposed open spaces (in restricted area 4 to the acre)	21 acres.
Areas for proposed open spaces (in restricted area 6 to the acre)	None
Areas for proposed open spaces (in restricted area 8 to the acre)	100 acres.
Areas for proposed open spaces (in restricted area 12 to the acre)	56 ,,
Areas for restricted area 4 to the acre, all residential	1,310 ,,
Areas for restricted area 6 to the acre, residential and shops, and factories optional	260 ,,
Areas for restricted area 8 to the acre, residential and shops	2,000 ,,
Areas for restricted area 12 to the acre, small residential, shops and factories optional ...	2,180 ,,
	5,750 acres.

Areas for factories optional, 110 acres.
Areas for shops and business premises optional, 300 acres.
Areas for shops and business premises compulsory, 54 acres.

WORCESTERSHIRE ROADS.

COUNTY SURVEYOR'S REPORT.

The first annual report of Mr. C. F. Gettings, county road surveyor of Worcestershire, has been issued. One of the effects of the recent extension of the city of Birmingham, it appears, was that the county was deprived of some 22 miles of main roads, a change which necessitated the revision of certain districts. The year covered by the report was the first in which work was carried out under Road Board grants, and practically the whole of the strengthening and surface work approved by the board was completed; but owing to the interruption of negotiations for the acquisition of land in connection with some of the improvements, and amended schemes being required, considerable delay ensued, and these were not completed at the end of the year.

The winter proved somewhat disastrous to a number of roads in the county, and especially to those on the northern side, where heavy motor-lorry traffic is rapidly increasing. Although the council have appreciated that it is necessary to increase the estimates to provide for a larger expenditure on foundation work and improved surfaces, Mr. Gettings regrets to say that the amount allowed is insufficient to keep pace with the damage caused by the traffic referred to. He adds that from observations made during the past twelve months he has little doubt that the ordinary water-bound macadam surface is unsuitable for the heavy motor traffic that is applied in many parts of the county.

The report mentions that the Road Board have given grants for resurfacing with improved materials, but the amount allowed is considered to be totally inadequate for the requirements, and the county surveyor observes that unless a much larger sum can be obtained the rate of progress made in this direction will be exceedingly slow.

Consideration, it is stated, has been given to a comprehensive scheme for improving 57 miles of the more important main roads, but this is in abeyance until the programme for the year 1913 is submitted to the Road Board, when Mr. Gettings hopes the board will be in a position to assist some scheme of this description by giving a much larger grant than has hitherto been received. Continuing, the county surveyor remarks that as a result of the increasingly heavy traffic generally, much closer supervision is required in order that the best results may be obtained, and he is of opinion that the additional allowance made to the assistant surveyors for locomotion will be more than recouped in the results that will be obtained.

The total gross estimate for the year amounted to £69,526, and the gross sum expended was £59,149.

A USEFUL REFERENCE WORK.—If you contemplate carrying out some special municipal engineering or architectural work it might be of interest to you to know where work of a similar character has been carried out elsewhere in this country, possibly in districts where the conditions are similar to those in your own district. In such case you will probably find the desired information by referring to "The Civic Engineer's Who's Who," issued by the St. Bride's Press, Limited, of 24 Bride-lane, Fleet-street, London, E.C., at 2s. 6d. net (post-free 2s. 8d. It contains over 200 biographies which are mainly recitals of municipal works carried out in the United Kingdom, grouped under the names of those responsible for such schemes. There is no other book from which such guidance can be readily obtained.

Superannuation and Security of Tenure.*

By A. WINTER GRAY.

In February last it was my privilege to read before the institution in London a paper entitled "Superannuation and Security of Tenure—the National Association of Local Government Officers and its Bill." An attempt was then made to focus attention upon the pressing necessity for a national scheme of superannuation and security of tenure for municipal officers, to give a detailed account of the methods employed by the National Association in its endeavour to secure these concessions, and to indicate how members of the institution, both individually and collectively, could render material and invaluable assistance.

Subsequently, the subject attracted considerable attention, and was discussed at length both at meetings and in the press, but it has reluctantly been admitted by those best qualified to judge that the practical sympathy and support which might reasonably have been expected in regard to a movement of such vital importance to municipal engineers has been withheld by the very individuals whom it is sought to benefit. There are still unmistakable signs of the existence of supineness and lethargy which must be eradicated; it is also apparent that the majority of municipal engineers are content to leave the struggle to the few willing workers. This inaction may eventually prove fatal, as it might conceivably give rise to the erroneous impression that municipal engineers are not unanimous in the desire for superannuation and security of tenure.

Inasmuch as there remains an immense amount of spade work to be performed, the author is emboldened again to bring the whole question to the notice of the members of the institution.

THE INSTITUTION'S ATTITUDE TOWARDS SUPERANNUATION AND SECURITY OF TENURE.

One of the "objects" of the institution as defined by the by-laws is "to take such steps as may be deemed expedient with a view to obtaining security of tenure and superannuation for municipal engineering officials."

From its inception the institution recognised that if it was to rise above the level of a mutual admiration society, in addition to providing educational facilities it must take practical steps towards securing for its members the advantages of a retiring allowance coupled with adequate and effective protection. The first step taken by the institution was that of affiliation to the National Association of Local Government Officers, which association had shortly before been incorporated for the purpose of organising the local government service in an attempt to secure these benefits for every municipal officer in the country.

While the institution has been engrossed in the work of evolution, the National Association has succeeded in bringing the questions of superannuation and security of tenure within the range of practical politics, and it would now appear to be opportune for the institution seriously to consider what practical assistance it should render in the contest which is to be anticipated in the near future. The next stroke of policy should be the appointment of a special committee, comprising some of the most capable and influential members of the institution, for the purpose of (*a*) co-operating with the National Association, (*b*) propaganda work in the several districts, (*c*) constantly impressing upon every individual member the imperative need of ceaseless endeavour, and (*d*) influencing public opinion and educating members of municipal corporations and of Parliament in the interests of the class of local government officers to superannuation and security of tenure.

THE ADMITTED NEED FOR SUPERANNUATION AND SECURITY OF TENURE.

Every member of the profession recognises that the duties performed by a municipal engineer are of a special nature, [illegible] many instances carried out under difficult circumstances and in the face of considerable opposition and prejudice [illegible] generally speaking, the remuneration of municipal engineers compares unfavourably with that obtaining in other professions and commercial offices, while a correspondingly high standard of learning, skill and administrative ability is exacted; that, invariably, he is precluded from augmenting his income by supplementary effort, and that the many calls upon his purse in maintaining a social position commensurate with the dignity of his office in many instances hinder the making of adequate provision for his own future and that of his dependents. Further, it is agreed that the municipal engineer, if he conscientiously discharges his multifarious duties, is often brought into personal conflict with the desires and interests of individuals, and instances have been known where an official has been subjected to vituperation, persecution, and even dismissal, for no other reason than that of fearlessly and honestly performing the duties imposed upon him by statute.

The foregoing are the principal obstacles with which the municipal engineer has to contend, and they can only be removed by granting to him superannuation and security of tenure. In his own mind he is perfectly convinced as to the legality of his claim to these concessions, and it is his duty, as an act of self-preservation, to use every means in his power to impress upon his employers, and upon Parliament, the absolute necessity for the speedy reversal of the unsatisfactory conditions which at present obtain. In this connection it is well to emphasise the fact that it is as much in the interest of the ratepayer as of the officer to establish a superannuation scheme for the latter. The officer in possession of a superannuation scheme experiences a sense of security in times of stress and sickness, and that sense reacts to the advantage of the service. The same remark applies with equal force to the question of security of tenure. If Parliament and local authorities impose certain onerous duties upon the municipal engineer, they should also see that he is not jeopardised in the execution of such duties. Thus protected, the official would be enabled to act freely and impartially to the mutual advantage of his employers and of himself.

It is pleasing to record that in the local government service acts of injustice have been few and far between, but the fact remains, and should not be lost sight of, that in the past municipal officers, and particularly municipal engineers, have been subjected to vindictive and personal attacks, and have even been forced to resignation and loss of office and reputation owing to the absence of effective protection and lack of organisation.

COMBINATION FOR THE PROTECTION OF THE RATEPAYER.

In this connection it should be borne in mind that the very employers of local government officers have combined for the defence of their own interests, and the strength of the County Councils Association, the Association of Municipal Corporations, the Urban and Rural District Councils Associations, and others, is constantly used for the benefit of the ratepayers. These bodies realised many years ago that united action was their only safeguard.

PARTY POLITICS AND THE MUNICIPAL OFFICIAL.

It is also lamentably true that party politics play an important part in municipal administration to the detriment of the local government officer. This is evidenced by the following excerpt from a farewell letter written to his brother officers by an ex-town clerk of one of the largest cities in the provinces. He wrote—

"The conditions of official life, well as I thought I knew them, have proved to be other than I thought. . . . So long as party strife continues in our business affairs, it is hopeless to get the best results. The early recriminations of October are full of prejudice to the welfare of the city. The strife for party votes affects the work of the municipality all the year round. It makes the position of officials still more difficult than their actual duties would do. When men see their efforts handicapped it makes them despair.

"There is a mass resistance year after year for the municipality to undertake wider work, whilst those who are most urgent in their demand are those who cry out most loudly about the salaries paid to the men who are entrusted with the work they deem most important to the public weal.

"At election time the dress-ring with almost others who are receiving certainly no more than, if as much as, they would gain for equal efforts in private affairs. The anxieties of official life, the constant strain, the feeling that a well-earned income is grudged by many of those who think they

* Paper read at the Forty-Ninth Annual General Meeting of the Institution of Municipal Engineers.

pay it, make the position of an official difficult indeed. For me it is intolerable, and I prefer to take the chances of, as it were, beginning life again to continuing in a career where my health was being seriously affected."

That many similar letters must inevitably be indited in the years to come is absolutely certain so long as the average municipal officer is too timid to identify himself with the projects of a powerful association, and is too apathetic to stand shoulder to shoulder with his colleagues to defend the dignity of his service. Until such time as he can muster sufficient courage to support a national movement for mutual protection and legal defence he must remain crying in the wilderness of the unrecognised.

SUGGESTED DISJUNCTION OF "SUPERANNUATION" AND "SECURITY OF TENURE."

In a leading article which appeared some time since in one of the service journals the opinion was expressed that the questions of superannuation and security of tenure were as wide as the poles asunder. With this view the author is, to some extent, in agreement—*i.e.*, national superannuation can only be obtained by means of an Act of Parliament, but security of tenure, if not conferred in this way, can forthwith be effected through the medium of an organisation so powerful and influential as to command respect, so that it would be necessary to think twice before an injustice were done to one of its members.

The example of that powerful organisation the National Union of Teachers is to be commended and emulated. Few associations have been of more practical service to its members than the one in question, and the suggestion to some educational authorities that the strength of the union would be invoked against improper treatment of any of its members has repeatedly had a salutary effect and served to ensure respect.

THE NEED FOR INDIVIDUAL ACTION.

It would, perhaps, be well if every member of the institution were to ask himself what he personally is doing towards the attainment of superannuation and security of tenure; if he is satisfied with the financial support he is affording by his affiliation fee to the National Association of Local Government Officers, paid through the institution. Surely this infinitesimal sum is totally inadequate comparable with the value of the benefits to be derived. If for the next ten years he contributed a guinea per annum, it would not be too great a sacrifice to make in return for superannuation and security of tenure. What a war chest the institution alone—with its 800 odd members—could accumulate in this period!

Again, each member might question himself as to what personal assistance he is rendering. Is he endeavouring, to the best of his ability, to enlist the sympathy and active support of his brother-officers, and, by so doing, assisting towards the consummation of the ideal organisation comprising every member of the local government service, and having for its object the attainment of superannuation, security of tenure, and the betterment of existing conditions? If he is doing little or nothing, it is to be hoped he will see the error of his ways and forthwith realise his responsibilities, and evince that interest and enthusiasm which is imperatively essential if success is to be achieved. He might with advantage realise the truth of the proverbs "Up and be doing is not come on with me" and "Procrastination is the thief of time."

PARLIAMENTARY PROCEDURE.

From correspondence which has recently appeared in the columns of the service journals, it is evident the erroneous impression prevails in some quarters that it is only necessary for municipal engineers to ask for the benefits under review and they will forthwith be obtainable. It may therefore be well to invite attention to the tedious to be adopted in the endeavour to secure such benefits. It is, presumably, what may be termed the constitutional method of, by means of legislation, either by a private member's Bill or by a Government measure.

The difficulties surrounding a private member's Bill are so well known to everyone possessing even an elementary knowledge of Parliamentary procedure as to need no further comment, while in the present congested state of affairs in Parliament it is practically hopeless to expect the Government to render any assistance, notwithstanding the fact that it has recently dealt with the question of superannuation for teachers. A private Bill would doubtless be strenuously opposed by the Association of Municipal Corporations and kindred associations, as the representatives of the ratepayers, although these associations have approved the principle of a national superannuation scheme in preference to the continuance of piecemeal legislation. It should also be borne in mind that superannuation and security of tenure cannot be obtained solely for municipal engineers, and isolated action on the part of any Institution of Municipal Engineers would assuredly prove abortive.

THE NATIONAL ASSOCIATION OF LOCAL GOVERNMENT OFFICERS.

It must not, however, be thought that the interests of local government officers have been neglected in the past. There exists at the present moment an association, the National Association of Local Government Officers, which for years has been striving to obtain for the service superannuation and security of tenure, and in numerous instances has given legal advice and assistance to those requiring the same, including members of the institution.

After having been in existence for about six years the membership of the National Association is well over 30,000, or nearly one-third of the total of local government officers in the country. Here, then, would appear to be the nucleus of the powerful and influential organisation to which reference has been made, and before embarking upon an individual enterprise it might be worth the while of the institution to consider the advisability of furthering the work of the National Association by supporting it financially and by increasing its membership, either directly or by forming local associations where at present no such association exists, for it must be borne in mind that whatever benefits are gained by the minority will be shared by the whole.

The National Association is the only powerful organisation connected with the municipal service known to the author. The association is now engaged upon the promotion of a Bill in Parliament to provide superannuation and security of tenure for its members, as well as for a considerable number of municipal officers who have so far failed to identify themselves with the movement. For years past the association has been wearing down the opposition of its most formidable opponents, and its efforts have not been abortive. At the first favourable opportunity, which cannot long be delayed, the Bill will be presented to Parliament. It may possibly be rejected; in such a contingency it will, from time to time, be reintroduced, and the pertinacity of the National Association must ultimately meet with success.

HOW ASSISTANCE CAN BE RENDERED.

It has already been pointed out that two-thirds of the number of local government officers in the country have yet to be persuaded to join the National Association. It is also known that many members of the institution hold office in districts where local associations do not at present exist. For each of such members there is a field for immediate action, and he is cordially invited to take advantage of the opportunity which presents itself. His first duty should be to convene a meeting of his brother officers with the view of forming a local association, to become affiliated to the National Association. The fullest information how to proceed will, if required, be furnished upon application to the secretary of the institution, or to Mr. L. Hill, the secretary of the National Association, whose address is 24 Bloomsbury-square, London, W.C. Speakers from headquarters, or from neighbouring associations, will, if required, be sent to address meetings.

It may be necessary to state that paucity of numbers should not be a deterrent to the formation of a local association—one grain helps to fill a sack! In some instances, however, it might perhaps be well for several small guilds in adjacent localities to combine in order to ensure the maximum of success. As to the future work of a newly formed local association, means will be devised and advice tendered, which it would be unwise to describe in a paper such as this.

An earnest appeal is made to the chairman and hon. secretary of each district to use his personal influence with every municipal engineer in his locality; to initiate discussion, having for its object the formation of local associations, so that a greater interest may thereby be stimulated, and places may be reached which the National Association could not hope to invade for many years to come. It should readily be realised what a power in the land the National Association would become if every local government officer were a member of it. It might rival, and even sur-

pass, those powerful associations of the doctors, solicitors and teachers, the memberships of which are composed of professional men whose status is not less important than that of the municipal officer. The associations in question are not afraid openly to support the objects of their unions, and who will venture to assert that their action has not reacted to the benefit of their members?

CONCERTED ACTION AND EFFECTUAL ORGANISATION.

The author has endeavoured to adduce a few arguments in favour of superannuation, security of tenure and State protection for local government officers, and to indicate some of the courses of action to be pursued in the attainment of these essentials, the principal being concerted action and effectual organisation. There must be no molly-coddling or cavilling at providing a fund for militant purposes, but, on the other hand, there must be a good deal of back-stiffening and a corresponding desire to furnish financial assistance. By these means, at any rate, the problem of security of tenure can immediately be solved. Success or failure rests with every individual member of the local government service; if he is too "shabby-genteel" to be organised, then he is undeserving of further sympathy.

Local government officers should remember that they possess an immense number of votes which could be placed at the disposal of the political party pledged to confer superannuation, security of tenure and State protection upon members of the service, and this fact might have an important bearing upon the result of a future general election.

Once again the members of the institution are reminded that if they desire to see in substance what is now the shadow, they must not keep their wishbones where their backbones ought to be.

Although the author claims to possess the courage of his convictions, for obvious reasons it may be considered desirable to restrict the publication of this paper to the columns of the Journal.

SOME RECENT PUBLICATIONS.*

The Fire Resistance of Doors and Shutters: Tabulated Results of Tests. Price £2 2s. net. London: The British Fire-Prevention Committee.

The British Fire-Prevention Committee have for some ten years been investigating the fire-resistance of doors and shutters, both those in every-day use and those subject to patent rights. No fewer than fifty-eight doors have been under test, and the expenditure incurred on this work has exceeded £6,000, raised voluntarily, the actual conduct of the tests also being in the hands of voluntary workers.

The results of these fifty-eight tests have now been issued in the form of four tabulated summaries, which present the facts arrived at in concise and illustrated form. These tables are issued as "Journal VII." of the British Fire-Prevention Committee, and should be of great use to both the authorities controlling building construction, as also the many architects and engineers who have to specify structural work. The surveyor, the insurance engineer, and other professional men should also be able to learn much from these summaries, the not least important feature of which are the records of the tests with ordinary doors of different woods, such as deal, pine, mahogany, walnut, teak, pitch pine, the English, Australian and American oak, and Australian jarrah and karri.

The summaries have been prepared jointly by Mr. Edwin O. Sachs, F.R.S.ED., and Mr. Ellis Marsland, respectively chairman and hon. secretary of the British Fire-Prevention Committee, and the importance attached to the subject abroad may be gauged from the fact that the International Fire Service Council are shortly issuing French and German translations of the committee's "Journal VII." here under review.

Lifts. We have received from Messrs. R. Waygood & Co., Limited, Falconbrook, S.E., a copy of a booklet which furnishes abundant proof of that firm's unique experience in the provision of goods and passenger lifts for steam ships. The fact that repeated orders have reached the company from the great shipbuilders of both Great Britain and Germany is eloquent testimony to the excellence of their design and workmanship.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

ROAD MAINTENANCE AND CONTROL.

HEAVY MOTOR TRAFFIC.

On Friday last, at the annual general meeting of the Association of Municipal Corporations in London, the following resolutions, submitted by Mr. H. Sagar, town clerk of Richmond, were referred to the council of that body to take such action as they might deem desirable, the council being at the same time requested to consider the subject of motor traffic generally:—

"(1) That the Government be asked to introduce a proviso in next year's Finance Bill to the effect that in future the proceeds of the petrol tax or any other special tax or charge levied on or in connection with heavy vehicles mechanically propelled, less some small percentage representing the cost of administration, should be paid over to the local authorities on whose roads these vehicles run, in proportion to the use made by such vehicles of the roads."

"(2) That it is urgently necessary, having regard to the increased cost of road maintenance, the risk of serious accidents, the detriment to property, and the loss and inconvenience to tradesmen and others arising from the use of motor omnibuses on highways which, in the judgment of the local authority, are unsuited for traffic of this description, that requisite powers should be conferred upon the local authorities charged with the duty of maintaining and repairing the highways (subject to an appeal to the Local Government Board) to limit and define the routes to be taken by such traffic."

In the course of his remarks Mr. Sagar pointed out that the London General Omnibus Company paid between £65,000 and £70,000 a year under the petrol tax, and he contended that as motor omnibus traffic was purely local in character such money should be allocated to the districts where the traffic actually was.

Lord Derby, who presided, said that there was not a single district, urban or rural, in the United Kingdom that was not being hit by heavy motor traffic, and what that conference had to do was to put forward a scheme that would meet the requirements of all districts or municipalities.

Institution of Mechanical Engineers.—The first monthly general meeting of the coming session will be held in the meeting hall of the institution on Friday, the 25th inst., at 8 p.m.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. Thomas, M.Inst.C.E., County Surveyor, Buckinghamshire.

NORTH WALES DISTRICT MEETING, WREXHAM.

District Chairman—Mr. Wm. Jones, Assoc.M.Inst.C.E., Colwyn Bay.

A North Wales District meeting will be held at the Free Library, Queen-street, Wrexham, to-morrow (Saturday).

PROGRAMME.

11.30 a.m.—Meet at Free Library, Queen-street. Members will be received by the mayor.

11.45 a.m.—Inspect markets, fire station, electricity works and Willow depot.

1 p.m.—Luncheon at Wynnstay Hotel, by the kind invitation of the mayor.

2 p.m.—Drive to sewage farm.

3 p.m.—Return to Wrexham. Formation of District Executive Committee. Discussion on paper entitled "Wrexham and its Municipal Works," by Mr. J. England, borough surveyor (member).

4 p.m.—Light Refreshments, provided by borough surveyor.

J. England,
Hon. District Secretary.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. Frank Latham, M.Inst.C.E.I., F.S.E., Borough Engineer and Surveyor, Penzance.

YORKSHIRE AND NORTHERN DISTRICTS.

A joint meeting of the above will be held in Harrogate to-morrow (Saturday).

Programme.

(Arranged by kind permission of the Harrogate Corporation.)

11.15 a.m.—Meet at Harrogate Station.

11.30 a.m.—Drive by motor char-a-banc to Corporation Depot, Wetherby-lane, to inspect new tar-macadam mechanical mixing plant (supplied by Messrs. Ord & Maddison, Darlington), and stone-breaking machine in operation.

Light Refreshments.

12.45 p.m.—Drive to North sewage outfall works, new septic tanks and percolating filters, new aërating sprinklers and special apparatus for treatment of sludge.

1.30 p.m.—Drive to Royal Baths. There are eighty-six different treatments, the principal ones of which will be explained and viewed.

2.45 p.m.—Drive to Iron Gate reservoir. Sand-bed filters.

3.15 p.m.—Drive to Harlow Hill reservoir. Candy-Whitaker's mechanical filters.

3.45 p.m.—Drive to corporation stable and Town's Yard, Robert-street.

4.15 p.m.—Drive to corporation fire brigade station New Merryweather's motor fire engine.

4.30 p.m.—Dinner at North-Eastern Hotel, Station-square.

A short meeting of the Yorkshire members will be held to discuss proposed rearrangement of district.

H. J. Firth.
Hon. District Secretary, Yorkshire District.

John Robinson.
Hon. District Secretary, Northern District.

NORTH-WESTERN DISTRICT.

It has been decided to hold a social evening at Manchester on Saturday, December 7th. The approximate expense per head will be 4s., and it is desirable that members should give notice, at the earliest possible moment, of their intention to attend. Full programme will be issued later.

"Brantwood," Jas. W. Gleave,
Commassie-street, *Hon. District Secretary.*
Heywood.
October 12, 1912.

Subscriptions, 1912-13.—Members and others are requested to note that annual subscriptions for 1912-13 are now due.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*

ROYAL SANITARY INSTITUTE.

PROVINCIAL SESSIONAL MEETING, ALTON.

On Saturday, October 26th a sessional meeting of the Royal Sanitary Institute will be held in the Assembly Rooms, Alton, at 11.15 a.m., when discussions will take place on "Housing Problems in County Areas"—to be opened by Dr. Robert A. Lyster, county medical officer of health, Southampton, and "Municipal Work in Alton" to be opened by Mr. G. Bertram Hartfree, F.S.I., surveyor to the urban district council. Among those who are expected to take part in the discussion are Messrs. R. W. Cass, surveyor to the Farnham Urban District Council; C. G. Mason, Assoc.M.Inst.C.E., borough engineer, Guildford; W. J. Taylor, M.Inst.C.E., county surveyor, Southampton; and F. C. Uren, M.Inst.C.E., surveyor to the Aldershot Urban District Council.

The chair will be taken by Mr. H. Percy Boulnois M.Inst.C.E., chairman of the council of the institute.

At a meeting of the Royal Sanitary Institute, to be held at 90 Buckingham Palace-road, S.W., on Tuesday, November 12th, Mr. H. Percy Boulnois, M.Inst.C.E., chairman of council of the institute, will open a discussion on the recently issued report of the Departmental Committee on Intercepting Traps in House Drains.

The chair will be taken at 8 p.m. by Sir Maurice Fitzmaurice, C.M.G., M.Inst.C.E., chief engineer to the London Council Council.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

INSPECTOR OF NUISANCES.—October 19th.—Patrington Rural District Council.—Mr. L. A. Milton, clerk.

COUNTY SURVEYOR.—October 19th.—County of the Soke of Peterborough. £200 per annum.—Mr. Walter J. Deacon, clerk, Cross-street, Peterborough. Applications to be endorsed "Application for County Surveyorship."

JUNIOR SURVEYOR AND DRAUGHTSMAN.—October 21st.—East Sussex County Council. £65 per annum.—Mr. F. J. Wood, county surveyor, County Hall, Lewes.

SEWAGE WORKS MANAGER.—October 21st.—Crompton Urban District Council.—Mr. F. F. Gartside, clerk.

ENGINEER'S CLERK.—October 21st.—Watford Urban District Council. £1 £1 7s. per week. Mr. D. Waterhouse, engineer.

FOREMAN AND SURVEYOR.—October 22nd.—Tow Law Urban District Council. 35s. per week.—Mr. J. W. Temperley, clerk, Tow Law, Durham.

SURVEYOR'S ASSISTANT.—October 22nd.—Wath-upon-Dearne Urban District Council. £85 per annum.—Messrs. Nicholson & Co., clerks.

ASSISTANT FIRE BRIGADE SUPERINTENDENT.—October 22nd.—Singapore, Straits Settlements. 200—240 dollars per month (value of dollar, 2s. 4d.), with quarters and uniform.—Mr. C. C. Lindsay, M.Inst.C.E., 180 Hope-street, Glasgow.

INSPECTOR OF NUISANCES.—October 23rd.—Marsden Urban District Council. £40 per annum. Mr. J. W. Piercy, clerk, Cloth Hall-street, Huddersfield.

BUILDINGS INSPECTOR.—October 23rd.—Corporation of Northampton. £2 £2 5s. per week. Mr. Herbert Hankinson, town clerk.

INSPECTOR OF NUISANCES.—November 5th.—Skerness Urban District Council. £120—£150 per annum.—Mr. V. H. Stallon, clerk.

INSPECTOR OF NUISANCES AND DISTRICT SURVEYOR. October 25th. Luton Rural District Council. £180 per annum.—Mr. W. Austin, clerk, 7 George-street West, Luton.

CHIEF ENGINEER.—October 28th.—Municipality of Karachi (India). 500—750 rupees per month.—Mr. Measham Lea, chief officer and chief engineer, Municipal Office, Karachi.

ASSISTANT INSPECTOR OF NUISANCES October 31st.—Twickenham Urban District Council. £90—£120.—Mr. J. Saunders, clerk.

MUNICIPAL ENGINEER.—November 21st.—Municipal Board of Cawnpore. 800—1,000 rupees per mensem.—Mr. C. E. Goument, C.S.I., M.Inst.C.E., *c/o* Messrs. Thos. Cook & Son, Ludgate-circus, London.

ASSISTANT WATERWORKS ENGINEER.—November 30th. Bombay Municipality. 800 rupees per mensem. Messrs. John Taylor, Sons & Sanko Crimp, Caxton House, Westminster, S.W.

ASSISTANT SURVEYOR OF ROADS.—Public Works Department of the Gold Coast Government. £300—£350, with allowances.—Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W. Quote M 5,497 on left-hand top corner of application.

MUNICIPAL COMPETITIONS OPEN.

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GLASGOW.—October 29th.—Preliminary sketch designs are invited by the corporation for the extension of the municipal buildings. Honorariums of 100 guineas to five selected designs. Mr. John J. Burnet, A.R.S.A., 239 St. Vincent-street, Glasgow, is assessor.—Applications to the clerk, Mr. J. Lindsay, town clerk.

LLANDUDNO.—October 31st.—Designs for laying out about 20 acres, for the urban district council. A

premium of 50 guineas is offered.—Mr. A. Conolly, clerk.

HUDDERSFIELD.—October 31st.—Designs for laying out certain areas as a town planning scheme, for the corporation. Premiums of 100, 50, and 25 guineas. —Mr. J. Henry Field, town clerk.

ROSCREA.—November 1st.—Plans, specifications, and estimates of a complete sewerage scheme, for the No. 1 Rural Council.—Mr. Thomas Dooly, clerk, Roscrea Workhouse.

CARLISLE.—December 2nd.—School buildings, for the corporation.—City Surveyor, 36 Fisher-street, Carlisle.

ORSETT (Essex).—January 1st.—For the construction of a sewerage and sewage disposal scheme in the parish of South Ockendon, for the Orsett Rural District Council. Premiums of £50 and £25 are offered.—Mr. James Beck, clerk, 2 Orsett-road, Grays.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, but those *responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1369 Holborn), subject to later confirmation by letter.*

Buildings.

SOUTH WESTMORLAND AND ULVERSTON.—October 19th.—For erecting a stone arch bridge, for the rural district council.—Mr. A. Milne, Lowther-street, Kendal.

PEMBROKE (co. Dublin).—October 19th.—For the erection of a gate and weighbridge house, for the urban district council.—Mr. J. C. Manly, clerk.

IPSWICH.—October 19th—November 11th.—For the erection of a school, for the Education Committee.—Mr. J. H. Hume, secretary, Education Offices, Tower House, Ipswich.

MONMOUTH.—October 21st.—For the erection of a domestic arts centre, for the Education Committee.—Mr. C. Dauncey, secretary, County Council Offices, Newport.

PORTSMOUTH.—October 21st.—For the erection of a school, for the Education Committee.—Mr. G. Hammond Etherton, town clerk.

HENDON.—October 21st.—For the erection of fifty artisans' dwellings, for the urban district council.—Mr. H. Humphris, clerk.

HENDON.—October 21st.—For the erection of a fire station, for the urban district council.—Mr. H. Humphris, clerk.

BILLERICAY.—October 21st.—For the erection of three pairs of semi-detached cottages, for the urban district council.—Mr. C. Edgar Lewis, clerk.

BANBURY.—October 21st.—For the erection of forty cottages, for the corporation.—The Town Clerk.

SOUTHAMPTON.—October 21st.—For the reconstruction of Fore Bridge, Petersfield, for the county council.—Mr. H. Barber, clerk, The Castle, Winchester.

KNOWLE.—October 22nd.—For the erection of three pairs of semi-detached cottages at the county asylum, for the Visiting Committee.—Mr. J. R. Wyatt, clerk, Hants County Asylum, Fareham.

CARLTON.—October 22nd.—For the erection of four cottages, for the urban district council.—Mr. E. W. Turpin, clerk.

WILLESDEN.—October 22nd.—For the construction of a public convenience, for the urban district council.—Mr. O. C. Robson, engineer, Municipal Offices, Kilburn.

BRADFORD.—October 22nd.—For the erection of a branch post office, for the corporation.—Mr. Frederick Stevens, town clerk.

FRASERBURGH.—October 23rd.—For additions to a [illegible] school, for the School Board. The Clerk.

PERTH.—October 23rd.—For piling 280 yds. of the river bank with larch piles and pitching slopes, for the corporation.—Burgh Surveyor.

LANCASHIRE.—October 24th.—For the erection of a school for the Education Committee. Mr. Harcourt E. Clare, clerk, County Offices, Preston.

WEYMOUTH.—October 24th.—For the erection of a disinfecting station, for the corporation.—Mr. K. J. S. Harris, borough surveyor.

DEVON.—October 24th.—For alterations at certain county schools, for the Education Committee. The Architect, 1 Richmond-road, Exeter.

NORTHUMBERLAND.—October 25th.—For the erection of out offices and alterations to school, for the Education Committee.—Mr. C. Williams, secretary, The Moothall, Newcastle-upon-Tyne.

STAFFS.—October 28th.—For the erection of a school, for the County Education Committee.—Mr. Graham Balfour, Director of Education, County Offices, Stafford.

SOMERSET.—October 28th.—For the erection of a council school, for the Education Committee.—Mr. G. H. Bottomley, secretary, Weston-super-Mare.

BASFORD.—October 28th.—For alterations and additions to outfall works, for the rural district council.—Mr. Henry Stone, clerk.

LONDON (City).—October 29th.—For alterations and extensions of the convenience in Billingsgate market, for the corporation.—The Town Clerk.

NORTH RIDING.—October 29th.—For the erection of a school, for the Education Committee.—Mr. E. G. Fletcher, architect, Prince Regent-street, Stockton-on-Tees.

DEVON.—October 30th.—For strengthening Axe Bridge, Colyford, for the county council.—Mr. F. Bailey, clerk.

ESSEX.—October 30th.—For the erection of a school, for the Education Committee.—Mr. H. J. Goodwin, clerk, Education Offices, Loughton.

PEMBROKE (co. Dublin).—October 31st.—For the erection of a pier, promenade, sea and other baths, pavilion, and repairs to existing baths, for the urban district council.—Mr. J. C. Manly, clerk.

QUEENSTOWN.—November 1st.—For the erection of fifty houses, for the urban district council.—Mr. J. H. Campbell, clerk.

WANSTEAD.—November 7th.—For the erection of a fire brigade station, for the urban district council.—Mr. C. H. Brassey, surveyor.

BARNSLEY.—No date.—For the extension of the public baths, for the corporation.—Mr. W. F. Donald, town clerk.

LOUGHBOROUGH.—No date.—For the erection of a refuse destructor house, for the corporation.—Mr. A. H. Walker, borough surveyor.

BRECON.—No date.—For the erection of a police station, for the county council.—Mr. C. W. Best, county surveyor.

Iron and Steel.

NEWTON ABBOT.—October 23rd.—For laying cast-iron water mains, for the rural district council.—Mr. F. Horner, clerk.

WINTERTON.—October 23rd.—For the supplying and laying water mains, for the urban district council.—Mr. Norman Gibson, clerk.

MALDON.—November 4th.—For laying 370 yds. of 6-in. water main, for the corporation.—Mr. F. H. Bright, town clerk.

Roads.

BRITON FERRY.—October 19th.—For the supply of broken granite or basalt, for the urban district council.—Mr. Alex. Clarke, engineer and surveyor.

STURMINSTER.—October 21st.—For the hire of two steam rollers, for the rural district council.—Mr. G. F. Hazel, surveyor.

KIRKBURTON.—October 21st.—For laying kerbs, channelling and asphalting, for the urban district council.—Mr. G. W. Smith, clerk.

HUNSLET.—October 21st.—For making-up work, for the rural district council.—Mr. W. B. Pindar, clerk.

BOOTLE.—October 22nd.—For paving and sewering, for the corporation.—Mr. J. H. Farmer, town clerk.

LEEDS.—October 22nd.—For laying macadam and asphalt, for the corporation.—Town Clerk.

ROMFORD.—October 24th.—For the supply of Guernsey granite, for the urban district council.—Mr. J. Turvey, surveyor.

DEAL.—October 24th.—For making up two roads, for the corporation.—Mr. T. C. Golder, borough surveyor.

TURTON.—October 26th.—For the supply of 13,500 tons of Welsh granite setts and two traction wagons, for the urban district council.—Mr. J. B. Goulburn, clerk.

SHREWSBURY.—October 26th.—For paving the cattle-market avenue with granite setts, for the corporation. Mr. W. Chapple Eddowes, borough surveyor.

HEADINGTON.—October 26th.—For making up two streets, for the rural district council.—Mr. A. Walker, surveyor.

WALTON-UPON-THAMES.—October 28th.—For the supply of broken granite and broken flints, for the urban district council.—Mr. R. Wilds, surveyor.

MALDENS AND COOMBE.—October 28th.—For making up part of Dickerage-lane, for the urban district council.—Mr. R. H. Jeffes, surveyor.

SHOREHAM.—October 28th.—For the supply of granite quartzite or elvan stone, for the urban district council.—Mr. A. W. Nye, surveyor.

LONDON (City).—October 29th.—For street repairs and maintenance, for the corporation.—Town Clerk.

ALTRINCHAM.—October 29th.—For making-up and tar-macadamising work, for the urban district council. Mr. H. E. Brown, surveyor.

MONK BRETTON.—November 4th.—For the execution of private street works, for the urban district council.—Mr. James Gibson, clerk.

WANSTEAD.—November 7th.—For making up certain streets, for the urban district council.—Mr. Bruce Blewitt, clerk.

MIDDLETON.—November 8th.—For private street works, for the corporation.—Mr. W. Welburn, borough surveyor.

Sanitary.

ARDSLEY.—October 19th.—For the construction of sewage disposal works, for the urban district council. —Mr. C. McNaughton, clerk.

BRANDON AND BYSHOTTLES.—October 19th.—For laying sewers with manholes, for the urban district council.—Mr. Geo. D. Donkin, surveyor.

BOLTON-UPON-DEARNE.—October 21st.—For the construction of stoneware-pipe sewers and manholes, and erection of pumping station and filters, for the urban district council.—The Surveyor.

HAYES.—October 21st.—For the construction of percolating filters, sludge beds, and humus tank, and alterations at existing works, for the urban district council.—Mr. D. C. Fidler, engineer, Grange-road, Hayes.

ROTHERHAM.—October 22nd.—For the construction of earthenware pipe sewer and manholes, for the corporation.—Mr. Chas. L. Des Forges, town clerk.

MAIDSTONE.—October 22nd.—For the supply of disinfectants, for the corporation.—Mr. S. L. Monckton, town clerk.

CONGLETON.—October 24th.—For the construction of sewage purification works, for the rural district council.—Mr. H. Ferrand, clerk.

BEXHILL-ON-SEA.—October 26th.—For the construction of storm-water overflow sewers, enlargement of brick culvert, and extension of storage tanks, for the corporation.—Mr. G. Ball, borough surveyor.

ST. COLUMB MAJOR.—October 28th.—For constructing sewers and under-drains and laying out irrigation ground, for the rural district council.—Mr. C. E. Whitford, clerk.

BECKENHAM.—October 28th.—For laying a 12-in. diameter relief sewer, to include 9,001 ft. of 12-in. pipes and sixteen manholes, for the urban district council.—Mr. F. Stevens, clerk.

RUGELEY.—October 29th.—For the removal of refuse, for the urban district council.—Mr. W. L. Orgill, clerk.

LLANTWIT FARDRE.—October 30th.—For laying stoneware pipe sewer, for the rural district council.—Mr. W. Spickett, clerk.

LICHFIELD.—October 31st.—For the construction of 7,828 yds. of 6-in., 9-in. and 12-in. diameter stoneware, cast-iron and steel pipe sewers, including 12-in. sewer in deep channel work, manholes, ventilating columns, tanks, bacterial filters and rotary distributors, for the rural district council.—Mr. Thomas Moseley, clerk.

GLASTONBURY.—October 31st.—For the erection of pumping machinery at the sewage disposal works, for the corporation. Mr. Reginald T. Gould, town clerk.

Stores.

BRADFORD.—October 19th.—For the supply of stores, for the tramways department.—Mr. F. Stevens, town clerk.

WEST HARTLEPOOL.—October 22nd.—For the supply of kerbstone, flags, channel blocks, paving setts, whinstone, pitch and tar, lime, earthenware sewer pipes, metal castings, cement, disinfectants, horse provender, cartage, general hardware, picks and shovels, scythes and brushes, galvanised pails and sanitary pans, oil, waste, firewood, packing and blacksmith's materials, and cart repairs, for the corporation.—Mr Nelson F. Dennis, borough engineer and surveyor.

Miscellaneous.

WEST HARTLEPOOL.—October 22nd.—For the supply of road materials and sewer pipes, for the corporation.—Mr. Nelson F. Dennis, borough engineer and surveyor.

MANCHESTER.—November 1st.—For the supply of two four-cylinder petrol-driven motor fire pumps, for the corporation.—Mr. Thomas Hudson, town clerk.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BENTLEY-WITH-ARKSEY.—For carrying out a scheme of main sewerage and sewage disposal works, for the urban district council.—Mr. R. G. Whitley, surveyor:—

P. Dicks, Doncaster	£16,730
— Simpson, Newcastle	15,706
Waring & Sons, Huddersfield	14,300
J. Rogers, Castleford	13,949
— Bushby, Headingly	13,000
Edwards & Co., Doncaster	12,898
Arnold & Sons, Doncaster*	12,468

BROMLEY.—For making up Nightingale-lane, Quernmore-road, Pinewood-road, and Talbot-road, for the town council:—

	Nightingale-lane.	Quernmore-road.	Pinewood-road.	Talbot road.
Fry Brothers	£1,424	£985	£668	£471
C. F. Pant	1,389	993	607	452
— Farrow	1,291	903	601	443
Mowlem & Co.	1,279	897	569	439
Wood & Son	1,260	909	549	422
Peill & Son	1,213	872	566	431

Those of Peill & Son for Nightingale-lane and Quernmore-road, and Wood & Son for Pinewood and Talbot roads have been accepted.

COCKERMOUTH.—For the construction of 4,300 yds. of 24-in., 9-in., 6-in. and 4-in. sewers, manholes, flush tanks, ventilators, tanks and filters, for the rural district council.—Mr. J. B. Wilson, sanitary surveyor:—

	No. 3 and 4.
E. J. Arundel, Bradford	£2,585
C. Bushby & Son, Leeds	2,494
T. Johnston, Workington	2,102
J. Dawson, Whitehaven	2,061
W. G. Fett, Lenzie, Scotland	2,033
L. Ferguson & Son, Harrington (amended)	2,008
Dolaughan & Mulcorte, Cleator Moor*	1,960

DUNDEE.—For the supply of cast-iron pipes, for the Water Commissioners:—

J. Oakes & Co., Limited, Derbyshire	£535
Cameron & Robertson, Limited, Kirkintilloch	545
D. Y. Stewart & Co., Limited, Glasgow	531
Stewarts and Lloyds, Limited, Glasgow	530
Stanton Iron Works Company, Limited, Nottingham	527
Macfarlane, Strang & Co., Ltd., Glasgow	527
R. Maclaren & Co., Limited, Glasgow	515
Staveley Coal & Iron Company, Limited, Chesterfield	516
Clay Cross Iron Works Company, Chesterfield	502
J. & R. Ritchie, Limited, Middlesbrough-on-Tees	502
J. Shaw & Co., Glasgow	485
Cochrane & Co., Limited, Middlesbrough-on-Tees*	485

ENFIELD.—For making up part of Fair road, for the urban district council.—Mr. R. Collins, surveyor:—

J. Hampton, Palmer's Green	£509
W. J. Jackson, Ponstow, E.	466
Jennings & Grenfell, Waltham Cross	445
E. J. Betts, Enfield Highway*	395

FAVERSHAM.—Accepted for the supply of granite or basalt, and chippings, for the corporation:—

Penlee & St. Ives Stone Quarries, Limited, Bristol*

LLANDAFF AND DINAS POWIS.—For works of street improvement, for the rural district council:—

J. Bartlett, Cardiff	£127
Messrs. Rutherly & Co., Glamorganshire	114
E. Rees, Cardiff	104
Messrs. Osmond Brothers, Llandaff*	99

REDDITCH.—For laying pipe-sewers, for the urban district council. Mr. A. J. Dickinson, engineer and surveyor:—

W. Thorp, Birmingham	£979
G. Emery, Aston Manor	899
H. P. Williams, Kidderminster	891
Tilt Brothers, Bromsgrove	877
G. P. Trentham, Handsworth	861
T. Vale & Sons, Stourport	860
J. & A. Frazier, Bromsgrove*	849

RUNCORN.—For making up work with tar macadam and or limary macadam, for the rural district council. Mr. H. Swetenham, surveyor, 49 Northgate-street, Chester:—

P. Balmer, Liverpool	£834
W. Shepherd & Son, Rochdale	829
R. Heaton & Son, St. Helens	766
North Wales Asphalte Company, Chester	765
T. Stringer, Warrington	678
S. Hutton & Co., Northwich	671
G. P. Trentham, Birmingham	668
Burnie & Thompson, Warrington	667

‡ Received too late

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

OCTOBER.

19.—Institution of Municipal Engineers: Joint Meeting of Northern and Yorkshire Districts at Harrogate.
19.—Institution of Municipal and County Engineers: North Wales District Meeting at Wrexham.
21.—Institute of Sanitary Engineers: Mr. Percy L. Marks on "The Hygiene of Buildings," Caxton Hall, Westminster, 8 p.m.
24.—Junior Institution of Engineers: Mr. G. C. Allingham, A.M.I.E.E., on "Scientific Shop Management on the Taylor System," Institution of Electrical Engineers. 8 p.m.
26.—Junior Institution of Engineers: Week-end Visit to Sheffield.
26.—Royal Sanitary Institute: Meeting at Alton; Discussions on "Housing Problems in County Areas" and "Municipal Work in Alton." Town Hall, 11.15 a.m.

NOVEMBER.

12.—Royal Sanitary Institute: Discussion on Report of Departmental Committee on Intercepting Traps in House Drains, 90, Buckingham Palace-road, S.W. 8 p.m.
14.—Concrete Institute: Mr. E. P. Wells delivers his presidential address. 7.30 p.m.
28.—Concrete Institute: Mr. John M. Theobold, F.S.I., on "Bills of Quantities for Reinforced Concrete Work." 7.30 p.m.

DECEMBER.

12.—Concrete Institute: Messrs. R. Cathcart and Laurence Gadd, F.S.I., on "The Effects on Concrete of Acids, Oils and Fats." 7.30 p.m.

APPOINTMENTS WANTED.

ASSISTANT (23), A.M.I.C.E., requires an appointment. Experience in large inland municipal office 5 years, and in sea-coast town. Good knowledge of sewerage, building and road-making work. Capable at calculations, quantities, specifications, estimates.—Apply Box 1,188, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

MISCELLANEOUS.

ADDRESS WANTED.—A Subscriber is desirous of ascertaining the present address of Mr. J. Kemp, late city engineer, Brisbane (Australia). Can any reader assist in the matter? Kindly write to Box 1,187, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

APPOINTMENTS OPEN.

SINGAPORE, STRAITS SETTLEMENTS.
MUNICIPAL FIRE DEPARTMENT.

The Municipal Commissioners of the Town of Singapore require an Assistant Fire Brigade Superintendent under 32 years of age, and of sound constitution. He must have received a good education, a knowledge of Building Construction and Electricity, a regular training in Mechanical Work, have had experience in the maintenance and repair of Motor Appliances, and have served in a Fire Brigade under a Municipal Fire Superintendent. The engagement will be for three years, and each applicant is to state the earliest date upon which he could be free to leave for Singapore. The selected candidate must pass a medical examination. A second-class passage will be provided by mail steamer, or a first-class passage by other steamer, with half-pay during the voyage out. The salary will be 200 dollars per month for the first year, 220 dollars the second year, and 240 dollars the third year, paid monthly in dollars, the currency of the Colony (the value of the dollar being two shillings and fourpence sterling), with free unfurnished quarters, uniform, light and water. Should the engagement be renewed the salary would be increased by annual increments of 240 dollars up to 3,600 dollars of a maximum per annum. Applications, stating age, and place of birth, and giving details of education, training, and experience generally, and referring to the above requirements seriatim, accompanied by copies (only) of testimonials, and also personal references, are to be lodged with C. C. Lindsay, Esq., M.Inst.C.E., 180 Hope street, Glasgow (who will give further particulars if requested), not later than Tuesday, 22nd October, 1912.

NORTHERN POLYTECHNIC INSTITUTE.
HOLLOWAY, LONDON, N.

The Governors of the above Institute invite applications for the post of Assistant to the Evening Lecturer in Building Construction. Salary 7s. 6d. per evening.—Particulars and application forms to be obtained from the Secretary.

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The Surveyor

And Municipal and County Engineer.

Vol. XLII. OCTOBER 25, 1912. No. 1,084.

Minutes of Proceedings.

New York Sewage Disposal. The Metropolitan Sewerage Commission of New York, which is engaged upon a study of the collection and disposal of the sewage of that city, has just published a further "Preliminary Report," the fourth of a series of what might be termed interim reports, issued in advance of its final report, in order that their contents may be of early service. The present report deals with a general plan for the main drainage and sewage disposal of one of the four parts into which the area covered by the City of New York is divided. The chief feature of the scheme is the discharge of the sewage, after partial purification, into the large, deep tidal channels in the harbour. This area in question is divided into five sub-divisions, in each of which it is proposed to bring the sewage to a central point for treatment and discharge, the outlets in all cases delivering into deep water and in positions where the currents are found to be most suitable for rapid diffusion of the sewage in the water of the harbour. From the report it appears that, in order to provide the "partial" purification which is considered to be sufficient for the needs of the case, grit chambers are required at all the outfalls, and in addition either fine screening or coarse screening followed by sedimentation. There is nothing in the report to show what are the intentions of the Commission with regard to the disposal of the screenings and sludge from these outfall works. It is probable that the ultimate total volume of sludge will not fall short of that now produced at the two sewage outfalls of the London County Council, with the further disadvantage that the sludge from the New York sewage will be produced at a number of outfalls situated at various points on the shores of the harbour. It is evident that this will form a serious problem, and we look forward with much interest to the solution to be recommended by the commission.

In this connection a paper recently read at a meeting of the American Public Health Association by Mr. George A. Soper, the president of the abovementioned commission, is extremely interesting. In this paper, which we print on another page, Mr. Soper describes the means adopted by the commission to obtain the opinions of a number of sanitary experts as to the desirability of establishing a standard of cleanness for the harbour, and of the provisions which such a standard should contain, in order to assist the commission to decide to what extent the sewage should be purified. The list of experts includes a foreign chemist who contributed to the fifth report of our own Royal Commission on Sewage Disposal, an epidemiologist, a sanitary engineer, a civil engineer, an American chemist, a hygienist, a health officer, and a biologist. The questions submitted to these experts are given in full and their replies are summarised. The conclusions of the commission are also given, and among them the most interesting are those in which it is stated that, except in the immediate vicinity of docks and piers and sewer outfalls, the dissolved oxygen shall not fall below 3 c.c. per litre of water (corresponding to 58 per cent of saturation), and that the quality of the water at points suitable for bathing and oyster culture should conform substantially as to bacterial purity to a drinking-water standard. These are excellent ideals to set up, and it only remains to be seen how and at what cost they are to be attained.

* * *

The Local Government Board and West Hartlepool. The plea for the appointment of whole-time medical officers of health which has been made in these columns from time to time has usually arisen *à propos* of circumstances existing in districts of a rural character. There can be no doubt that the general view to-day is that a medical officer of health who is also engaged in private practice cannot do full justice to himself, to his patients, and to his council, and it is rather startling therefore to learn that there still exists a county borough—West Hartlepool—with a population of nearly 64,000, in which the council are anxious to continue their former policy of engaging a part-time medical officer of health at a salary of £150 a year. It is not surprising that the Local Government Board have declined to sanction the proposed appointment of a new medical officer on these terms, and that they have held an inquiry into the sanitary circumstances and administration of the borough with a view to ascertaining the degree of success which the adoption of this plan has attained in the past. The report of Dr. E. P. Manby, to whom was entrusted the duty of holding this inquiry, contains, as was to be expected, considerable criticisms of the public health administration of West Hartlepool, particularly in regard to the existence of a large number of privy middens. It is only fair to point out, however, that Dr. Manby's report makes it clear that the part-time medical officer is energetic and anxious to carry out his duties properly, but is the victim of his circumstances in being unable to do so, and that if he is to give effective service he should be recognised as the head of the public health department, with all the activities of which he should be in a position to keep in close touch. In this connection, as Dr. Manby says, he must give some attention to detail in regard to the inspection of dwellings, of dairies, cowsheds, and milkshops, of all premises where food for human consumption is prepared or stored, and so on; but in addition there are broad questions to be considered and lines of policy to be evolved in regard to the public health of the district. For example, it is not merely details of sanitary inspection and

the investigation of specific outbreaks of infectious disease which concern the medical officer of health to-day. He must interest himself in the more general questions of possible physical deterioration, of infantile mortality, tuberculosis, housing, occupation diseases, and similar matters, as affecting his particular district. This implies and demands special training and special knowledge. But many of the duties need for their full usefulness cordial co-operation between the medical officer and the local medical practitioners. As long as the medical officer is himself in practice, and thereby in competition with his non-official brethren, it is hardly to be expected that this co-operation will be as wholehearted as it might be in the case of a medical officer not in private practice. We cordially agree that the town council of West Hartlepool would be well advised to employ a whole-time medical officer of health who is a trained and experienced sanitarian.

* * *

Sewage Disposal in South Africa.

The recent issue of a special supplement to the journal of the Royal Sanitary Institute dealing solely with subject matter of colonial interest marks a satisfactory step in the progress of the work of the institute in all parts of the empire. Most of the papers printed in this supplement were presented at the first Sanitary Congress held at Cape Town in October of last year, and among them two, dealing with the disposal of sewage, are of particular interest, as they show how the local engineers and others are making use of the experience gained in the Mother Country in devising methods adapted to the needs of local conditions. The opinion expressed in these papers is that the sewage should be subjected to suitable preliminary treatment in tanks and the tank effluent used for irrigation on land, as it is claimed that large tracts of land of a thoroughly suitable character are available in the neighbourhood of nearly all the towns in the Union. This being so, it was natural that considerable space was devoted to the discussion of the most suitable and most profitable crops for such purposes, and it is satisfactory to notice that already warnings are uttered against allowing the interests of the crops to override those of sewage purification. One speaker in the discussion emphasised the statement that the primary object and aim of a sewage farm must be to purify the sewage, and that the growing of crops must be a secondary consideration, even if this should occasionally spoil some of the crops. A warning against the letting of sewage farms to tenants was also timely in view of the unsatisfactory results which ensued in the past when such a course was adopted in this country.

The author of one of the papers apparently favours one particular type of preliminary treatment and speaks of "so-called" bacteria and filter beds, which would appear to indicate that he does not agree with the bacterial theory which is now accepted by practically all the leading sanitarians. It is unfortunate that this controversy should be raised in South Africa, as in this country the crux of the problem is how best to deal with the sludge. From particulars given in the course of the discussion it appears that in consequence of the scarcity of water the sewage is usually very strong, exceeding by two or three times the strongest known in England. On the other hand the evaporation coefficient is 60 in. to 65 in. as compared with 15 in. to 20 in. per annum in the Thames Valley. These factors will have to be taken into serious consideration, especially in the methods adopted for sludge disposal. At present the system of shallow burial in the ground seems to be favoured, and as long as a sufficient area of suitable land can be obtained and the tanks are carefully operated, this will probably meet the requirements of the case, but it will be very interesting to watch developments in this direction and to receive particulars of the results of the various sewage works in operation from time to time.

The Education of Highway Engineers.

At the American Road Congress which was held in Atlantic City in the early part of this month Prof. A. H. Blanchard presented a paper on "Highway Engineering Education," which, though intended primarily for an American audience, is so able a review of the subject generally that we have gladly availed ourselves of the opportunity which Prof. Blanchard has kindly afforded us of reproducing it in full in another part of the present issue. "The consensus of opinion of eminent highway engineers and educators," writes Prof. Blanchard, "is to the effect that the highway engineer of the future requires the broad foundation which the four years' course in civil engineering gives," and we believe that most of our readers will find themselves in accord with the spirit of this opinion, though the form which the four years or so of general civil engineering should take, its actual duration, and the extent to which courses on highway engineering are embodied in it must necessarily depend upon the nature of the work which the engineer will have to perform when he is fully qualified, as well as upon the probable rates of pay which necessarily affect the length of time and the amount of money which can be expended upon the training itself as distinct from partly paid employment. The importance of the civil engineering course relatively to the period of pupilage will, for one thing, depend upon the extent to which road construction will be a feature of the student's future work. In a thickly peopled and highly developed country problems of maintenance predominate, and here an intimate acquaintance with roads, such as can best be gained by a pupilage, when the young man's mind is still in a receptive state, is relatively more important than it is in a country which is at an earlier stage of development. In either case, however, if one were to devise a three years' course, say, in highway engineering alone it would be quite reasonable to defer all mention of roads till the third year, devoting the first two years to such pure mathematics and pure science as can be applied directly in highway work as well as to those sciences and their general applications to engineering problems which will enable the student to deal swiftly and surely with the difficulties that will confront him later in life. Engineers who have received such a training are not among those who pay tribute, here to what is waterproof, there to what is rigid, to-day to what is sticky, to-morrow to what is hard—they estimate the relative importance of each characteristic of available materials and they recognise the natural law on which, in each case, the dominant character of the material depends.

One of the evils of a special as distinct from a broader training is that the student is impelled along a set path instead of being instinctively drawn towards the career for which he is best fitted; a man who would have made a good structural engineer becoming, for instance, a second-rate road engineer. Specialisation should come as a result of knowledge, not knowledge as the result of a predestination to specialise.

* * *

The Functions of Colonel Crompton

Colonel Crompton, the consulting engineer to his Majesty's Road Board, had the honour last week of being made the subject of a "question" in the House of Commons by Mr. T. M. Healy, and of a printed reply thereto by the Chancellor of the Exchequer. Both query and answer are given at length in the body of this issue. Personally, we think Colonel Crompton is to be congratulated on the publicity thus given to his relations with the Road Board. It has "cleared the air" effectively, and one may hope finally. The first point it establishes is the exact remuneration attached to the post, and it is safe to say that hitherto this has been placed by Colonel Crompton's detractors at about four times the moderate figure brought out. We know now, definitely, that Colonel Crompton has "no general or executive duties" in relation to

the Board. "The conditions of his employment are that he is employed only as consulting engineer, his advice being sought on technical questions, within the scope of his knowledge and experience, when considered necessary." The Chancellor's reply to the very detailed question addressed to him is full and frank; we find only one allegation it does not meet, probably—and excusably—because it was unworthy of notice. Mr. Healy, in his inexplicable thirst for knowledge on a subject for which he cannot care twopennyworth of cold tea, asked whether a certain "relative" of Colonel Crompton "is in the employment of one or both of the two companies named in the question." We are able to satisfy Mr. Healy's somewhat feminine curiosity by an answer in the affirmative. The relative is Colonel Crompton's son, who is so employed abroad. Here is the appalling admission in all its bald gravity, and we have nothing to add to it except to congratulate one or both of the companies on having secured for their staff a helper of probity and ability worthy to stamp him as a son of his father. There remains another serious allegation which was brought under the notice of our imperial legislators. Colonel Crompton, it would seem, had invited some road engineers, "who are or may be applicants for grants from the Board," to see the interesting work in Addison-road, and with sinister Machiavellian diplomacy he had further asked them "to remain with him to tea." We suspect there were also shrimps, but Mr. Healy mercifully restrained himself. Doesn't it remind one irresistibly of "Chops! Gracious heavens! and tomato sauce! Gentlemen, is the happiness of a sensitive and confiding female to be trifled away by such shallow artifices as these?" Well, Mr. Healy has delivered himself of his portentous question, and has been answered, and it only remains now for some one to ask him by whom, and in whose interest, he was made a cats-paw in connection with his query.

The Treatment of Soft Wood Paving Blocks: Some French Experiments.

In another part of the present issue there will be found some account of the main results of experiments which were recently carried out in Paris to determine the effects of various treatments of soft wood paving blocks. Though of considerable interest, these experiments are perhaps of not more than secondary importance, since what really determines the life of a wood pavement is not the actual or mean strength of the wood, but the extent to which one part of the pavement differs from another in strength and toughness combined. It is more important that a wood pavement shall wear evenly than it is that it shall wear slowly, since it is the presence of lumps and puddles which finally settles the date of relaying, long before the blocks are worn through. The woods which are now in favour are those which wear most evenly. Even wearing, it may be added, tends to promote slow wearing, since it lessens the number and severity of the blows which the paving receives from wheels. As regards the tests made with soaked specimens, the object of these experiments is not quite clear, since it is, surely, desirable to ensure that the wood is properly seasoned and dried before subjecting it to creosoting or any other treatment intended either to preserve it, antiseptically, from decay, or to prevent the penetration of water. On the whole, the results of the experiments seem to give support to the most recent practice as regards London pavements, which makes the work of the patient investigators, Mr. Labordere and Mr. Anstett, the more welcome on this side of the channel, even if, to English eyes, the tests made seem to have been in some respects a little unpractical.

Sanitation at Oakengates.

In consequence of representations as to housing conditions and the home isolation of infectious diseases, Dr. J. R. Hutchinson, one of the medical inspectors of the Local Government Board, was appointed to hold a local inquiry into the sanitary circumstances and administration of the Oakengates Urban District, Shropshire. It appears that in the autumn of 1911 the district was visited by an outbreak of scarlet fever, when the facilities for the home isolation of patients were found to be totally inadequate. The late medical officer of health thereupon reported to the board that bad housing accommodation and the impossibility of proper isolation were responsible for the repeated occurrence of secondary cases of infectious disease. The investigations of the inspector show that this allegation has substantial proof, and in his report he recommends the provision of adequate hospital accommodation. It is evidently a practical impossibility to prevent the propagation of infectious diseases in such a case, for example, as that mentioned in the report, where there were two patients in a house consisting of a kitchen and two bedrooms (without fireplaces), in which there lived, in addition to the patients, two adults and five other children. This is no doubt hardly an average example, but it does not need the existence of many such houses to demonstrate the necessity for adequate hospital accommodation in order to safeguard the public health. It is to be hoped that the inquiry at Oakengates may lead to prompt and effective action.

The Wrexham Meeting.

The North Wales District meeting of the Institution of Municipal and County Engineers held on Saturday last was a very pleasant and successful function, although it must be said that there was only a very moderate attendance of members. The President of the Institution, Mr. R. J. Thomas, was thoroughly at home, as he is of course a native of the Principality, and a master of the Welsh language In the course of the proceedings, Mr. J. England, the borough engineer, read an interesting paper descriptive of the municipal works of the town; the discussion which followed, although not of great length, raising many points of importance, as will be seen from our report elsewhere in this issue. There can be no doubt that the idea of postponing discussions of papers until after the visits to works has many advantages; but if this course (which, as will be seen, was adopted at Wrexham) is to be followed at future gatherings, we would venture to suggest, for the convenience of those attending meetings from distant parts of the country, who are necessarily obliged to leave at a comparatively early hour, a rather stricter adherence to the time-table than was insisted upon on Saturday.

The Concrete Institute.

The programme of the fifth session of the Concrete Institute has just been issued, and those who have been responsible for its arrangement are to be congratulated on having secured an attractive list of meetings both as regards lectures and subjects. We would particularly draw the attention of our readers to a course of six educational lectures on "Concrete, its Properties and Manufacture," which will be delivered on Tuesdays at 5.30 p.m., commencing on November 12th. The lecturer will be Mr. H. Kempton Dyson, the secretary of the Institute, and lecturer on "Reinforced Concrete and Structural Engineering" at the L.C.C. School of Building, and this fact is a full guarantee for the interest of the lectures. The ordinary meetings will be held as heretofore on Thursday evenings at 7.30, and, judging by the programme, the session should be a very successful one. At the first general meeting Mr. E. P. Wells, J.P., will deliver his presidential address, and at subsequent meetings papers will be read on matters connected with concrete and structural work, variety being afforded by an evening to be devoted to the consideration of "Concrete in its Legal Aspect."

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Highway Engineering Education.

By ARTHUR H. BLANCHARD, M.AM.SOC.C.E., Professor of Highway Engineering, Columbia University, New York City.

[The subjoined paper, which we comment upon in "Minutes of Proceedings," was presented before the American Road Congress at Atlantic City on October 3rd.]

The educational training of the engineer who may enter that branch of civil engineering devoted to the economics, construction and maintenance of highways should be considered from two standpoints: First, the essentials, which, from an educational point of view, are considered as prerequisite to a successful career in highway engineering; and, second, practical methods of securing this training under American conditions.

The American youth who has expressed the desire to enter the profession of engineering has various channels open to him. The usual course followed is to enrol in one of the four-year engineering courses designated as civilian, mechanical engineering, electrical engineering, chemical engineering, or mining engineering. There are, however, notable deviations. Several institutions and some engineers advocate a broader training for the engineering profession than is possible in the ordinary four-year course, and, in fact, believe that the profession of engineering demands the same type of training as is now universally recognised as desirable for men entering the legal or medical profession.

Usually the American boy, in entering on a technical career, has not fully made up his mind as to the particular field in which he is most interested. In the four-year courses he has in some cases one year, and in others two years, in which to make up his mind as to which of the five general branches of engineering referred to above he wishes to enter. It is self-evident that the ideal training is one which will prepare a student upon graduation to enter any one of the numerous fields of engineering. At least it is possible that a comparatively wide field of activities will be open to a man whichever one of the above courses he takes in the technical school.

Having these general facts in mind, attention will now be riveted upon the situation which confronts the young man who may be one of our future highway engineers. Let us suppose, for example, that he has decided to devote four years to securing a technical education, and that there is offered to him the four-year course in civil engineering and a four-year course designated as highway engineering. Which course should he take? The evils of over-specialisation in the undergraduate engineering course have been fully discussed by the Society for the Promotion of Engineering Education. Suffice it to say in this discussion before the general public interested in highway improvement that the graduate of the civil engineering course on the one hand has before him a large field of activities for all of which he is equally well equipped. For instance, he may enter the field of structural engineering, sanitary engineering, railroad engineering, geodetic engineering, hydraulic engineering, highway engineering, irrigation engineering, and in many cases mechanical, electrical and mining engineering. On the other hand, a graduate from a so-called four-years' course in highway engineering has, if the course is made up of the subjects which the title implies, only a limited field in which he considers that he is particularly proficient.

VALUE OF FOUR-YEARS' COURSE.

The consensus of opinion of eminent highway engineers and educators is to the effect that the highway engineer of the future requires the broad foundation which the four-year course in civil engineering gives. A knowledge of practically all of the subjects included is found of value in the manifold duties imposed in the various positions which he may occupy in the service of municipalities, states, counties, [illegible] estates, contractors' organisations, consulting engineers' offices, and manufacturing companies.

In the consideration of the training received and the subjects covered in the four-year course in civil engineering relating especially to highway engineering it is of interest to note the present status of highway engineering in the civil engineering courses of American universities and technical institutions. An examination of the latest catalogue received from ninety-two institutions in the United States offering courses in civil engineering showed that seventy-eight included a text-book lecture course in highway engineering in the curriculum. The number of recitation lecture hours in the various courses may be arranged approximately in the following groups: Thirteen, 15 hours or less; twenty-eight, 30 hours; seventeen, 45 hours; six, 60 hours; six, 75 hours; three, 90 hours; three, 120 hours; one, 135 hours; and one, 165 hours. Fifteen give some instruction in laboratory work, while ten include special courses in highway surveying. In the case of institutions devoting over ninety hours to highway engineering, the general civil engineering course covers three years, while a highway option is taken in the fourth year. A comparison of the present status of highway engineering education as outlined above with the conditions described by Logan Waller Page in his valuable paper on "Highway Engineering," presented before the Society for the Promotion of Engineering Education in 1909, is certainly encouraging, especially when it is remembered that only three years have elapsed. In 1909, according to Mr. Page, 50 per cent of the institutions investigated did not include a course on highways in the civil engineering curriculum, while it is noted that of the courses in ninety-two institutions examined by the speaker, 85 per cent now give a course in highway engineering.

The importance of the subject of the economics, construction and maintenance of roads and pavements in the United States at the present time demands that more prominence should be given to the course in highway engineering in civil engineering curricula. Having in mind the various component parts which go to make up the curricula, it appears that a well-balanced civil engineering course under present conditions should contain a three-hour course of one year in length devoted to highway engineering.

In such a course lectures and text-book work should cover the following topics: Historical review of the construction of roads and pavements; preliminary investigations incident to construction; principles of surveying and mapping peculiar to highway work; design of highways; drainage and foundations; construction and maintenance of earth, sand, clay, gravel and broken-stone roads, including a consideration of the materials which enter into their construction; general consideration of bituminous materials as such, and their use in the construction of bituminous surfaces, and bituminous macadam, bituminous concrete, sheet asphalt and asphalt-block pavements; the construction and maintenance of wood-block, stone-block, brick and cement-concrete pavements; dust prevention, street cleaning and snow removal; construction of car tracks and pipe systems; comparison of road and pavements; construction of sidewalks, bridges and culverts; and a general treatment of economics, highway administration and highway legislation.

LABORATORY WORK.

Laboratory work should be limited to what is sometimes called lecture demonstration work by the officers of instruction. In other words, although it is advisable that the methods of testing all kinds of bituminous and non-bituminous road materials should be brought to the attention of students in civil engineering by actual demonstrations in the laboratory or lecture-room, it is not considered advisable to devote the time necessary for each student to run through complete tests as is done by students in the laboratories devoted to the testing of structural materials. In two to five afternoons all the fundamental tests employed in the examination of bituminous and non-bituminous road materials could be demonstrated before a group of from twenty-five to thirty men if the laboratory equipment was properly arranged and the work well planned out. Two to three afternoons would suffice if the testing of bituminous materials were covered in a course given by the department of chemistry. Unfortunately at the present time very few instructors in chemistry are familiar with bituminous materials; hence the methods of testing will have to be worked up by civil engineering instructors.

Eventually some of the time now given by the department of chemistry to carbon compounds or quantitative analysis in courses for civil engineering students can be profitably devoted to the chemistry of bituminous materials.

VISITS OF INSPECTION.

A limited number of inspection trips, covering the economics of highway location and the construction and maintenance of various types of roads and pavements, will be of value.

The time devoted to road or street surveys in some institutions, in addition to the regular work in railroad surveying and general surveying, is of questionable merit. Although there are many problems in highway surveying which are different from those encountered in other branches of surveying, it is doubtful if it is necessary or expedient to use up valuable time on this work, considering the number of subjects which it is necessary to include in a broad course in civil engineering. The speaker's experience with civil engineering graduates who have worked under him on highway work has led to the belief that a graduate in civil engineering who has had a good course in railroad surveying and in railroad curves, together with a comprehensive course in highway engineering as outlined above, is admirably equipped to occupy the minor positions in a field party on highway surveys. In these positions he may acquire, either through advanced study or special instruction, the information and practice necessary to occupy the position of chief of party and the higher positions in the highway department connected with the bureau of surveys. It is, however, advisable in certain instances, where practicable, to divide the time devoted to railroad surveying, so that a highway survey outside built-up districts may be added to the course, together with the preparation of plans, cross-sections and estimates.

In further consideration of the special training which will be of benefit to those entering the field of highway engineering, the educational plans which have been evolved to elevate the profession and to equip men thoroughly for this field of engineering work, foreign practice will be given consideration first.

BRITISH PRACTICE.

Great Britain affords an illustration of one method by which well-trained highway engineers may, under favourable circumstances, be secured. Fortunately for the British engineer, his position in highway work is much more permanent than in the United States. There are several reasons why such is the case. Among others may be mentioned the recognition by the British public that the principle of continuity in office of capable engineers results generally in economical and efficacious construction and maintenance of public works. Those American engineers who visited Great Britain at the time of the Brussels International Road Congress in 1910 will, without doubt, find the majority of the prominent highway engineers of England occupying the same positions or higher positions when they attend the Third International Road Congress to be held in London in 1913. This is not a long period, but could the same observation be made in regard to the *personnel* of many of our great state highway departments for a similar period? It should be stated, however, that the subordinate positions in the United States, being in many cases under the Civil Service regulations, are more permanent than those affected by political exigencies. This condition of permanency of position of high officials in Great Britain means that it is possible for young men who are attracted to highway engineering to enter the department of some county or municipal engineer, and, proving capable, to acquire a valuable experience under the continued leadership of an able engineer. In this position a young man of the right calibre may, by hard work, including a large amount of home study, equip himself for the highest positions in highway work in Great Britain. Another safeguard of the British engineer, and an incentive to highway engineers in embryo, is the admirable practice which has been adopted in many cases requiring that applicants for a certain class of positions shall hold certain grades of membership in the Society of Municipal and County Engineers, and in other cases certain grades of membership in the Institution of Civil Engineers of Great Britain.

FRANCE.

France offers an entirely different type of training for men who are going to enter the field of highway engineering. All the important positions in this branch of the public service are occupied by picked men, especially educated and trained for the service. After a preliminary general education, covering as a final period that comparable with the four years' high-school training in this country, men of high standing are admitted to the Ecole Polytechnique, the course in which is practically two years in length. Upon graduation from this school, the men of high standing are allowed to select one of the several national schools, provided openings exist, in which they will secure special training for the public service in a given field. Those who enter the Ecole Nationale des Ponts et Chaussees devote three years to a general course in civil engineering under the leadership of engineers of the highest grade in the Department des Ponts et Chaussees de France. During the vacations these men are alloted to service on the construction of roads and bridges in various parts of France. It is evident that the training thus obtained is admirable, and that the *personnel* of the engineering staff of the department of roads and bridges of France is exceptionally high.

AMERICA.

In America, while in some cases an attempt has been made to give as special instruction in highway engineering a four-years' undergraduate course in this subject, this method has not given particular satisfaction for the reasons previously noted. Excellent work has been done by many universities in several parts of the country in giving extension courses to groups of men interested in various phases of highway improvement. Very little advanced work, however, has been done through the medium of the American university. The United States Office of Public Roads has evolved a scheme by which men may secure a certain amount of advanced instruction and training in that part of highway engineering dealing with highways outside of built-up districts. This plan is to place the student engineers in the charge of men in the service of the office in various parts of the country on different kinds of highway work. When it is impossible to work in the field, the men do a certain amount of office work at Washington, receiving instruction by means of lectures on certain phases of highway engineering, and also do laboratory work on the testing of both bituminous and non-bituminous road materials.

THE COLUMBIA UNIVERSITY COURSE.

In 1911, through the generosity of Charles Henry Davis, president of the National Highways Association, there was founded at Columbia University a graduate course in highway engineering. The object in founding this course was to elevate this branch of the engineering profession, and to provide an opportunity for men engaged in highway work to obtain advanced instruction and training in the various phases of highway engineering under the most favourable conditions. For many reasons it is fortunate that the first course of this character should be found at a university presided over by a president and trustees who look upon the work of the university from an exceptionally liberal standpoint. While maintaining the high character of all degrees conferred, nevertheless these men believe in opening the courses of instruction to any mature man provided he has the prerequisites for any given course, and earnestly seeks information. Likewise, it is fortunate that the administrative authorities allow the introduction of an innovation as far as the period of attendance is concerned, inasmuch as the graduate course referred to is given in the period from December 1st to April 1st. An engineer, therefore, who desires to take all the graduate courses in highway engineering and allied subjects which fulfil the requirements for the Master's Degree, will necessarily be in attendance for two winter periods, the equivalent of one collegiate year. The selection of this period in which to give the instruction was based upon the prevailing idea among leading highway engineers that it would be feasible for many men to obtain a four-months' leave of absence during the dull period of the year. This prediction has been found to be correct.

As this plan is somewhat of an innovation in engineering education, it may be of interest to cite certain facts in connection with the attendance during the winter period of 1911-12, which was the first period under this plan. Although the graduate courses were not brought to the attention of engineers until November, 1911, there were in attendance fifteen men affiliated with highway work, thirteen of whom registered as candidates for the Master's Degree. It is of

interest to note that this group included men connected with state highway departments, contractors' organisations, materials departments, engineering sales departments of manufacturing companies, county highway departments, and consulting engineers' offices. The experience of these men ranged from one to twelve years. They came from widely distributed localities—Connecticut, Massachusetts, New York, Pennsylvania, Maryland, North Carolina, Alabama, Panama and British Columbia being represented.

The curriculum of the graduate work in highway engineering comprises advanced courses in the economics and design of roads and pavements, including a thorough discussion of bituminous surfaces and bituminous pavements; highway bridges and culverts; mechanical appliances used in highway engineering; road and street surveying and highway design; highway laws and systems of administration; management engineering; bituminous and non-bituminous road material laboratory courses; seminars in highway engineering literature; chemistry of bituminous materials; engineering geology; optical mineralogy; and inspection trips covering various types of roads and pavements and manufacturing plants producing highway materials.

A large staff of non-resident lecturers in highway engineering, which includes many of the most prominent highway engineers and chemists in the United States, is employed to give instruction on specified subjects forming an integral part of the various courses. It was decided to throw these special lectures open to the engineering public, and to hold the same during evening sessions in order that this feature of the work may be of maximum benefit to all that may find the university accessible. An attendance of from fifty to one hundred engineers at many of the lectures during the past winter period showed the interest taken in the many problems of highway engineering presented.

INTERESTING INNOVATIONS.

During the 1912-13 winter period a special arrangement will be introduced which is considered of particular interest to practising highway and chemical engineers. Many who cannot secure a four-months' leave of absence have expressed the desire to devote from six to seven weeks at Columbia University in securing information relative to the manufacture and testing of all kinds of bituminous materials, and their use in the construction and maintenance of bituminous surfaces and bituminous pavements. Arrangements have therefore been made so that courses covering the above subjects may be taken either independently or as an integral part of the unified graduate course in highway engineering. During a continuous period of about six weeks, beginning in the latter part of December and ending during the first week of February, three courses will be offered as follows: Two weeks will be devoted to a demonstration lecture course on the mining, manufacture and testing of all kinds of bituminous materials; the next two weeks will be devoted to a course on bituminous surfaces and bituminous pavements; while during the final period of two weeks will be given a laboratory course, in which those enrolled will test various types of bituminous materials, make analyses of unknown materials, and write specifications covering the use of bituminous materials under varying conditions. Each course will comprise forty lectures or eight laboratory hours, depending upon the character of the course.

During the coming year at Columbia it is expected that another innovation will be introduced, inasmuch as, in connection with the graduate work in highway engineering, there will be founded several research fellowships by various manufacturing companies. The research workers holding these fellowships will investigate problems of particular interest and value to the manufacturing concerns founding the same. It is expected that many problems which interest those engaged in highway work will be thoroughly investigated through this medium. While admirable work has been done along many lines in the research laboratories of our universities, the speaker earnestly hopes that more attention will be given in the next decade than in the past ten years to the multitude of problems in highway engineering which demand the best efforts of investigators for their ultimate solution.

Woolwich Subway.—The new subway under the Thames at Woolwich will be opened to-morrow

MANCHESTER SEWAGE DISPOSAL.

We make the following extracts from the annual report of the Manchester Rivers Department for the year ended March 27th last:—

DAVYHULME WORKS.

Total flow of sewage (fifty-two weeks) 12,382,950,000 gallons. Amount of sludge, sand, &c., removed, 18·3 tons per 1,000,000 gallons.

Cost of sludge disposal, 12s. per 1 000 000 gallons. Of the total volume of sewage 94·1 per cent was treated in the contact beds. The results of this treatment were 74 per cent purification on the oxygen absorbed test, and 76 per cent purification on the albuminoid ammonia test; but these figures apply to the *average* effluent including the unfiltered tank effluent. This is the highest percentage purification of the raw sewage that has been obtained so far at these works, and further improvement is expected as the additional beds now under construction come into operation.

The cost of filtration of the actual volume so treated was 15s. 8·4d. per 1,000,000 gallons. Of this sum 5s. 3·6d. was for maintenance and 10s. 4·8d. for renewals. Calculated upon the total volume of sewage these figures are 14s. 9·4d., 4s. 11·8d. and 9s. 9·6d. respectively per 1,000,000 gallons.

The total revenue cost of the disposal of the sewage at the Davyhulme works (apart from interest and sinking fund) was £1 19s. 7·5d. per 1,000,000 gallons, or 9·8d. per head of population, which compares favourably with the average of 10·1d. for the seven years to March 27, 1912.

WITHINGTON WORKS.

At these works the amount of sludge removed was 9·3 tons from the tanks and 4·4 cwts. from the screens, or a total on the average of about 9·5 tons per 1,000 000 gallons of sewage, while the cost of sludge disposal was 6s. 10·8d. per 1,000,000 gallons of sewage. The total cost of sewage treatment was £1 17s. 2·2d. per 1,000,000 gallons, or 9·7d. per head of population connected to sewers.

MAIN ROAD MAINTENANCE.

SOMERSET COUNTY COUNCIL'S REQUIREMENTS.

The Somerset County Council have agreed to a set of specific requirements with the object of obtaining better results for the money expended upon main road maintenance. Among the conditions recommended for contracts with the rural district councils in future are that the maintenance of main roads shall not be entrusted to any district council that does not employ a properly qualified surveyor. A second provides for notice to be given to district councils failing to carry out the road maintenance to the satisfaction of the County Works Committee, giving grounds of complaint and providing for the County Works Committee to take over the work themselves subject to certain conditions.

Wood Paving in Belgrade.—Belgrade seems always to be hampered in times of political crisis by the processes of Western civilisation (writes Mr. Charles E. Hands, the famous war correspondent). Four years ago, at the time of the crisis caused by Bulgaria's declaration of independence, the Servian capital was in the throes of a sewerage scheme. The first sewage pipes in Servian history were being laid down in the capital, and the narrow streets in the centre of the city were blocked by trenches and heaps of rock and dirt. . . . Now comes another crisis, and the principal streets have been torn up by a paving scheme. Two have been taken in hand—the pavements of the Prince Michael Gulitza and the King Milan Boulevard and the adjoining street in the middle of the town to make way for a wood [illegible]. The result is an unusual picturesque sight is that an afternoon promenade through the fashionable quarter of the city is a painful exercise of picking one's way through muddy excavations. They are doing their best for a makeshift finish to the operations, and the effort is doubtless wise. For the Royal Palace stands on the boulevard where the excavations are deepest, and if the crisis does not end to the popular satisfaction it may be as well to have the streets in condition for quick cavalry work and volley firing.

SOFT WOOD PAVING.

PARIS EXPERIMENTS: EFFECTS OF VARIOUS TREATMENTS.

[Notes from a paper prepared for the Sixth Congress of the International Association for Testing Materials, by Mr. P. Labordere, engineer, Ponts et Chaussees, and Mr. F. Anstett, director of the Municipal Testing Laboratory, Paris.]

Some 2,220,000 square metres, or about 24 per cent of the area, of the Paris roads and streets are paved with wood. All the wood used is resinous, the species including pines and red fir. The average life of these pavements is nine years, but on roads subjected to much traffic they have to be renewed every five or six years. Up till lately the usual treatment for preserving the blocks has been to immerse them in a heavy coal-tar oil, rich in phenols; but recently pressure has been employed in order to secure better penetration. It was found that this impregnation, while reducing porosity, did not increase the strength of the wood. Experiments were therefore made to find out what treatment would add to the mechanical strength of the material, the test adopted being the crushing strength in the direction of the fibres on a specimen 125 mm. long and 75 mm. square (just under 5 in. long by 3 in. square). Three equal specimens were cut from each block. To allow for the effects of moisture, as occurring under service conditions, two of these were, in each case, tested dry, and one after immersion in water for thirty days.

The substances with which the wood specimens were treated included: Pine tar, sodium and potassium carbonates, and sodium silicate. The proportions were varied, and the temperature of application was also varied.

PINE TAR TREATMENT.

The effects of various baths were tried, the temperatures being 60 deg., 80 deg. and 110 deg. Cent. (140 deg., 176 deg. and 230 deg. Fahr.). The first baths were of pure pine tar, and the effect was tried of adding (1) 2 grammes per litre of sodium carbonate, (2) 4 grammes per litre of sodium carbonate, and (3) 2 grammes per litre of sodium silicate. The nature of the bath did not affect the result. The temperature affected the results with the dry specimens, the hottest bath increasing the strength by about 12 per cent; but no such effect was observed in the case of wet specimens.

COAL-TAR OIL TREATMENT.

Coal-tar oil was then tried at temperatures between 112 deg. and 140 deg. Cent. (234 deg. and 284 deg. Fahr.). The treatment at the highest temperatures imparted strengths as great as those resulting from the pine tar treatment; but after the baths at the lower temperatures the strengths were no greater than those of the untreated blocks. Generally, it was found that the results were affected but little by the addition of the salts mentioned, the important factor being the temperature of the bath. The following results were obtained, starting with a strength of 323 kilograms per square centimetre (4,593 lb. per square inch) of the untreated block.

Temperature of bath.		Mean strength.	
Cent.	Fahr.	Kilograms per sq. c.m.	lbs. per sq. in
80°	176°	307	4,702
90°	194°	347	4,934
100°	212°	320	4,806
110°	230°	358	5,091
120°	248°	345	4,906
140°	284°	187	6,925
150°	302°	346	7,338
200°	392°	506	7,192

It was regarded as desirable that a temperature of about 140 deg. Cent. (284 deg. Fahr.) should not be exceeded owing to the ill-effects of the higher temperatures upon the structure of the wood. Tests of blocks heated in a dry-air stove showed an increase in strength due to heating alone, though less than in the case of blocks from the same baulk of timber treated with oil, the temperature in both cases being 200 deg. Cent. (392 deg. Fahr.). It was concluded, however, that heating in dry air is more likely to injure the wood than heating in oil, since the blocks would lose their moisture more rapidly.

An important matter is the relation which the length of time during which the wood is in the bath bears to the strength. It was found that there was a gain in strength up to three hours or three and a-half hours, and it was therefore recommended that the blocks should remain in the bath for about this period.

TESTS WITH SOAKED SPECIMENS.

Tests with soaked specimens—thirty days in water—showed little or no gain in strength. Further, the experimenters concluded that the hot oil treatment would not prevent the wood pavement becoming soaked with water in service. Creosoting under pressure was therefore tried at high temperatures, sometimes before and sometimes after treatment in an oil bath. Blocks which had been kept dry were strengthened by the creosoting, but those which had been soaked were not made stronger than the untreated blocks. Experiments were also made with blocks coated with pitch, but the results were inconclusive. It was thought, however, that there was some advantage gained by keeping the blocks for ten minutes in pitch at a temperature of 110 deg. Cent. (230 deg. Fahr.). This treatment is suggested as suitable in conjunction with surface tarring of the pavement when laid.

ROADS IMPROVEMENT ASSOCIATION.

COUNCIL MEETING.

Mr. H. Percy Boulnois, M.Inst.C.E., occupied the chair at the October meeting of the council of the Roads Improvement Association held on the 17th inst. Correspondence with London County Council was reported concerning the establishment of by-laws to compel slow-going traffic always to keep to the near side of the highway. The London County Council informed the association that it was framing by-laws to deal with this matter under powers conferred upon it by sec. 23 of the Municipal Corporations Act, 1882, and sec. 16 of the Local Government Act, 1888. A resolution strongly supporting the proposal was passed, and ordered to be sent to the county council.

Upon the recommendation of the Office and Finance Committee the association resolved to take new and larger offices at the end of the current year. It was felt that the satisfactory way in which the association's work is progressing will convince motorists, cyclists, and other road users of the large field of usefulness before the association, and that the association will be accorded much more liberal support, and thus enabled to meet its increased expenses.

Important decisions were arrived at in regard to the great west road scheme, and the extension of the association's local activities. Full particulars of these will be issued when details are complete.

Bradford Sewerage Contract.—For the construction of a tunnel through Strangford Hill to connect Frizinghall with the new sewage works at Esholt, the Sewage Committee of the Bradford Corporation last week decided to accept the tender of Messrs. J. Best & Sons, who are the contractors for the Bradford waterworks scheme in the Nidd Valley. The amount of Messrs. Best's tender is £112,312.

London Western Approach Road Scheme.—The Improvements Committee of the London County Council recommend that the Road Board's scheme for a new western approach road to London be not accepted. The Road Board's scheme was for a continuation of West Cromwell-road through Hammersmith and by a new by-pass road to the north of Brentford High-street out on to the Bath-road at Hounslow. The estimated cost of the scheme, including street widenings, was £1,750,000, of which the Road Board offered to contribute £875,000. About £1,000,000 represents the cost of the section of the road which would be in London. A less expensive amended scheme prepared by the committee was submitted to the Road Board, the committee report. This scheme preserved the principle of providing a through western approach road from King-street, Hammersmith, to Cromwell-road, but reduced the estimated cost to London to £600,000. The Road Board have approved the modified scheme and with the consent of the Treasury would pay half the cost. They could not, however, promise grants for other London improvements. The committee, therefore, propose that the offer of the Road Board be declined and that the committee prepare an alternative scheme, which they consider would be of greater value to London traffic as a whole.

Institution of Municipal and County Engineers.

NORTH WALES DISTRICT MEETING AT WREXHAM.

Although not very largely attended, the North Wales District meeting of the Institution of Municipal and County Engineers which took place on Saturday last at Wrexham proved an entirely successful function, a pleasant and instructive time being spent by those who participated in the gathering. The proceedings opened at the free library, where a cordial welcome was extended to the members by his Worship the Mayor (Councillor W. J. Williams). Mr. R. J. Thomas, the president, occupied the chair, and there were present Messrs. J. Price Evans (Wrexham Rural District), E. Evans (Carnarvon County Surveyor), R. Burslam (Congleton), H. Collins (Norwich), G. W. Lacey (Oswestry), T. W. A. Hayward (Battersea), W. Wellburn (Middleton), F. Wilkinson (Prestatyn), J. A. Settle (Heywood), A. W. Panton and A. Asquith (Holyhead), J. England (Wrexham), J. S. Shaw (Wrexham), T. Roberts and J. J. Griffiths (Oswestry), T. Roberts, W. Ll. Williams and R. J. Prydderch (Wrexham).

Mr. J. England, the borough surveyor, said he regretted to announce that he had had a letter from Alderman Samuels, the chairman of the General Purposes Committee, and chairman of the Main Roads Committee of the county council, saying that he was confined to the house with a severe cold, and would not be able to meet and welcome the members of the institution. He regretted it all the more as he had met several of the members in his public capacity.

The Mayor of Wrexham, in his address of welcome, said he wished that the committee could have arranged another period of the year for the visit, because at the present time Nature was in one of her uncertain moods. If they had been there three or four months ago they would have had some idea of the beautiful district in which he lived, and on their visit to the sewage farm would have seen what splendid results could be attained when sewage disposal was placed in the hands of a scientific agriculturist and horticulturist. He trusted their visit to Wrexham would be thoroughly enjoyable.

The President, in acknowledgment of the welcome, said it was the desire of the members of the institution by their visits to different towns not only to benefit themselves, but also to impart to others in conversation and discussion any information they might have on any particular subject that was raised. It was not an institution entirely for self-advancement, although perhaps in more than one sense it was, but they did endeavour to make themselves more efficient servants of the public they had to serve. These visits enabled them to improve their knowledge, for, however admirable a treatise on any subject was, it was only in seeing the actual results of these theories that they could hope to advance in the profession they were following. In a small town the municipal engineer had a larger variety of work to carry out in his working hours than the engineer of a larger town. His experience of Wrexham was not great. He had been there years ago at a musical function, called the Eisteddfod, and took a prize away. This year the same choir under the same conductor also took a prize away. As officials they felt very keenly this mark of the mayor's appreciation, more especially as it showed appreciation of the work of Mr. England. He knew Mr. England had suffered of late from ill-health, he seemed to have recovered completely, and he hoped he would long continue in good health.

Leaving the free library, the members proceeded on a tour of the markets, and afterwards paid a visit to the fire station, the electricity works and the town's depot. They were subsequently the guests of the mayor at luncheon at the Wynnstay Hotel, his Worship presiding.

The health of the Mayor was proposed by the President, who, in the course of his remarks, gave expression to the members' keen appreciation of his Worship's cordial reception of them and his kindly hospitality.

In responding, the Mayor proposed "The Institution of Municipal and County Engineers." One consolation which municipal engineers had was that nothing in the way of discovery or invention could do away with their work; whatever reforms might come about, they would always be wanted. The comfort and health and progress of a municipality depended very largely upon the efficiency of the work of its borough engineer and surveyor. He knew that they were not adequately paid, and from his experience of a corporation he knew that sometimes they were not supported in the way they ought to be by the councils they served. There were members in every council who held parochial views, and belittled the work of their officials. Seeing that so much of the comfort and health of the people depended upon the ability, foresight and tact with which the surveyor and engineer approached his work, it was of the utmost importance that they should not only bring to bear upon their work a determination to do the work which devolved upon them, but that they should have all the information and all the experience which these conferences gave to them. Therefore, corporations should do everything they could to encourage their officials to attend these meetings whenever possible.

The President, in reply, observed that there were between 1,100 and 1,500 members of the institution scattered. They had many difficulties and obstacles to overcome, not the least of these being the difficulty that first cost was generally the main consideration, whereas in the important matter of prolonging human life and preventing human misery cost should not be an unduly prominent factor. They were trying to raise the status of their profession, and he could assure his Worship that the class of young men who sat for their examinations promised well for the future, not only as regarded their own profession, but the people generally. They had also endeavoured to look after the widows and orphans of members who had been called away suddenly. They had been able to assist, and they hoped to assist still more. They had endeavoured recently to widen the scope of their institution by getting district committees formed, and he felt sure in his native country of Wales they would not be behind any other nationality in this work. Concluding, Mr. Thomas said it was surely a question for public bodies to consider whether it was not an excellent expenditure of their funds to encourage officials, particularly the younger ones among them, to attend as many of these meetings as possible by at least defraying their out-of-pocket expenses.

In proposing "The Corporation of Wrexham," Mr. W. Jones (Colwyn Bay), chairman of the North-Western District, remarked that the town council had in Mr. England, their surveyor, one of the best members of the institution. He had known Mr. England for many years, and he could assure them that he was a man who was most anxious to do his duty and to do it thoroughly.

Dr. Edward Jones, chairman of the Sanitary Committee, responding to the toast, said he was glad to think their borough surveyor was held in such esteem by the members of their institution. In the department of which he was chairman, he was brought in contact with Mr. England a good deal, and whatever he took up he put his whole heart and soul into it, and carried out his work efficiently and well. He might say that Mr. Price Evans's work in the rural district was, if anything, more difficult than Mr. England's, for he was working in a wide and scattered district where villages had been dumped down here, there and everywhere. As a professional man speaking to professional men, he could not help regretting that means could not be adopted, either by the Government or by a combination of sanitary authorities, to put the medical officer of health and the municipal engineer and surveyor in a position more or less parallel with that of Government officials, so that they would not be liable to be shot at or humbugged to death in various committees by men who, in a great many cases, did not know what they were talking about. The public health of the community ought to be a State matter entirely free from any local prejudice. Probably the day would come when that would be done, for he saw that the Local Government Board was stiffening its back in many respects, and although a political opponent of the President of the Local Government Board, he thought they would all agree that Mr. John Burns had been an ideal President of that body.

The next two hours were devoted to an inspection of the sewage farm.

The members returned to Wrexham at 4 o'clock considerably later than had been arranged for the discussion of a paper on the municipal works of the town, by Mr. J. England, the borough surveyor, and for the transaction of other business. The proceedings took place at the Wynnstay Hotel, Mr. R. J. Thomas, the president, occupying the chair. At the outset the matter of the formation of a district executive committee was introduced by Mr. Wm. Jones (Colwyn Bay), district chairman, upon whose proposition, seconded by Mr. Evan Evans (Carnarvon), it was agreed that the whole of the members of the district should compose the committee.

The President expressed the hope that the formation of the different committees would conduce to the general prosperity of the institution. The idea was, no doubt, to get more meetings in each district, and he could tell them, more or less unofficially, that the council were hopeful of making arrangements by which in the future it would not be necessary to advise every member of the institution of a forthcoming district meeting a step which would, of course, effect a certain economy. At the same time the arrangements would permit of members being acquainted with and of attending meetings in outside districts should they so desire. He very much hoped the North Wales district secretary would take a leading part in promoting the interests of the institution; evening meetings might possibly be held, and topics of importance discussed to the general advantage. There was another connection in which the council were desirous of obtaining support—namely, the Orphan Fund—which was particularly in need of assistance. It was desirable that every member of the institution should contribute to that fund, irrespective of the amount he might be able to contribute. What was essential was the practical support of all; the help thus given would enable the committee to carry on their work of assisting the widows and orphans of deceased members. He wished the district every possible success and advancement, and felt sure that those belonging to it would do all in their power to promote the interests of the institution.

Letters of apology for non-attendance were reported to have been received from Messrs. E. Hall (Carnarvon), S. Evans (Flintshire), A. D. Greatorex (West Bromwich) and Parry (Barmouth).

The minutes of the last district meeting—held at Colwyn Bay on May 31, 1907 were next read by the hon. district secretary (Mr. J. England) and confirmed, following which the subjoined paper was submitted for consideration.

WREXHAM AND ITS MUNICIPAL WORKS

By J. England,
Borough Engineer.

Wrexham is a market and manufacturing town situated in the north-east corner of Denbighshire, having as its western boundary the famous Offa's Dyke of ancient history. The local historian, Mr. A. N. Palmer, in his book, "The History of the Town of Wrexham, its Houses, Streets, Fields and Old Families," states that the name is derived from Wrocansaetan, or the people round the Wrekin, a well-known group of hills situated in the adjoining county of Salop. The parish church, built previous to the year 1220, is one of the seven wonders of Wales, and is well worth a visit, the tower being a magnificent piece of architecture.

PHYSICAL FEATURES.

The subsoil consists chiefly of drifts composed of gravel and boulders overlying the Permian sandstone. Sand and clay are also found in places. The surface levels vary considerably, the mean being 275·0 above ordnance datum.

GENERAL STATISTICS.

Incorporated 1857; area, 1,305 acres; population, 18,379; number of houses, 3,849; birth rate, 25·8 per 1,000; death rate, 14·3 per 1,000; rateable value, £77,968; rates—poor, 5s. 4d., general district, 3s. 5d.

INDUSTRIES.

The principal industries carried on within the borough are brewing, tanneries, flour mills and leather works; but in close proximity to its boundaries are collieries, steel and terra-cotta works, and it is owing to the large population within a radius of 3 miles of the town—*i.e.*, over 50,000 inhabitants—that Wrexham has grown to be the premier town of North Wales.

ROADS.

There are at present 20¼ miles of public highways, of which 3¾ miles are main roads; there are also 3 miles of unadopted streets. The county council contribute the sum of £848 towards the maintenance of the main roads, and in addition pay the principal and interest, amounting to £135 per annum, on a loan, covering a period of twenty years, for the paving of a length of main road 2½ furlongs in extent. The author experiences considerable trouble in the maintenance of the roads owing to the constant openings made by the various public authorities having statutory powers, and during the last twelve months the length of mains and services laid along the carriageways alone amounts to over 1,300 lin. yds. Arrangements have been made whereby the corporation undertake the final repair of street cuttings at prices which are sufficient to cover all expenses incurred. The streets bearing heavy traffic are chiefly coated with granite, the remainder with a whinstone obtained from a local quarry. Tar painting the roads has proved very successful, crude tar being principally used, the penetration in some instances having been found to be as much as 2 in. The author is of opinion that streets having a gravel subsoil are the best for tarring, and if laid where the subsoil is clay the foundation requires to be well drained. It is found that two coats are required to make the surface waterproof, and considerable economy is effected both in maintenance, scavenging and watering. The cost averages 1d. per yard for the first coat and ¾d. for the second. The author keeps a record of the cost of street repairs, and the average for a 3-in. coating of granite is 1s. 2d. per square yard, and with whinstone 10d. per square yard.

Footpaths.—The main street footpaths are principally paved with York or 2½-in. concrete flags, and in several instances concrete *in situ* and chequered tiles, the two first-named being principally used at the present time. The light-traffic streets have tar-paved footpaths constructed with a 3-in. foundation of tarred destructor clinker and a 1½-in. topping of ¼-in. tarred slag, the average cost being 1s. 4d. per square yard. Trial lengths of granite treated with ferromac, tar macadam (both whinstone and granite) and tar-grouted granite have been laid; but, with the exception of the first named, all have been laid recently.

Street Improvements.—Wrexham, in common with most of the older towns, is suffering from a lack of wide streets, and during the last nine years over £10,000 has been spent in widening and improving the principal traffic streets. The most important improvement of recent years has been the widening of Regent-street, from 32 ft. to 42 ft., for a length of 200 yds., at a cost of £1,500, towards which the Road Board contributed £800.

Private Street Works.—The Act of 1892 has been adopted, and since 1904 the streets have been constructed to the following specification:—

Carriageways.—Foundation, 9 in. of pitchers, hand laid, well rolled, and 6 in. of whinstone macadam (consolidated) of 2-in. gauge, well rolled and blinded with gravel or chippings, York channel blocks, 10 in. by 5 in.

Footways.—York kerbs, 12 in. by 5 in., with tar paving consisting of a 3-in. bed of tarred destructor clinker, and 1½ in. of tarred slag topping.

The average cost for a 36-ft. road, excluding soil and surface-water sewers, is 9s. 6d. per foot of frontage. The work has of late years been carried out by administration.

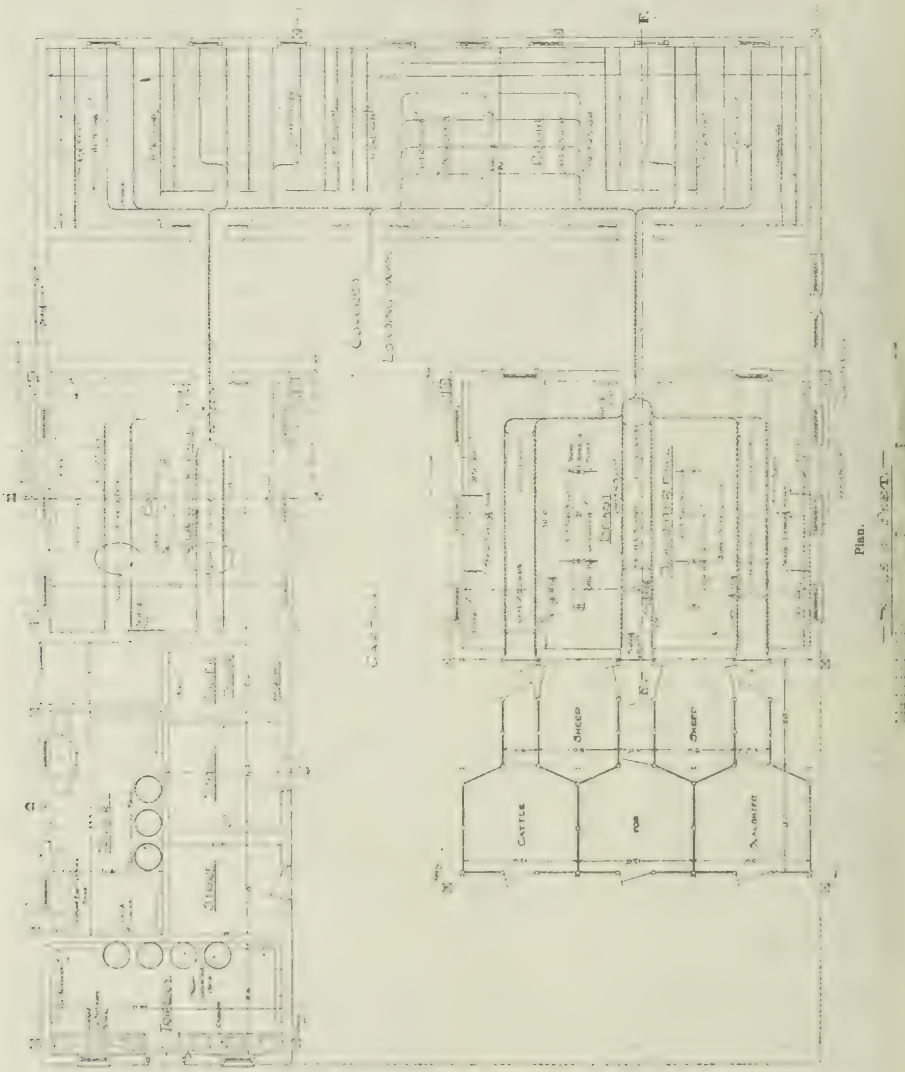
MARKETS AND SMITHFIELD.

The markets were purchased in 1898 at a cost of £46,850, and consist of three separate buildings—*viz.*, butchers', general and vegetable markets—the annual income being about £3,300. The corporation have also purchased, at a cost of £6,200, with a view to extensions, properties known as Queen-square and Yspytty, the areas of these being 900 sq. yds. and 1,440 sq. yds. respectively, the first named being for the enlargement of the vegetable market and the latter for the erection of a wholesale market. A portion of the Yspytty land has been leased for a term of five years to the Glynn Picture Company at a ground rent of £120 per annum. The vegetable market has recently been greatly improved by covering over the large open space in the centre, at a cost of £1,907, and it is intended in the near future to proceed with an extension of this market, along with the provision of a corn exchange, at an estimated cost of £5,000. The Smithfield covers an area of 3¾ acres, and cost, with land for future extensions, £6,300, the whole of the pens, with few exceptions, having concrete *in situ* paving and a large number of the pens are covered with galvanised roofing. The author recom-

mends concrete *in situ* paving for sheep and pig pens, but for cattle it is not suitable owing to its slipperiness.

WILLOW DEPOT.

The Willow depot and the electricity works, refuse destructor and baths comprise spacious and substantially built brewery premises, purchased by the corporation from the late Mr. Peter Walker's Trustees for the sum of £8,000. The situation is admirable, being very central, and the depot portion comprises stabling, cart-sheds, stores, workshops and horse-keeper's house. There are two smaller depots, used

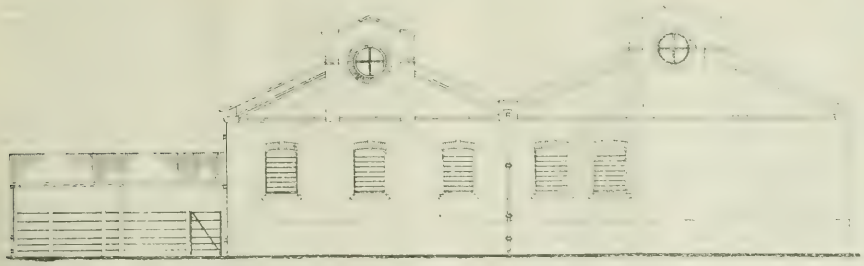


Proposed Corporation Abattoir, Wrexham.

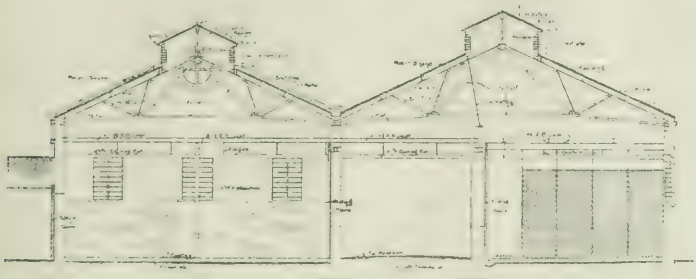
principally for the storage of material. The number of horses employed by the surveyor's department is thirteen, including two light horses suitable for fire brigade use, which are yoked and worked together as far as possible when not required for fire-brigade purposes. The average cost per horse and man per day is 8s. 4½d. The fodder allowed each horse per day is: Clover, 7½ lb.; hay, 10 lb.; oats, 8 lb.; bran, 2 lb.; and the cost per horse per week is 13s. 4d.

BATHS AND GYMNASIUM.

The baths were constructed in an existing building (forming part of the disused brewery already referred to). The plans were prepared by and the work carried out under the supervision of the author's predecessor, and comprise plunge bath, 60 ft. by 42½ ft., with shower baths, dressing boxes, &c. There are four first and five second class slipper baths, and one vapour bath. The manager lives on the premises. The plunge bath is open from April 1st to October 31st, the number of bathers last year being nearly 20,000 in the aggregate. The slipper baths are open the whole of the year, and are well patronised. The water supply for the plunge bath is obtained from a public spring known as the Brynyffynon Well, a line of 4-in. cast-iron pipes being laid therefrom, a distance of 550 yds., along the bed of a small river that passes close to both spring and baths, and flows by gravity into an underground tank at the electricity works, from which it is pumped into an elevated storage tank of 20,000 gallons capacity. The electricity department provide the steam for heating, and do all pumping required for the baths department for the sum of £50 per annum. The plunge bath is emptied twice weekly, the water supply from the well being sufficient to enable this to be done. Land has been purchased for the provision of an additional plunge bath, and sketch designs for same have been prepared by the author, but up to the present nothing further has been done. The gymnasium adjoins the baths, and is fitted up with the necessary appliances, and



West Elevation.



Section E.F.

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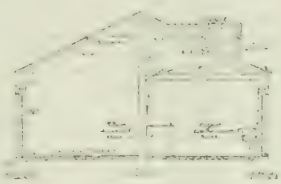

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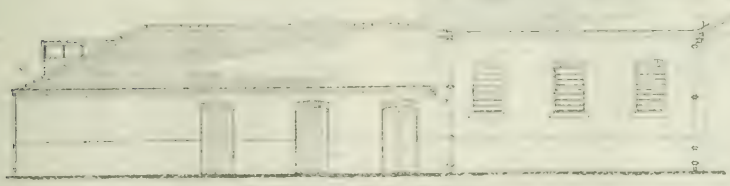
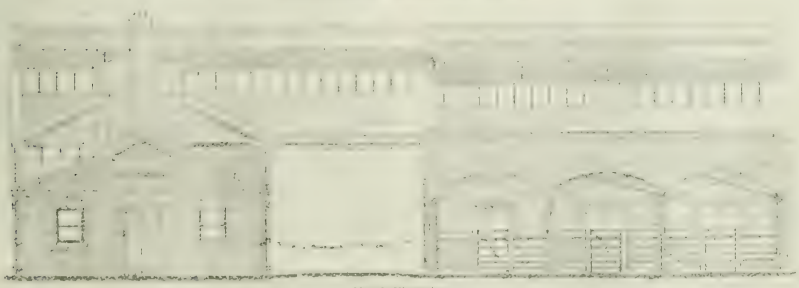


West Elevation of Pig Slaughter Hall, &c.



North Elevation.

PROPOSED CORPORATION ABATTOIR, WREXHAM.

when first opened was well patronised, but of late little interest is taken in it by the public.

REFUSE REMOVAL AND DISPOSAL.

The refuse collection is carried out by day work at present, but the author has recommended his council to adopt the piece-work system, as he is of opinion that this is the best means whereby the cost of collection can be kept within reasonable limits. The collection is weekly where portable bins are provided, and monthly where ashpits exist, but it is hoped that in a short time the whole of the houses will be provided with bins, the conversion to bins by the property owners being at a rapid rate. The shop refuse is collected daily without extra charge. The wages of the ash-men are 21s. per week, with the leading hand 2s. per week extra. The refuse is destroyed in a four-cell Meldrum destructor, erected in 1901, which adjoins the electricity works, and is in the charge of the electrical engineer. The cost of burning is borne by the Health Committee, who receive £150 per annum from the Electricity Department for the steam generated. Owing to the refuse not having been weighed previous to June this year, the cost for collecting same is uncertain, but averages 3s. 6d. per ton, the amount destroyed being approximately 135 tons per week, and the cost 1s. 4d. per ton. The residue from the destructor averages 33 per cent of the refuse tipped, and of this 10 per cent is hard clinker.

ELECTRICITY SUPPLY DEPARTMENT.

The works were opened in 1901. Originally three 120-kw. sets were installed, with a surface condenser, and two Babcock boilers of a capacity of 200-h.p. each. In 1903 extensions to the generating plant were found necessary, and a 300-kw. set was installed, with the necessary boiler and condenser, the boiler being of a similar type to those already installed. Each of the Babcock boilers were fitted with superheaters. Since 1907 the generating station has been thoroughly reconstructed and brought up to date. At the beginning of 1908 a 60-kw. set was installed, consisting of a Lancashire dynamo and Belliss engine, this for the purpose of doing the street lighting night load, and subsequently to do traction in conjunction with a battery. A superheater was also fitted to the destructor boiler, and a set of economisers has been installed. The engine room has been extended, and one of the original Willans engines has been fitted with automatic expansion gear, and a second dynamo coupled to the end of the shaft. This enables both traction and lighting to be run from one engine. A new switchboard of an unusual type has just been erected; a particular and special feature about this board is that there is no combustible material on the rear of the panels, bare copper being used throughout. The number of consumers at present connected equals 354, and the connected load, exclusive of street lighting, equals approximately 33,200 30-watt lamps. A supply is also given to tramways, which are controlled by the Wrexham and District Electric Tramways Company. For the year ended March, 1912, the current supplied was as follows:—

Private supply lighting	234,664 units.
Power	129,486 ,,
Tramways	165,114 ,,
Public lighting	181,030 ,,

The accompanying schedule sets out the rate of increase and financial progress during the last seven years:—

Year ending	Units sold.	Increase.	Loss.			Profit.		
			£	s.	d.	£	s.	d.
March, 1906	409,974	81,687	957	1	1			
.. 1907	425,235	25,161	190	17	2			
.. 1908	485,886	60,651				11	5	8
.. 1909	536,284	50,398				569	17	1
.. 1910	548,711	12,427		—		342	13	5
.. 1911	646,877	98,166				503	6	8
.. 1912	710,500	63,623		—		375	0	0

The borough electrical engineer is Mr. W. G. Pickvance, A.M.I.E.E., by whose energy and professional skill the undertaking has been placed upon a thoroughly sound and satisfactory profit-earning basis.

PUBLIC LIGHTING.

The street lighting is by both gas and electricity, the total number of lamps being 375, and the total cost £1,906. The whole of the gas lamps are fitted with incandescent burners, and the average cost per lamp with 5-ft. burners, including renewals and cleaning, is £2 1s. 3d. per annum, the lighting hours being 4,345, and gas costing 2s. per 1,000 ft. The electric lighting is by means of 45 high-candle-power metallic filament lamps of 600 watts in the principal streets, each costing £20 per annum, the smaller lamps being fitted with metallic filament lamps, averaging 75-candle power, the cost per lamp being £3 3s. Automatic switches have been fitted to twenty of the gas lamps as an experiment, and up to the present have been found very reliable, and it is hoped to extend this system to the whole of the lamps on the outskirts of the town in the near future.

FIRE BRIGADE.

The fire station adjoins the Guildhall, the appliances consisting of a 350-gallon steamer, manual, hose cart, and two fire escapes, the largest being 56 ft. high, and is of the self-supporting type. The brigade consists of superintendent and twelve men, the superintendent and one man being permanent. The men are paid 1s. 6d. per drill, twenty-six drills per annum, and on Bank Holidays four men are specially retained for the day. The whole of the men's houses are electrically connected. At the rear of the station is the recreation room, with billiard and card tables, which is a means of attracting the firemen to the station in their spare time, thereby increasing the efficiency of the brigade to a considerable extent. The water supply is in the hands of a company, the corporation until recently paying 4s. per annum for each hydrant; but they are now in negotiations with the company for the purchase of these hydrants. The pressure in the mains averages 35 lb. per square inch.

ABATTOIRS.

The public abattoirs are situated at the Holt-road depot, on an area of 2½ acres belonging to the corporation, and consist of eight separate slaughter-houses and lairages. The buildings, having been erected about the year 1864, are not in a condition to fulfil present-day requirements, and the author has been instructed to prepare plans for the erection of abattoirs on the most modern lines, and hopes that the same will be prepared in time for those members of the institution attending the meeting to inspect and criticise.

PUBLIC CONVENIENCES.

Since 1903 the whole of the public conveniences have been reconstructed on modern lines, and, in addition, an underground convenience, comprising six stalls and two water-closets, and three overground conveniences, with a total of twenty stalls, have been added. The returns from the water-closets in the underground convenience is more than sufficient to pay interest and sinking fund on the loan raised for its construction.

PARKS AND OPEN SPACES.

The town is well provided with "lungs," the chief being "The Parc'au," comprising an area of 17½ acres, which is being laid out as a park and recreation ground under the directions of the author to a design prepared by Messrs. Cheale & Co., of London, in a prize competition. Up to the present the entrance gates, railings and lodge have been completed to plans prepared by the author.

The William Jones recreation ground was presented to the town by John Jones, Esq., in memory of his brother, together with £650 to defray the cost of erecting boundary walls, fencing, shelter, and laying out the ground in accordance with plans prepared by the author, the area being 2½ acres. The beast market, purchased for an open space from the Crown in 1898, comprises an area of 1½ acres, and was used until the Smithfield was constructed as the cattle market. The annual pleasure fair is now held thereon, which brings in a revenue of over £200 per annum.

CEMETERY.

The cemetery, established in 1876, originally comprised an area of some 5 acres or so, and two extensions have since been carried out, the last in 1908, when a 12-acre field was purchased to be laid out as required to plans prepared by the author, but up to the present it has only been necessary to enclose about 1 acre of this land. It will be of interest to know that it has not been found necessary to lay down any drainage in connection with the cemetery, the land being gravel throughout.

MAIN SEWERS.

The main sewers were laid about forty years ago on the combined system from plans prepared by the late Sir Robert Rawlinson, the main outfall to Hafodywern being circular, 30 in. in diameter. There are about 21 miles of brick and earthenware sewers in the borough, the whole of which discharge by

gravitation. Owing to the old earthenware sewers being laid with clay joints, and in several instances with half collars only to the pipes, there is a very considerable amount of infiltration of subsoil water. All new streets constructed since 1904 have surface-water sewers in addition to foul-water sewers. The whole of the sewers are flushed monthly by means of a 400-gallon van. There are no privies within the borough, and with the exception of four isolated houses the drainage of every house is connected to the sewers. The system of ventilation is by means of shafts and Webb's sewer lamps, the manholes with few exceptions having closed covers.

SEWAGE DISPOSAL WORKS.

Previous to 1890 the sewage disposal works were situated at Hafodywern, and consisted of three shallow sedimentation tanks about 190 ft. in length, the effluent afterwards passing on to the Hafodywern Farm where it was distributed by broad irrigation. In 1889, owing to the Hafodywern farm being insufficient to deal with the whole of the sewage, the corporation leased for a period of ninety-nine years Five Fords farm, which is situated about 2 miles south-east of the borough, and to which the sewage is conveyed from the Hafodywern tanks by means of a 15-in. sewer. In 1903 the author's predecessor (the late Mr. J. W. M. Smith) prepared plans for the entire reconstruction of the sewage disposal works, and recommended that new sedimentation tanks be constructed at Five Fords farm, and that storm-water filters be constructed at Hafodywern to deal with the excess over three times the dry-weather flow. The works consist of detritus chambers and three sedimentation tanks, each 120 ft. long and 24 ft. wide, and have a total capacity of 300,000 gallons. Previous to entering the tanks the sewage passes through an automatic revolving screen worked by the flow of sewage. After passing through the tanks the sewage flows along underground carriers to various points on the farm for treatment by broad irrigation, chiefly on the ridge-and-furrow system. The farm has an area of 210 acres, of which 180 acres are available for sewage treatment, but 108 acres only are underdrained up to the present. The subsoil for the greater part is loamy sand and gravel. The tanks are constructed throughout of concrete, the aggregate consisting for the major portion of clinker from the refuse destructor, and it is of interest to mention that the works do not show the slightest signs of fracture. The storm-water filters at Hafodywern consist of four beds with a total area of 2,240 super. yds., and provide for the treatment of 1,120,000 gallons per day, the filtering medium being destructor clinker 4 ft. deep. The sewage is chiefly domestic, with a considerable quantity of chemicals from leather works and brewery waste. The dry-weather flow averages 1,145,000 gallons per day, of which it is estimated 425,000 gallons only is domestic sewage, the remainder being trade waste and infiltration water in the proportion of two-thirds and one-third respectively.

Owing to the regrettable death of Mr. Smith on the eve of commencing the construction of the works, the author was appointed engineer with the late Mr. J. T. Eayrs, M.INST.C.E., as consultant.

DISCUSSION OF MR. ENGLAND'S PAPER.

Mr. T. W. A. Hayward (Battersea) communicated the following remarks on the paper: Mr. England is to be congratulated on being able to present such an admirable account of the municipal works of Wrexham. The historical description is an interesting one, and the general statistics are good. There is, however, one question an answer to which would be of interest to the members generally, and that is, How much of the total rate of 8s. 9d. is raised for the payment of principal and interest on loans incurred, and does the poor rate include the police rate and the county rate? Mr. England has troubles, like all of us, through the breaking up of streets by the various authorities having statutory powers. It is now generally agreed that the reinstatement of road surfaces on breaking up is best undertaken by the local authority, and Mr. England is undoubtedly right in suggesting that this course should be adopted in Wrexham. The notes in regard to tar painting are interesting and instructive. They would be more so if Mr. England would kindly state the rate of wages paid to labourers and others. This would further elucidate the cost of horse, cart and man (8s. 4½d. per hour) many of us would like to hire at the same rate. Wrexham should be congratulated on its bold policy as regards street improvements. It is to be noted in regard to refuse collection and disposal that Mr England is recommending the adoption of the piece-work system. It is presumed that this is meant to convey that the men would be paid on the tonnage of refuse collected. Similar arrangements have been made in several boroughs in and around London, and, it is believed, with success. There is no reason why such a system should not work well in Wrexham. It is not my intention to weary members with a lengthy discussion on this interesting paper, but I cannot close without calling attention to one other point, upon which I should like some further information—that is, public lighting. It is stated that there is a total number of 375 lamps, and that the cost of lighting is £1,936, the hours of lighting being 3,345. This appears to be a very high cost for a town of the size of Wrexham, and one cannot help but notice the difference in the cost of lamps where gas is the illuminant as compared with the lamps where electricity is the illuminant. The price for the high candle-power filament lamps is undoubtedly excessive. The automatic switches for gas lamps have been working in Battersea for several years, and have given every satisfaction.

Mr. Wm. Jones (Colwyn Bay), in proposing a vote of thanks to Mr. England, said there were many valuable figures in the paper. He noticed that in Wrexham they experienced the same difficulty as he did at Colwyn Bay through having his roads cut up by various irresponsible authorities and persons. At Wrexham it appeared that arrangements had been made by which the corporation undertook the final repair of street cuttings at prices which were sufficient to cover all expenses incurred. He should like to know whether Mr. England had any standard price which would serve as a guide as to what other towns could charge. He could assure the meeting that this was a great trouble with him. People thought they could do as they liked after a road had been put into order, and he would be extremely glad, therefore, to get the information he had asked for. The cost of street repairs were given by the author as 1s. 2d. per square yard for a 3-in. coating of granite, and 10d. per square yard with whinstone. Although they were situated in the same county, he had been unable to convince the county surveyor that the work could not be done for the 7d. per square yard which he allowed him (the speaker). He (Mr. Jones) was sure it could not be done at the price. As to the statement in the paper that all new streets constructed since 1904 had surface-water sewers in addition to foul-water sewers, he would be glad to know what protection Mr. England took against unauthorised persons making wrong connections. At Colwyn Bay they had come across several such instances. The system of sewer ventilation at Wrexham was by means of shafts and Webb's lamps, the manholes, with few exceptions, having closed covers. Had Mr. England any figures to give them as to the cost of maintaining these lamps? As they knew, their usual custom was to advise their authorities to erect ventilating shafts, but although he had several of these, he still received complaints. What he wished to know was whether the Webb lamps prevented the effusion of foul gases, and whether as a result of their adoption complaints ceased.

Mr. Evan Evans (Carnarvon) seconded the vote of thanks for his clear, concise, and altogether excellent paper. Having lived for some years in that locality, perhaps he would be permitted for a moment to leave the subject of the paper. He wished to say how delighted he was with the success which had attended all that Mr. England had undertaken on behalf of the community which he served. He (the speaker) knew his predecessor in office, Mr. Smith, an excellent official, who did his work well, and he could realise what a difficult task it was to follow such a man. He was all the more glad to find, therefore, that his successor had made such an excellent impression on the town. Turning to the paper, he would like to know the basis of the figures in the paragraph in which it was stated that the county council contributed the sum of £848 towards the maintenance of the main roads, and, in addition, paid the principal and interest, amounting to £135 per annum, on a loan covering a period of twenty years, for the paving of a length of road 2½ furlongs in extent; also what expenditure was repaid in full—if any. Then, as regarded what was not paid in full, what proportion of scavenging and watering, and, now that it was so much in vogue all over the country, what proportion of the tarring was paid back to the county council. The paper stated that streets bearing heavy traffic were chiefly coated with granite, and the remainder

with a whinstone obtained from a local quarry. In connection with that he would like to know whether the granite was obtained from Penmaenmawr or Cleo Hill, and the prices at the station; also, had Mr. England had an opportunity of comparing the granites under equal conditions, and which did he prefer. The price of tarring was very clearly put, except that he should like to have the price of the tar itself. The average cost for a 36-ft. road, excluding soil and surface-water sewers, was given as 9s. 6d. per foot of frontage, but he should like it made clear whether the figure quoted referred to one side of the street or both; was it 9s. 6d. per lineal foot of street, or 9s. 6d. per foot of frontage on one side? In the section of the paper referring to the depot the average cost per horse, cart and man was stated to be 8s. 4½d. per day, but subsequently the cost of fodder was given as 13s. 4d. per week, and there seemed to him to be some disparity between the figures.

Mr. G. W. Lacey (Oswestry) remarked that 9s. 6d. per foot of frontage, considering the construction, did seem a little high for the new street works, and the 6 in. of granite used in the construction of the carriageways also appeared to be somewhat extravagant. The price quoted did not include soil and surface sewers, but did it include the gullies and branches through? With regard to the horses he took it the 13s. 4d. was for horse keep alone. He found it cost him, at the present rates for fodder, from 7s. 6d. to 7s. 8d. to keep a horse, cart and man, including all stable charges and depreciation—which was sometimes not included—veterinary attendance, repairs, and so on. As to refuse removal, it would be interesting to have some indication of the method he would recommend with regard to the piece-work system. It seemed rather difficult to carry out; was it at so much per ton collected? He took it it was all done by the corporation staff. In regard to wages, he should like to know what was paid to the horse drivers, so as to be able to ascertain how the 8s. 4½d. per day was made up.

Mr. Price Evans (Wrexham) observed that great strides had been made in Wrexham and the district, a very different condition of things prevailing twenty or twenty-five years ago as compared with the present. The statistics both as regarded the town and district were now very favourable indeed, and there were not many places that could boast anything very much better. As regards the death rate, for some years the sewerage system of the town was in a very bad state, and he thought they had to thank Colonel Jones for having introduced the broad irrigation system there. Wrexham, of course, was very fortunate in having such a farm and land situated as it was, and so suitable in character. For his own part he was not very much in favour of sewage farming, but to provide works to deal with the sewage of the district would mean a large expenditure. Colonel Jones' scheme, therefore, eased matters very considerably, and provided very satisfactorily for a long time, though, as Wrexham had increased greatly since then, he had no doubt that before long the sewage farm would have to be enlarged. Everything seemed to be satisfactory, and the corporation were fortunate in having a competent man to look after the farm. As regarded the ventilation of sewers, he recalled that a gentleman who was connected with the town, Mr. Isaac Shone, did a very great deal for Wrexham. In the days when town planning was hardly thought about he (the speaker) spent much of his time in preparing plans for Mr. Shone in connection with the construction of certain new roads through the borough, and he had no doubt that several of the roads which had since been formed in the town had been due to Mr. Shone's inception. Mr. Shone, added the speaker, was engaged at the present time in the preparation of a book on the ventilation of sewers, and he (Mr. Price Evans) was looking forward to its appearance with interest.

Mr. H. Collins (Norwich), speaking with regard to the question of street tarring, said it was the custom in Norwich before tarring any extensive road portion to send a circular letter to the different property owners and occupiers informing them of the corporation's intention and requesting them to make any connections within the succeeding three months. This had proved satisfactory, though it did not of course put an end to the trouble entirely. The street repairs were denser than in Wrexham, being 1s. 5d. instead of 1s. 2d. Granite was about 12s. per ton in Norwich. Their private street work was the same as in Wrexham, 9s. 6d. per lineal foot of frontage, inclusive of granite kerb and bituminous surface. The cost of horse keep was practically the same also, being 13s. 2d. instead of 13s. 4d. The cost of cart, horse and man was 13s. 10d. against 13s. 4d., their wages being slightly higher. He was sorry to hear the gymnasium was not very well patronised. They had one in Norwich, and it was probable that they would have to extend it. He had been very interested at the sewage farm. They were very fortunate in getting such good sludge. In Norwich they had considerable difficulty in that respect. There was a large amount of trade and brewery wastes, and their sludge was practically an emulsion of water and fats, the difficulty being to extract the latter. Works were now, however, being put down for treatment on a wet pulverising process, and it was hoped to sell the residue as manure. As regarded the connections to sewers, in Norwich all these were carried out by the corporation. Wrong connections might, of course, be made on the drains, but there was a very rigid examination of all work done.

The President said he had great pleasure in putting the vote of thanks to Mr. England for his admirable paper. Time was short, and he could not say very much, but he should personally like to support the proposition most heartily. It had been a most interesting meeting, and they had had an opportunity of seeing work which had been very well and economically done. The sewage farm seemed to be in admirable condition, and doing its work very well indeed; such a site must, metaphorically speaking, make many engineers' mouths water. At the electric light station great ingenuity had been shown in effecting economies, and considerable benefits should accrue to the ratepayers. The roads were in good condition, and were a great credit to the engineer. The question of excavations in streets was a most difficult matter indeed. It was desirable, as Mr. Collins had said, to inform companies and others concerned of prospective works; at the same time, even when that were done, innumerable excavations were made, and the authorities responsible for the roads should be the ones to restore the surfaces to their own satisfaction. The ratepayers should not be allowed to suffer either from the condition of the roads or through their pockets owing to the excavations of other people.

The vote of thanks was passed.

Mr. England, in returning thanks, said he could assure those present that it had been a great pleasure to him to have the honour of preparing a paper to present to a meeting of the institution. He only regretted that the meeting had not extended over two days, as was originally intended. Unfortunately, he fell ill just when the meeting was due, and it was then found that the surveyor to the rural district council was unable to join him in the gathering. Mr. Jones had asked the cost of cuttings in roads. Previous to his going to Wrexham there was no recognised price for the repair of cuttings, but he made arrangements with the companies for a payment of 1s. 6d. per lineal yard for service pipes, and 2s. 3d. for mains. Should, however, the main require a wider trench than 1 yd., the price was to be arranged with the engineer. He had had many instances in which, after having given three weeks' or a month's notice to companies and just repaired a road, one of them came along and cut up the road. As regarded the sewer connections, the only precaution he took was that every connection was examined either by himself or an assistant, so there was no possibility of wrong connections being made. With reference to the cost of the Webb lamps, the price of gas was about £4 per annum. The lamps had been a splendid thing in stopping complaints as to bad smells. The price of gas in Wrexham was the lowest in Wales, being 2s. per 1,000 cub. ft. The granite he used was Penmaenmawr. He had a certain amount of granite from another quarry near Bala, but for the main streets he used Penmaenmawr. The cost per ton was 9s. at the station. They did not ask the county council to contribute anything towards the cost of tarring. The price of crude tar was 35s. per ton. He had used quantities of refined tar, but had found that the crude tar, a good quality one, was quite suitable for the roads there. The 8s. 4½d. for carting, of course, included everything—the man, veterinary attendance and horse, and the cost of feeding was the cost of fodder only. As regarded the private street works, the cost in the paper was per foot of frontage and not per foot of street. The cost of gullies and connections was included. As to refuse removal, the system he proposed was similar to that of Chiswick. The wages of the ashmen were 22s. per week.

At the close of the discussion the members were entertained to tea by Mr. England, to whom a cordial vote of thanks was passed for his hospitality.

Permissible Limits of Sewage Pollution as Related to New York Harbour.

By GEORGE A. SOPER, President of the Metropolitan Sewerage Commission of New York.

[Mr. Soper's paper, which, we learn from the "Engineering Record" from which we reproduce it—was presented before the American Public Health Association, recently, is the subject of editorial reference in the present issue.]

Starting with the fact that the water of which sewage is chiefly composed must eventually be discharged into some natural body of water, and recognising that it is usually impracticable to remove all the impurities beforehand, the question arises—To what extent must the sewage be purified?

In arriving at an understanding of this subject many general statements can be made, but upon attempting to apply them to any particular case it will often be found that they are lacking in that definiteness and suitability which is necessary in order that they shall have practical value. So much depends upon the uses to which the natural body of water is put after the sewage is discharged into it that hard-and-fast requirements are difficult to lay down. In some cases the most complete purification which it is possible to give will not be too much, while in others it will be permissible to discharge the sewage in practically crude condition. Each situation requires to be considered separately.

An instance in which the need for careful study of the local conditions was clearly recognised and a situation of more than ordinary importance from various standpoints recently arose in connection with the work of the Metropolitan Sewerage Commission of New York, which is a board of engineers created to make plans for the protection of New York Harbour against excessive contamination by sewage. The commission has recently drafted a report in which the permissible limit of pollution for the harbour is fully dealt with and a definite standard of cleanness for the water proposed. In addition to the conclusions of the board, the report contains a number of reports of sanitary experts who were engaged by the commission to express their individual views as to the desirability of establishing a standard of cleanness for the harbour and of the provisions which such a standard should contain. Following is a statement of the qualifications of the experts, the questions which were submitted to them and a brief synopsis of their replies.

THE EXPERTS.

The experts were selected from the professions of engineering, chemistry, biology and sanitary science. Each was given a list of questions to which he was asked to make written reply. The experts were afforded facilities for inspecting the harbour in order to become personally acquainted with the conditions created by the present method of disposing of the sewage, and with the uses to which the harbour waters were put, and were furnished with the printed reports of the commission. There were eight experts; their qualifications were briefly as follows:—

A foreign chemist: An eminent authority on the chemistry of sewage-polluted tidal waters and a contributor to the Fifth Report of the Royal Commission on Sewage Disposal of Great Britain.

An epidemiologist: Noted as an author and authority on the transmission of communicable diseases.

A sanitary engineer: Of wide practical experience in the design, construction and management of sewerage and sewage disposal works.

A civil engineer: Past-president of the American Society of Civil Engineers, and of much experience in sanitary work.

An American chemist: Professor of chemistry in a prominent technical school and author of various books on sanitary subjects.

A hygienist: Professor in a well-known technical school, author, and prominent sanitarian.

A health officer and chief engineer of one of the most progressive State departments of health in America.

A biologist, experienced in sanitary investigations, particularly with reference to the purification of sewage.

THE QUESTIONS.

(1) Do you think it would be desirable and feasible to establish a standard of cleanness for the waters of New York Harbour?

(2) If a standard is established, should it be based solely on chemical analyses, or would a mixed standard which would take into consideration the appearance of the water and perhaps its physical, chemical and bacterial condition be better?

(3) Should a standard of cleanness rest upon the amount of sickness and death which can be shown to be produced by pollution, or should the standard be based on what seems suitable and appropriate on the score of cleanness?

(4) Should the waters be kept pure enough for bathing, and, if so, where?

(5) Should the waters be kept pure enough for oyster culture, and, if so, in what parts of the harbour?

(6) Should effervescence, marked discoloration, decided turbidity, oily, sleek, floating solid sewage materials or deposits of sludge be permitted anywhere in the harbour, and, if so, where and under what circumstances?

(7) Should we establish one standard of cleanness for the whole harbour, or should there be different standards for different parts of the metropolitan district?

(8) If a definite standard of cleanness is desirable, how should that standard be expressed? Please give us a draft of your opinion as to the proper wording.

(9) Will the amount of dissolved oxygen in the waters of the harbour, expressed in a percentage of its saturation value, furnish a reliable index of the cleanness of the water, and, if so, what percentage should be adopted to secure each of the following results?—(*a*) That the waters of the harbour may not become offensive under any weather conditions. (*b*) That the use of public baths, if judiciously located, may not be prejudicial to the health of those using them. (*c*) That shellfish taken from the beds in present use may be eaten without danger to health. If the percentage of dissolved oxygen will not furnish a satisfactory standard, what standard would you suggest, and should it be based upon chemical analysis, or should it take into account chemical, physical and bacterial conditions?

REPLIES TO QUESTIONS.

All the experts considered that provisional standards of cleanness for the harbour should be established. Some favoured one standard; some another. In no case was a standard proposed solely in terms of chemical or biological analysis.

All laid emphasis upon the appearance of the water, and insisted that the standard of cleanness should be so framed as to provide that the water should look clean. All were of opinion that the standard of cleanness should not rest solely upon the effect of the harbour water upon the health of the people who lived in the near-by cities, or passed over the waters in ships, or worked upon docks and piers, or sought recreation in the parks on shores.

So far as sickness was concerned, it was the epidemiologist's opinion that the present condition of the harbour was not a serious menace to health; but he thought this no reason why sewage should be permitted to defile the water. Strong reasons existed for keeping the harbour clean. There was a public demand for clean highways and clean waterways as well. To the occasional visitor to New York it appeared that the limit of permissible pollution of its waterways had been reached. The waters were evidently heavily polluted with sewage.

The American chemist considered that the amount of disease and death directly produced would not be a proper measure of the objectionable nature of the harbour's condition. Conditions which offended the senses, and of the existence of which conditions he saw abundant evidence, should also be taken carefully into account, for such conditions indirectly lead to disease.

The civil engineer pointed out that while many lives probably could be saved and much ill-health alleviated by reducing the pollution, it was still more

important to consider the question of a clean harbour from the standpoint of what was suitable and appropriate on the score of cleanness. It was a case where civilisation demanded a remedy on the score of what was necessary for the comfort, happiness and welfare of the public.

BATHING AND SHELLFISH.

There was a preponderance of opinion among the experts that it would not be practicable to keep the waters of the inner harbour clean enough to make bathing entirely safe, but it was held to be both feasible and desirable to maintain bathing places near the sea and within easy reach of the public in satisfactory condition. Because some bathing was likely to occur in the populous parts of the harbour, in spite of any restrictions which might be made, and because the shores were certain to be crowded with human beings engaged in gainful occupations or seeking the water fronts for relaxation and fresh air, the hygienist and others thought the water along the shores ought to be kept as clean as practicable.

In the opinion of the sanitary engineer it seemed probable that if the open waters of the harbour were kept as clean as the requirements of business, pleasure and recreation demanded, there would be little danger to the public health, provided bathing and the taking of shellfish for food were restricted or prohibited. The foreign chemist did not think there was great danger in bathing, provided analyses showed that the water contained plenty of oxygen, was comparatively free from ammonia, and there was absence of visible sewage matters. The epidemiologist did not consider that there was a great danger of sickness from bathing in polluted water unless the sewage was discharged close to the bathing places. On the other hand, the sanitary engineer found it impossible to avoid the conclusion that considerable sickness was produced by bathing in the polluted water of New York Harbour. All thought it unnecessary that the waters of the inner harbour should be kept pure enough to make bathing perfectly safe, if suitable bathing places, such as Coney Island and Rockaway, could be maintained in satisfactory condition. The hygienist would have such bathing places as Coney Island kept in scrupulously clean condition. The civil engineer did not think it practicable to make bathing in the waters of the inner harbour entirely safe against disease, and regarded this as an unreasonably high standard of cleanness to seek to maintain. The American chemist considered that it would not be possible to keep the water in any part of upper New York Bay clean enough for bathing, and thought that bathing establishments on the water front of Manhattan and Brooklyn were a menace to public health. The very presence of these places, he pointed out, was a guarantee by the city authorities of the safe character of the water. The biologist expressed the opinion that the waters of the inner harbour should be abandoned for bathing and shellfish culture. The waters of the lower bay could, he thought, be kept clean enough for bathing and the cultivation of shellfish, and should be maintained in that condition.

OYSTER BEDS.

All the experts considered it impracticable to keep the waters in the inner part of New York Harbour pure enough for oyster culture, but with care it seemed to some to be possible adequately to protect the oyster grounds near the sea. The value of the oyster industry did not appear to the sanitary engineer to be of sufficient consequence to warrant the construction of the expensive works which would be necessary to ensure to the waters of the inner harbour a sufficient degree of purity to warrant oysters being taken from them. The hygienist did not consider the oyster business to be of sufficient importance to warrant the expenditure of large sums of money to secure any special degree of purity for the water. The danger of pollution from increasing sewerage was so great as to forbid the culture of shellfish in New York Harbour. The civil engineer thought shellfish should be protected against sewage to a degree which might result from sanitary human activities, if this protection could be made genuinely effective. The health officer would not permit oysters to be cultivated anywhere within the metropolitan district except under strict supervision and control, and the biologist thought it might ultimately be necessary to sacrifice all oyster beds within the metropolitan district.

VISIBLE POLLUTION.

All the experts held the opinion that while visible evidences of sewage was practically unavoidable near sewer outfalls, large sewage solids should not be present anywhere in the harbour except, perhaps, to a limited extent from the shipping. A small amount of oily sleek was permissible, but sludge and the escape of gases due to putrefaction should be prevented. The foreign chemist believed that sewage solids, either floating or deposited and gas should certainly not be permitted anywhere except such as come from boats, but that some discoloration and turbidity might be allowed in the vicinity of suitably situated outfalls. The sanitary engineer considered that turbidity and discoloration might be tolerated over relatively small areas in the immediate vicinity of properly located sewer outfalls, and oily sleek be allowed, provided it consisted simply of very thin films of oil in isolated and relatively small areas. The civil engineer would not permit sewage to be visible at the points of sewage outfall or elsewhere, and thought that the sewage should be purified or discharged into deep water under circumstances which would prevent its appearance from the shores, docks and other places where it might prove offensive. The water should not be allowed to become so polluted as to be blackened. Deposits of putrefying sludge should not be permitted to occur along the docks.

In the opinion of the American chemist the presence of oily sleek was not objectionable, since he did not consider it unsightly, and an infinitesimal amount of oily matter might produce it. He considered that it would be impossible to keep the water free from discoloration and turbidity, on account of the natural silt which the Hudson river carried down from the northern part of the state. Floating solid sewage material should not occur. Conditions which were disagreeable or disgusting either to the sight or smell of the average citizen using the waters for rowing, sailing or similar purposes of pleasure and recreation the hygienist thought should not be permitted.

The health officer felt that the visible evidences of sewage were so objectionable, and already existed to such an extent, that immediate steps should be taken to construct a system of main drainage and sewage disposal. This view was also held by the epidemiologist and others. The civil engineer expressed the opinion that no time should be lost in determining upon and beginning this work so that the pollution of the harbour might be reduced rather than increased, a result which he considered inevitable if wise action was not soon begun. The biologist's opinion was that occasional discoloration, turbidity and sleek could scarcely be avoided in the vicinity of a great city, but these conditions should not be permitted to become persistent or of frequent occurrence, otherwise they would constitute what he regarded as a short-sighted and uneconomic waste of one of the city's most precious assets.

DISSOLVED OXYGEN.

So far as the permissible draught upon the oxygen was concerned, there was no unanimity of opinion. All who expressed themselves upon this point considered that a deficiency of 50 per cent indicated serious conditions. The civil engineer's idea was that the sewage should not anywhere reduce the percentage of dissolved oxygen below 50 per cent. In the neighbourhood of permanent or comparatively permanent beds for the cultivation of shellfish, the standard should insure bacterial purity. In the vicinity of bathing-places the water should not only be of a high standard bacterially, but should also be free from floating sewage, should have a large amount of dissolved oxygen, and should be chemically near to the normal condition of pure salt water or water of the normal salinity due to its position. In the neighbourhood of docks and thickly populated shores it might be sufficient to provide a physical standard of purity.

The American chemist was not prepared to suggest a definite amount of oxygen as the least permissible to seek to maintain, although he believed 70 per cent was an unduly severe measure by which to be guided. He considered that the physical appearance of the water, more complete chemical analyses than determinations of dissolved oxygen and bacterial examinations, should be included in the standard of cleanness.

For the more polluted parts of the harbour the biologist suggested that the dissolved oxygen be at no time and at no place allowed to fall below 50 per cent of its saturation value. No effervescence, marked discoloration, decided turbidity, oily sleek, floating solid sewage materials, deposits of sludge, or other conditions offensive to sight and smell should be permitted in any part of the harbour. For the less polluted regions—the outer bay, for example—the standard should be primarily sanitary, and should rest upon bacterial rather than chemical data

The foreign chemist would establish a higher standard of purity than any of the experts mentioned, so far as oxygen was concerned. He would not permit the oxygen to be exhausted below 60 or 70 per cent of saturation at low tide under calm weather conditions and at any point within 200 yds. of a point of sewage discharge, either at the surface or any depth below it. Before discharge the sewage should be freed, as far as possible, of solid matters by means of mechanical subsidence, or, in the case of unfavourably situated outfalls which it would be difficult or impossible to remove, by chemical precipitation. In his opinion, such a requirement would ensure proper protection to the harbour without undue hardship upon the taxpayers. The water beyond the neighbourhood of the sewer outfalls would, in all probability, show no appreciable deficiency in dissolved oxygen, not even when the volume of sewage to be disposed of became largely increased with the increase of population.

OPINION OF THE COMMISSION.

With regard to the degree of cleanness which should be maintained in the harbour waters, the commission has officially recommended the following specific requirements:—

(1) Garbage, offal or solid matter recognisable as of sewage origin shall not be visible in any of the harbour waters.

(2) Marked discoloration or turbidity due to sewage or trade wastes, effervescence, oily sleek, odour or deposits shall not occur except, perhaps, in the immediate vicinity of sewer outfalls, and then only to such an extent and in such places as may be permitted by the authority having jurisdiction over the sanitary condition of the harbour.

(3) The discharge of sewage shall not materially contribute to the formation of deposits injurious to navigation.

(4) Except in the immediate vicinity of docks and piers and sewer outfalls, the dissolved oxygen in the water shall not fall below 3·0 cubic centimetres per litre of water. (Within 60 per cent of sea water and 40 per cent of land water, and at the extreme summer temperature of 80 deg. Fahr., 3.0 cubic centimetres of oxygen per litre corresponds to 58 per cent of saturation.) Near docks and piers there should always be sufficient oxygen in the water to prevent nuisance from odours.

(5) The quality of the water at points suitable for bathing and oyster culture should conform substantially as to bacterial purity to a drinking water standard. It is not practicable to maintain so high a standard in any port of the harbour north of the Narrows or in the Arthur Kill. In the lower bay and elsewhere bathing and the taking of shellfish cannot be prohibited [illegible] outfalls [illegible] of a sewage outfall.

New School at Southend.—Mr. William Gregson, chairman of the Essex Higher Education Committee, on Tuesday laid the memorial stone of a new secondary school for girls at Southend, which is to cost £25,000, and will accommodate 400 students.

Surveyors' Institution.—The opening address of the president of this body, the Hon. Edward Strutt, will be delivered at a meeting which is to be held on November 11th when [illegible] for the best paper [illegible] last session will also be announced. Papers on "The Amendment of Rural Building By-laws," by Mr. W. Woodward, F.R.I.B.A., and "Some Urban Housing Problems," by Mr. M. Price Holmes, will be discussed at a meeting of the institution which will take place on January 27th.

Lawn Tennis Courts at Llanelly.—Mr. J. H. Montgomery, deputy surveyor to the Llanelly Urban District Council, informs *Lawn Tennis* that four courts have been laid down at Parc Howard, three of which were sown with Carter's seed and special manure, in June last, on 6 in. of soil laid over one foot of clinker. A hard court has also been laid and is formed with a bottom layer of 12 in. of clinker. On this was placed 1 in. of old macadam taken from the roads in the district, and well rolled before the top layer of tarred limestone chippings ½-in. gauge was laid on. This layer was about 3 in., rolled down to about 2½ in. thick. The surface was then sprayed with tar and sand, spread over and again rolled. Mr. Montgomery adds that the court plays truly and is fast, and that he does not anticipate any maintenance charges, except an occasional spraying and sanding, for the next fifteen years.

LONDON COUNTY COUNCIL CHIEF ENGINEERSHIP.

NAMES OF SELECTED CANDIDATES.

We are unofficially informed that the following are the selected candidates for the position of chief engineer to the London County Council, rendered vacant by the resignation of Sir Maurice Fitzmaurice, C.M.G., M.INST.C.E.:—

Mr. J. W. Bradley, M.INST.C.E., city engineer of Westminster.

Mr. S. E. Burgess, M.INST.C.E., borough engineer of Middlesbrough.

Mr. G. F. Carter, M.INST.C.E., borough engineer of Croydon.

Mr. W. C. Copperthwaite, M.INST.C.E., bridge engineer to the London County Council.

Mr. G. F. Griffiths, engineer to the Thames Conservancy.

Mr. G. W. Humphreys, M.INST.C.E., deputy engineer to the London County Council.

Mr. Chas. F. Marsh, M.INST.C.E., deputy engineer, Metropolitan Water Board.

Mr. W. H. Prescott, M.INST.C.E., engineer and surveyor to the Tottenham Urban District Council.

Mr. E. Sandeman, M.INST.C.E., chief engineer, Derwent Valley Water Board.

Mr. F. E. Wentworth Sheilds, M.INST.C.E., Docks Department, L. & S.W. Rly.

Mr. J. Walker Smith, M.INST.C.E., chief engineering inspector to the Local Government Board for Scotland.

Mr. W. J. Steele, ASSOC.M.INST.C.E., city engineer, Newcastle-on-Tyne.

Mr. H. E. Stilgoe, M.INST.C.E., city engineer of Birmingham.

Mr. H. T. Wakelam, M.INST.C.E., county engineer of Middlesex.

SOUTHWARK BRIDGE.

REBUILDING TENDER ACCEPTED.

After negotiations proceeding over three years, the Bridge House Estates Committee of the City of London Corporation on Tuesday carried the matter of the Southwark Bridge improvement a definite step forward by accepting the tender of Sir William Arrol & Co., Limited, for the execution of the necessary works. The amount of the successful tender did not transpire, but it is generally understood that the cost of the improvement will be nearly £300,000. All the arrangements are in an advanced state, and everything points to the workmen being engaged on the improvement before Christmas next.

The first operation to be taken in hand will be the construction of a temporary footbridge over the Thames by the side of the present structure, and it is anticipated that something like four years will elapse before the entire scheme is completed. In the contract provision is made for the widening of Southwark Bridge to the width of Queen-street-place, the construction of a straighter approach, and the reduction of the gradient, which is at present very steep, by several feet.

Wooden Water Pipes.—It is announced by the South Australian Official Intelligence Bureau that in order to test the utility of wooden water pipes the Government have placed a contract for the supply of a considerable quantity to be employed in connection with two large water schemes at Millbrook and Mount Crawford respectively. The company who have received the contract propose to erect extensive works at Port Adelaide in order to carry it into execution, and to supply pipes to the value of £40,000 for use on the Umeratumbika water [illegible] which is to serve Broken Hill.

BRIDGE DESIGN.—Engineers who are concerned with the principles of designing ordinary highway bridges of moderate spans will find the work on this subject by Reginald Ryves, Assoc.M.Inst.,C.E., M.S.A., F.R.Met. Soc., a practically helpful treatise on original lines. It is published by the St. Bride's Press, Limited, of 24 Bride-lane Fleet-street, London, E.C., at 2s. net (post-free 2s. 2d.), bound in cloth and well illustrated with Engineering Diagrams

Law Notes.

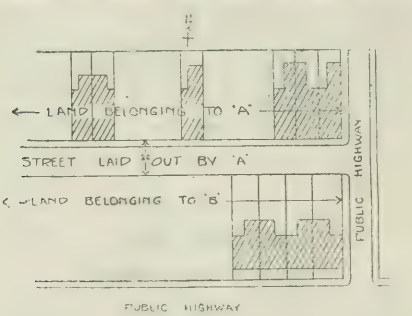
Edited by J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, one side only) should be addressed to "The Law Editor," at the office of The Surveyor, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction — i.e., without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. *The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.*

Private Street Works.—"Eastern" writes: In 1896 a plan was submitted by an owner A of a building estate for laying out a new street. This was approved by the council, and the street was subsequently laid out by A. The plan showed a road 25 ft. in width, with a footpath on the north side only, and building plots only on this side; the land on the south side was the property of another owner B. Several houses have been erected on the north side of this road, also houses on the south side, the latter fronting another road, but abutting on the road in question. My council now desire to make up this



road under the provisions of the Private Street Works Act, 1892, and, on making enquiries as to ownership of the various properties, I am informed that A, when he laid out the road, reserved a strip of land 1 ft. in width along the south side to prevent B from gaining access from his land to this road. There is nothing in the road to define this reserved strip of ground, and the public have been allowed to walk over it. On measuring the width of the road, however, I find that it is 26 ft. wide (the plan approved was for a road 25 ft. in width). Will you kindly give me your opinion on the following points: (1) Does the fact of the public being allowed to walk over the reserved strip of land for a period of sixteen years dedicate this to the road? (2) Who is the frontager to be apportioned under the provisions of the Act for the land on the south side?

(1) If the public have used the strip during this period, openly as of right, without interruption, this would be such strong evidence of dedication as to be practically conclusive, in the absence of any rebutting evidence. (2) Assuming that the strip in fact forms part of the street, the owners of the land and houses on the south side are chargeable.

By-Laws: Picture Theatre.—"Alpha" writes: A plan has been submitted for a proposed picture theatre. It is intended to be built in the main street, coming right up to the street, in the centre of the town, and adjoining some shops on one side, and on the other side to be set back 8 ft. from a proposed new side street. The outside walls are to be constructed as follows: 9-in. brick foundation walls to main walls, 10-in. by 5-in. R.S. stanchions, 10-ft. centres, resting on 2-ft. 6-in. by 2-ft. 6-in. by 2-ft. concrete blocks. In between the stanchions are to be filled in with 4-in. by 3-in. wood framing, covered with Hyrib sheets, finished outside with cement and pebble dash or rough cast, and inside with plaster. No thickness is shown for the wall but most likely it will be 5 in. or 6 in. at the most. The plan was disapproved on the following ground: "That the walls are not constructed of incombustible materials." Our contention is that the 4-in. by 3-in. wood framing covered with Hyrib sheeting and finished plaster is not incombustible within the meaning of the by-laws. (1) Are we right in our contention that the walls are not constructed of incombustible materials, and could we insist on the outside walls being 13½ in. thick, as required for public buildings, and built of brick or stone? (2) The gallery is proposed to be built entirely of wood, including the principals and uprights; it is simply 7-in. by 3-in. wood framing. Have we any jurisdiction over this? Could we insist on the uprights being R.S. stanchions instead of 7-in. by 3-in. battens? The public have to pass the back of this gallery to get into the building, but nothing is proposed to be stored under the gallery.

(1) I think the council's contention is correct. In my opinion a wall partly constructed of wood framing is not constructed of hard and incombustible materials within the meaning of the by-law. Under by-law 20 the council can require the external walls to be 13½ in. thick, and either of bricks or of suitable stone, or other blocks of hard and incombustible substance. (2) There does not appear to be any provision in the by-laws which would enable the council to insist on any particular kind of uprights, but by-law 55 (x) would, presumably, apply to the floor of the gallery (unless it is intended to be used for private purposes). If, however, Part III. of the Public Health Acts Amendment Act, 1890, has been adopted, the council could, under sec. 33 of that Act, insist upon the building being substantially constructed, regard being had to the purposes for which it is intended to be used, and this might justify the suggested requirement as to uprights of the gallery.

By-Laws: Exemption: Height of Rooms.—"C.F.B." writes: "I should like your opinion on the following points: (1) A railway company are about to erect houses for their workmen in this district, and claim they are exempt from sending in plans for approval by the council. Is this so? (2) Plans have been deposited with this council for houses in which the bed-rooms on the first floor are not shown to be the full height of 9 ft. over the whole area. I contend this is against the by-laws (copy forwarded), but the owner claims otherwise. Please give your opinion. (3) The same owner sends in the height of his scullery (one storey only) similar to above, the height to ceiling being only 8 ft. and 7 ft. to eaves, contending that it is not a habitable room. The size is 7 ft. 6 in. by 7 ft., with copper and sink in it. I contend it is a habitable room, and should be 9 ft. high over the whole area. What say you?

[copy of by-laws.]

Height of Rooms.

66. Every person who shall erect a new building shall construct every room in such building which shall be intended to be used for human habitation, in accordance with such of the following regulations as may be applicable to the circumstances of the case, that is to say,—

(1) Every such room which is an attic, or a room wholly or partly in the roof of such building, shall, over at least two-thirds of the area of the floor, be not less than nine feet in height, and shall not in any part be less than five feet in height:

(2) Every such room which is not an attic, or a room wholly or partly in the roof of such building, shall not in any part be less than nine feet in height.

(1) No, unless there is any clause in their special Act which would have the effect of exempting them. Buildings used *for the purposes of the railway* would be exempt under sec. 157 of the Public Health Act, 1875, but this does not apply to houses built for their workmen (see *Scargill and Carmarthenshire Railway Company v. Burnley Local Board*, 13 L.T., 749). (2) If this is an attic (as it would appear to be), it is sufficient if the height is 9 ft. over two-thirds of the floor area. (3) In my opinion this is a room intended to be used for human habitation within the meaning of the by-law.

Highway Repair: Damage to Water Main. "Stop-cock" writes: A county council, in the exercise of their powers as a highway authority, are improving and repairing a section of main road by re-ballasting and surface metalling. In the course of carrying out the work a water main, laid by a private company under statutory powers, is alleged to have been displaced and the joints broken. Are the county council liable for the cost of the repairs to the main if it can be shown that the damage has resulted from the work they are carrying out? Can it not be maintained that the powers possessed by the water company under their statutory powers, &c., do not take away or abridge any of the powers vested in the

highway authority for which such authority was constituted, and that therefore the highway authority could not be held liable for any expenses in addition to that which they would have necessarily incurred in reconstructing and repairing the road if the main had not been laid under it, for instance, as in the case of a tramway (sec. 32, Tramways Act, 1870)? Does not the onus of protecting their main from damage by traffic, or repairs carried out with the aid of a steam roller, rest entirely with the water company?

If the main was at a sufficient depth as not to have been injured by the ordinary mode of repair if the steam-roller had not been used, the council are liable. See *Gas Light and Coke Company* v. *St. Mary Abbots*, (15 Q.B.D., 1).

Connections to New Sewers: Cellar under Street.—"Diz." writes: (1) Some time ago my council approved plans for two houses in parts of their district where there were no sewers, and allowed the drainage from the buildings to be carried to open mill leats. My council are now carrying out a drainage scheme, which will enable these houses to be drained to the new sewers, but to do so it necessitates the relaying of the house drains in the opposite direction. Under these conditions, can the council call upon the owners to connect to the new sewers? (2) With reference to sec. 26 of the Public Health Act, 1875 (Part 2)—(*a*) Does "carriageway" include the footway of a street? (*b*) Can a person who has premises with a cellar under a footway build new premises with a new cellar under a footway without the consent of the council as to the construction of the cellar? (*c*) or erect new premises, on site that has not had a cellar, constructing a cellar under the footway without the consent of the council? (*d*) Would the approval of the plans be the council's consent for the construction of the sewer, or must the owner make separate application for consent?

(1) If the drains are sufficient for effectual drainage the council cannot call upon the owners to provide new ones. But the council can close the old drains and provide new ones at their own expense under sec. 23 of the Public Health Act, 1875. (2) (*a*) No. (*b* and *c*) The consent of the council does not appear to be necessary, except so far as any by-laws may apply. (*d*) I think the approval of plans would be sufficient.

Water Stand Post.—"Disturbed" writes: A borough council some years ago erected a stand post for filling water carts in a public street. Since its erection a house has been built, and the presence of the stand post causes a nuisance and annoyance to the occupants of the ground floor by reason of the noise in the early morning and, indeed, all day. Children play with the cap and fittings and cause further noise and annoyance. The man from his elevated position can see right into the room, &c. (*a*) Under what powers are stand posts erected by metropolitan boroughs? (*b*) Have the Water Board powers over these stand posts, and, if so, what powers? (*c*) If the stand post was legally erected and caused no nuisance at the time, would the altered circumstances—*viz.*, the erection of the dwelling house—make any difference, and what powers have the occupiers to proceed against the local authority if the latter decline to remove the stand post?

(*a*) I cannot find that the metropolitan borough councils have any powers to erect stand-pipes. The control of the water supply of the metropolis was formerly in the hands of eight water companies whose undertakings have now been taken over by the Metropolitan Water Board. It may be that the stand post in question was erected by the council by arrangement with the water company. (*b*) The board would have such powers as were conferred on the respective water companies by their special Acts, and (if incorporated therewith) by the Waterworks Clauses Act, 1847. The only material clause in that Act seems to be sec. 37, which provides that in all pipes to which any fire-plug shall be fixed the undertakers shall provide water for (*inter alia*) street watering. The section does not expressly authorise the erection of stand posts, but I think it would be held to do so by implication. See *Metropolitan Water Board Company* v. *St. Matthew, Bethnal Green* (17 Q.B.D., 475). (*c*) I think the altered circumstances would make a difference, and would entitle the owners or occupiers to an injunction if a sufficiently strong case could be made out; see *Sturges* v. *Bridgman* (11 Ch.D., 852). A nuisance by noise, however, is emphatically a question of degree, regard being had to the character of the neighbourhood.

Cesspool Construction.—"Watertight" writes: By-law No. 89 of those in force within this borough reads thus: "Every person who shall construct a cesspool in connection with a building shall construct such cesspool of good brickwork in cement, and with a backing of at least 9 in. of well-puddled clay around and beneath such brickwork. He shall also cause such cesspool to be arched over, or otherwise properly covered over, and to be provided with adequate means of ventilation." If a cesspool constructed as above is still not watertight, has the local authority power to insist that it shall be made watertight? By the insertion of the portion of the by-law relating to clay puddling, it seems evident that the intention of the by-law is to compel a watertight cesspool.

If the leakage is due to the fact that the work required by the by-law has not been efficiently carried out, the local authority can enforce compliance with the by-law in this respect. In the event of a nuisance occurring, from whatever cause, the authority can proceed under sec. 41 of the Public Health Act, 1875.

Rain-Water Pipes.—"Owner" writes: A rain-water pipe from the roof of a building discharges on to a public footpath, either directly or through a forecourt. In order to prevent the stream of water from the pipe damaging the surface of the footpath, particularly where the latter consists of ashes or asphalt, it is usual to fix in the footpath a cast-iron conduit, provided with cover-plate to convey the water to the street channel. Who is liable to provide this conduit, the owner of the building or the local authority, where the latter is either (1) a rural district council, (2) an urban district council, or (3) a corporation?

There does not appear to be any enactment directly imposing such a liability on either the owner or the local authority. But under sec. 74 of the Towns Improvement Clauses Act, 1847, an urban district council can require the owner or occupier to fix a pipe to carry the water from the roof "in such manner that the water from such house or any portico or projection therefrom shall not fall upon the persons passing along the street or flow over the footpath." This section would apparently enable the council to require the owner to provide a conduit or some other means of preventing the water from flowing over the footpath. Municipal corporations are urban district councils for this purpose. The enactment does not apply to rural districts, but if the owner or occupier in such a district permitted water to flow over the footpath to such an extent as to be a public nuisance he would be liable to be indicted.

New Street.—"Street" writes: Some years ago the owner of an estate submitted a plan for a new street, 12 yds. wide, which was approved by the authority. Only a part of the street was formed, and this part was built upon. The remainder of the estate has changed hands, and the present owner, who is a builder, wishes to develop the land differently, and not continue this street, but to leave it a *cul-de-sac*, as it is at present. Can the authority compel the builder to make this street in accordance with the original plan, which was approved twenty years ago, or will the builder be in order in closing the street at the end of the portion already formed?

If the unformed part of the street has been used by the public as a highway, uninterruptedly, and as of right, for any considerable time, this would be very strong evidence of its having been dedicated as a highway, and in that case the builder could not enclose it. If, however, it has not been so dedicated the authority could not compel the builder to lay it out as a street.

We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.

New Reservoir for South Wales.—The first turf of the Abertillery and District Water Board's new reservoir in the Grwyne Fawr Valley was cut last week. The reservoir will serve a population of 80,000.

Continental Municipal Engineers at Hampton.—On Monday afternoon a large party of members of the Association Generale des Hygienistes et Techniciens Municipaux—a body which consists largely of municipal engineers and medical officers of cities and towns in France, Belgium and Switzerland—paid a visit to Hampton for the purpose of inspecting the works of the Metropolitan Water Board and the district council's sewage disposal works. The party, who were under the care of Mr. Thomas Cole, secretary of the Institution of Municipal and County Engineers, were met at the waterworks by Mr. W. B. Bryan, the chief engineer to the Water Board, Mr. H. B. Stent, resident engineer, and Mr. S. H. Chambers, engineer and surveyor to the district council, and spent nearly an hour in their examination of the undertaking. The visitors next proceeded to the sewage works, inspecting *en route* a section of tarred road. Some time was spent in examining the hydrolytic tank—which, as is well known, is a feature of these works—percolating filters, power-driven distributors, and other details, thanks for the cordial reception extended to the party being expressed before departure by M. Montricher, of Marseilles, speaking on behalf of M. Arthur Metz, vice-president of the association, who was among those present.

Correspondence.

"Be calm in arguing; for fierceness makes
Error a fault and truth discourtesie."
GEO. HERBERT, "The Temple."

TOWN PLANNING: WHOSE WORK?

To the Editor of THE SURVEYOR.

SIR,—In a recent number of your paper you invited opinions from readers on the above question. I should like to give an expression of my ideas on the subject.

Let me say clearly at the outset that it is my opinion that the municipal engineer is best qualified to prepare a town planning scheme. Having said this, I must also give it as my decided opinion that if the engineer is successfully to carry out this work without incurring the censure of the architects and everyone interested in the beauty of our towns, he must cultivate an "architectural sense." By this I do not mean that he must become an architect, with all the training that it involves, nor that he should cover his work with gimcracks evolved by the architectural draughtsman, or be carried away by that folly which attempts to make a water tower look like a Norman keep or a sewage tank to appear as an ornamental lake. What I do mean is that the engineer should study the principles of beauty in design, and apply them to his own particular work.

This sense of beauty—the "architectural sense," as I have called it—once acquired must inevitably influence the engineer's town planning, and remove from him the stigma of ugliness which at present attaches to his works. When planning his roads he will then consider their prospects and vistas; when arranging his areas for residential purposes, his sites for public buildings and parks, he will consider the possibilities of architectural grouping, the dignity essential to public places, and the preservation of natural beauty.

Moreover, this sense of beauty in design will assert itself in his bridges, culverts, embankments, and all other works which essentially belong to his science. That this sense of beauty has been sadly lacking among engineers in the past is all too evident. Can anyone stand on Waterloo Bridge and look westward without feeling that a great profession should be ashamed of producing such a vulgar monstrosity as Hungerford Bridge?

Engineering structures can be made beautiful by a right use of materials, and a sense of line and proportion, without altering their character as such. As an instance of such a one let me cite the new reinforced-concrete bridge at Thorverton, Devon (built in 1910 to the designs of Mr. S. Ingram, county surveyor). The beauty of this is apparent in the graceful curve of the arch surmounted by the line of the roadway, and the careful treatment of detail. Yet it is an engineer's bridge, built with an engineer's materials. Its beauty is a spontaneous one, due to a simple and natural use of materials proper to the structure, and expressive of its purpose. I cannot see why engineers generally cannot study this possibility for beauty in their works.

If the engineer approaches his work in this spirit, the architect will find his work assisted by the sympathetic foresight of the former, and much of the enmity between the two professions will cease. If the engineer cannot or will not acquire this "architectural sense," then let him openly acknowledge his deficiency and make it his duty to collaborate with an architect at every stage of preparing a town plan.—Yours, &c.

F. G. [illegible]

Surveyor's Office,
Town Hall,
Sandown, I.W.
October 18, 1912.

To the Editor of THE SURVEYOR.

SIR,—I am afraid that there are many municipal engineers and architects even claiming that town planning is essentially his work.

Town planning involves many things, a number of which Mr. Wilkes, in his letter, has enumerated; however, it seems to me that Mr. Wilkes has contradicted himself, for in the first part of his letter he says that the planning of a new town is essentially the work of a municipal engineer, and in the latter part he says that the British architect's true function is to do for his town what his prototype has done for Düsseldorf, and to concede to the municipal engineer his true work of town planning construction and maintenance. I take it, therefore, from the latter part of Mr. Wilkes' letter that he agrees that town planning is the work of the architect, but—and I agree—that town planning construction and maintenance is the work of the municipal engineer.

There is a broad distinction of definition between architect and engineer; an architect is a member of a professional art, and an engineer is a member of a science.

The question now is, Does town planning come under the former or the latter? I think there is no doubt that it comes under the former; town planning is essentially a work of art. But when one comes to the constructional part of town planning, then it is the work of science, and this is when the engineer takes his place. Thus the two work together, the architect doing the planning and the engineer the construction.

As regards the most delicate negotiations, and so forth, which Mr. Wilkes refers to, and into which the architect would be plunged, am I to understand that the architect would not be able to carry these negotiations through? Here, again, of course, I admit the municipal engineer in whose district the town planning scheme is can materially help the architect, and I doubt not that all municipal engineers would do so. I think it will, however, be admitted by Mr. Wilkes, and all municipal engineers and architects, that the carrying through of a town planning scheme is not the work of either engineer or architect alone, but of both. By the term architect, I am not taking into consideration the estate agent who terms himself an architect, but whose calling has nothing whatever to do with architecture.—Yours, &c.,

J. BARBER.

North Finchley, N.
October 16, 1912.

To the Editor of THE SURVEYOR.

SIR,—May I correct one error in the letter of Mr. A. J. Price? He says that "garden city and garden suburb schemes are essentially promoted by building speculators."

Inasmuch as the return of capital is limited to 5 per cent, and that the companies which are responsible for the schemes do not themselves build at all, except in the case of co-partnership tenants, where houses are not sold, the description is surely very far removed from the fact. Mr. Price's acquaintance with the garden city movement is apparently of the very faintest, for he says "the main feature is the effort to cheapen road making"! And this in the year of grace 1912.

The observations on the federal capital plan, however, are worthy of note, and I may say that on November 20th Mr. W. R. Davidge, F.S.I., A.R.I.B.A., ASSOC.M.INST.C.E., will give a lecture on the subject here at 5 p.m., illustrated by plans and models. I shall be pleased to send an invitation to any of your readers who may like to see the subject dealt with by one who is both an architect and surveyor.—Yours, &c.,

EWART G. CULPIN,
Secretary, Garden Cities and
Town Planning Association.

7 Gray's Inn-place,
Gray's Inn,
London, W.C.
October 21, 1912.

"SOUTHERN ENGLAND: COAST AND COUNTRYSIDE."

To the Editor of THE SURVEYOR.

SIR,—I have to thank you very much for the kind notice of the above book which appeared in your issue of the 4th inst. There are one or two little points, however, which I should like to mention. The book does not purport to deal with the whole of Surrey—a great part of this county is dealt with in our publication "Where to Live Round London"—consequently we have not attempted to give the

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
Accomodation Subways for Pipes and Wires	Supplement
Appointments Vacant	593
Assistants' and Students' Section	578
Concrete Institute	559
Correspondence	576
Dundee's New Central Reading Rooms	Supplement
Education of Highway Engineers	558, 560
Functions of Colonel Crompton	558, 592
Institution of Municipal Engineers:—	
Eastern District Meeting at Godmanchester	590
Fourth Annual General Meeting in London	585
Notices	594
Institution of Municipal and County Engineers —	
North Wales District Meeting at Wrexham .	564
Law Notes	574
Local Government Board and West Hartlepool	557
Local Government Board Inquiries ...	579
London County Council Chief Engineership	573
Manchester Sewage Disposal	562
Municipal Competitions Open	593
Municipal Contracts Open...	594
Municipal Work in Progress and Projected	581
New York Sewage Disposal	557, 571
Personal	583
Reinforced Concrete	Supplement
Reinforced Concrete Reservoir at East Cowes .	Supplement
Road Gritting	593
Roofing Materials	Supplement
Royal Sanitary Institute	594
Sanitation at Oakengates . .	559
Sewage Disposal in South Africa	558
South Fife Development	Supplement
Tenders for Municipal Works or Supplies . ..	595
Town Planning Progress	Supplement
Town Planning: Whose Work?	576
Treatment of Soft Wood Paving Blocks: Some French Experiments	559, 563
Wrexham and its Municipal Works	565

books, golf links or schools that are not related to the places in the county which are dealt with in the book. The same applies to that portion of Kent which lies fairly near to London. It is just possible that in looking through the article on the books to read that you may find the author has included books dealing with one or two places not dealt with in a separate descriptive section (*e.g.*, Gravesend). The reason for this is that we had hoped to be able to include several other places, for which at the last moment we were unable to find room, but as these places were mentioned in certain of the preliminary articles we did not deem it advisable to delete them from those articles. The tendency of the book was to run far outside the limits of what we could possibly give for 1s., and I note that you speak of the book as a marvel of cheapness.

There is no doubt that in this the first edition there are probably one or two small errors or omissions, and, of course, we are quite pleased to have these pointed out, so that we may correct them in future issues. Naturally, we also hope to be able to deal with additional places in succeeding issues.—Yours, &c.,

A. H. Anderson,
Editor.

Chandos Chambers,
15 Bedford-street, W.C.
October 7, 1912.

NON-SLIPPERY WHINSTONE.

To the Editor of The Surveyor.

Sir,—Your correspondent "Scotch Whinstone" avers that "he has seen many miles of streets paved with whinstone setts, but has never observed slipperiness in such paving." The exact value of this testimony cannot be estimated in the absence of more definite data; of itself it does not go far to confute my view that whinstone is an undesirable material for paving tramways.

It is easy to understand that evidence of slipperiness in sett paving may exist, but be unobserved by a casual pedestrian; it is the riders and drivers of horses who have cause to notice it, so likewise has the surveyor, who usually gets the blame for it. "Scotch Whinstone's" testimony would probably have been very different had he had official responsibility for the condition of whinstone-paved streets. Possibly his observations may have been made on newly laid whinstone or where it is laid in streets with light traffic. I have myself paved with whinstone many miles of streets where the traffic has been of the "milk cart order" and unlikely to wear any paving slippery in a generation.

But to bring the consideration of this question more closely to my point—*viz.*, the wisdom, or otherwise, of using whinstone for tramway paving—as pointed out in my previous letter, the responsibility upon tramway authorities for maintaining their paving free from slipperiness is much more direct and onerous, under the decision of the House of Lords in the Dublin case, than that of road authorities. As an example of the cost thus entailed, Cardiff spends over £1,000 per annum in gritting its tramway tracks, which are almost wholly paved with hard wood. This evidences the importance of using a paving material not prone to slipperiness.

That it is the general view of road surveyors that whinstone wears slippery is evidenced by the fact that local authorities, both English and Scotch, invariably give this as their reason for declining to approve the use of whinstone setts by companies about to construct tramways in their districts. That a municipal authority (Portsmouth) should use setts of this material was therefore not a little surprising. Possibly the explanation may be that in this instance the committee were not acting under the advice of the borough surveyor, but of the tramway manager; as a rule, such gentlemen are not experts in paving materials.

As your correspondent rightly says, "he must be ignorant indeed who cannot tell Scotch whinstone from Scotch granite." The fact that the two materials are so unlike is the reason of my complaint that traders sometimes apply the latter term to the first-mentioned material; there must be an intent to deceive by this. "Scotch Whinstone" tells us such a practice is unknown north of the Border; doubtless, even tramway managers and town councillors are too much "on the spot" there to be misled by such a misuse of terms.—Yours, &c.,

W. J. Howard-Smith.

Westminster.
October 23, 1912.

THE CROMPTON PAVEMENT.

To the Editor of The Surveyor.

Sir,—To have taken up your valuable space by directly answering Mr. W. J. Howard-Smith's very elementary question as to why a percentage of cement is employed in the manufacture of asphaltic paving mixtures was farthest from my thoughts when I suggested that it seemed a pity that he should make invidious comparisons between asphaltic paving mixtures.

I will refrain from commenting upon Mr. Howard-Smith's retort courteous giving his opinion as to the personal motives which he imagines actuated my criticism of his former letter, but would now humbly beg of him to enlighten the paving world upon what he calls "liquid 'bitumen' (*i.e.*, British)," and so refute the strictures which I made upon his apparent lack of knowledge on this subject.—Yours, &c.,

Cecil Nathan.

3 London Wall Buildings,
London, E.C.
October 18, 1912.

To the Editor of The Surveyor.

Sir,—I have followed the correspondence on this subject with much interest.

Mr. Howard-Smith will know that it is not difficult to ascertain the length of time that any particular expert has been connected with a material such as bitumen, and whether any inferred claims to possess superior knowledge are based on long experience or otherwise. At the same time I do not quite understand what Mr. Howard-Smith means by "bitumen (*i.e.*, British)." If he refers to tar and pitch, then I must say I think he should make this more clear, and not lead us to think that Nature had, perhaps, been keeping abreast of the times by giving us bitumen in this country just at the moment when natural materials are being so much sought after. Seeing, however, that bitumen is not found in commercial quantities in Britain, and as we shall always, unfortunately, be compelled to import natural bitumen, Mr. Howard-Smith must have been referring to tar, pitch or some other artificial material, and using the word bitumen in the same loose way that many others have done.—Yours, &c.,

Natural.

October 21, 1912.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

276. Roof Design.—It is found necessary in designing the steel trusses for a roof to adopt some system of wind bracing. Explain in detail how the cross-sectional area of the wind ties is determined. (H. F. W., *Tottenham.*)

278. Mechanics.—Give an expression for the tension of the bucket rod or piston rod in a common suction pump. The barrel of the pump is 8 in. diameter, and the stroke of the bucket or piston is 10 in. Find the work done per stroke in ft.-lbs. when the spout is 16 ft. above the surface of the water in the well. (A.M.I.C.E., October, 1901.)

280. Building Construction.—The walls at the base of a high brick tower are 3 ft. 9 in. thick. Describe, with drawing, what footings should be provided, the thickness of concrete, and the distance below the surface. (T. R.)

281. Surveying.—Upon what trigonometrical rule does triangulation depend? Prove that the sides of a triangle are proportional to the sines of the angles opposite to them.

282. Hydraulics.—Explain simply what is meant by the "hydraulic gradient" of a pipe, and how this may be obtained in any given case. ("Pupil.")

REPLIES TO QUESTIONS.

277. Sewage Disposal.—What main principles should be kept in mind in arranging the sewage disposal of the following: (*a*) A village of 800 inhabitants (purely agricultural)? (*b*) A town of 2,000 inhabitants (industrial)? (*c*) An infectious diseases hospital of 100 beds? ("Charger.")

The main principles to be kept in mind in the arrangement of works of sewage disposal are those of economy and efficiency. The works should require a minimum of attention in order that the cost of maintenance may be as low as possible.

(*a*) The question of the removal of sewage comes under two main heads—viz., the conservancy system and the water-carriage system. The first named is now practically obsolete except where houses are very scattered. In a village of this size it is probable that a system of sewers is either already in existence or is contemplated. The cheapest method of disposing of sewage is by running it direct into a stream, but Section 17 of the Public Health Act, 1875, does not permit the use of a sewer for conveying sewage into a watercourse until it is purified to such an extent that it will not deteriorate the quality of the water in that watercourse. The allowing of sewage to flow into a stream is an offence under Section 3 of the Rivers Pollution Prevention Act, 1876. Local Authorities are therefore called upon to purify the sewage before turning it into any stream.

The disposal works should be situated, if possible, in such a position that the sewage may gravitate from the village to them, and so eliminate the necessity and cost of pumping. At the same time the works should be as far removed from houses as is practicable.

The amount of the sewage to be dealt with will depend largely upon whether there is a public water-supply or not, and whether the sewerage is on the separate or combined system. If the water-supply is taken from wells and springs an allowance of 15 gallons per head per day should be ample, but in case of a proper water supply at least twenty gallons per head per day should be allowed. If the sewerage is on the combined system, or a combination of separate and combined, provision will also have to be made for storm water.

The purification of the sewage may be effected by land treatment, chemical precipitation, or by bacteriological or biological methods. If land can be acquired cheaply, suitable as regards nature of soil and position, land treatment may be considered. It must be borne in mind that sewage farms are to be run for efficiency and not solely for profit, and they require a considerable amount of attention to keep them in working order. The suitability of land for sewage treatment varies considerably; thus with a light sandy loam on gravel 15,000 gallons per acre per day of crude sewage may be dealt with, while with stiff clay not more than 1,000 gallons per day can be treated per acre. If the sewage is settled in suitable tanks, or subjected to a preliminary process of purification before being run on to the land, the acreage required will be correspondingly decreased.

Chemical precipitation is not economical, on account of the cost of chemicals and attention required. There is also the sludge problem to be considered.

The disposal in this case would be probably best effected, and with least annual cost, by works on bacteriological lines. The sewage would first be run through detritus chambers with a capacity of 2 per cent to 5 per cent of a day's dry weather flow, then into septic tanks of a combined capacity of eighteen to twenty-four hours' dry weather flow, and then through percolating filters. The capacity of the filters will depend on whether the sewage is classed as strong, average, or weak in strength, according to the recommendations of the Royal Commission on Sewage Disposal. The allowances for weak, average, and strong are respectively 100, 70, and 45 gallons per cubic yard of filtering medium. Provision should be made in the works for removal of the sediment which will form. The effluent would preferably be run on to land, but if this is not practicable it would run into a stream. If there are houses near the works, taking water for any purpose from the stream, the effluent should discharge below the houses.

Local authorities are empowered by the Public Health Acts to borrow money to defray the cost of disposal works, subject to the sanction of the Local Government Board. The sum to be borrowed must not exceed the assessable value of the district for two years. If the sum, together with any outstanding loans exceeds the value for one year the Local Government Board cannot sanction a loan without holding a local inquiry. They will require detailed plans of the works together with an estimate of cost.

(*b*) The general notes given above with regard to pollution of streams and position of works also hold good in this case. The amount of sewage per head of population will probably be higher, however, and an allowance of 25 to 30 gallons per head per day may be necessary. The actual figure will be largely affected by the amount of trade effluents, being an industrial town. Owing to the large area required and the usual high price of land in the vicinity of towns, land treatment will probably be out of the question. The point requiring most consideration here is that regarding the trade effluents.

Under Sections 16 and 17 of the Public Health Act Amendment Act of 1890, liquids issuing from factories, &c., may be discharged into public sewers where such liquids do not interfere with the efficiency of the sewers. The actual method of treatment at the disposal works will be determined by the nature of the predominating trade or trades. Effluents containing an excess of suspended solids, such as from tanneries, coal-washing plants, potteries, aniline stills, dye works, paper mills, &c., can usually be classified by subsidence in suitable tanks or by passing the effluent through screens or mechanical filters. Fermentative and putrefactive effluents, as from breweries, distilleries, tanneries, starch works, wool-scouring works, glue works, &c. can be purified by suitably arranged biological tanks and filters, though liquids that undergo acid fermentation, such as starchy and brewery effluents, are not suited for anaerobic treatment. Colouring matters from dye works, &c., can generally be precipitated by iron or aluminium salts. Effluents containing substances

poisonous to aquatic vegetation and fish life, such as from indiarubber works, sulphur-dye stuffs, and from ammonia stills, should be treated with lime and ferrous sulphate, and settled in precipitation tanks. Some effluents contain oily matters—fat and soap. Free grease and fat can be intercepted by special grease traps. Soap from wool-scouring works may be broken down by acids and then separated and purified. In the case of laundries the soap may be precipitated with lime.

It will depend on the nature and quantities of the trade effluents whether they are purified at the factories or allowed to come into the sewers, in which case the disposal works will be accordingly arranged.

In cases (*a*) and (*b*) allowance should be made in designing the works for increase of population.

(*c*) The most important point to be considered in this case is the possibility of disease-germs finding their way into streams, especially if the hospital be near houses which may take water from these streams. Filtration through land or artificial filters cannot be relied upon to produce, under all circumstances, effluents free from pathogenic organisms. The sewage from an isolated hospital can, however, be efficiently dealt with by a small disposal works on bacteriological lines consisting of septic tanks and percolating filters.

The consumption of water can generally be easily obtained in such institutions so as to arrive at the required size of the works. The number on the staff must, of course, be allowed for in addition to the patients.

The grease, fat, and soap should receive special consideration, as if allowed to get to the disposal works they may cause trouble. The grease and fat should be intercepted in grease-traps, and the soap precipitated with lime at the laundry.

The disposal works should be well away from all buildings and houses, and the effluent should not be discharged into a stream if near cottages, but preferably run on to land. As a precaution it is possible to sterilise the effluent by the use of chlorine in the form of hypochlorites or oxides of chlorine (obtained by electrolysis).—(I. W. S., *Clapham Junction.*)

279. Paving.—What is the best material for paving carriageways of steep gradient? Give reasons. ("Muneng.")

The best material for paving a road having a steep gradient would be granite setts, such as Guernsey or Aberdeen, which do not wear smooth and acquire a polished surface. The shape of the stones should be from 7 in. to 9 in. in depth, and not more than 3 in. to 4 in. in width, and they should be laid in parallel courses across the street

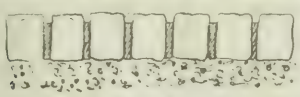


Fig. 1.

in such a manner that the stones in each course break joint with those in the adjoining course.

They should be laid on a bed of 6 in. cement concrete, and the joints in each case should be as small as possible. After the stones have been set they should be well punned, and, if necessary, a thin grouting of sand and lime should be poured over the surface to fill the interstices between the stones.

If the street has a very considerable gradient a course of slate rather more than an inch in thickness, and about an inch less in depth of the stones should be laid between the rows, as shown in

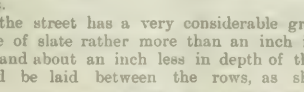


Fig. 2.

Fig. 1. Or a somewhat simpler method may be adopted—namely, placing the stones with a cant on their beds, so forming a series of ledges or steps, as shown in Fig. 2. Either of these methods affords horses a safer foothold than the ordinary way of laying the stones.—(H. B., *Worcester.*)

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Belfast T.C. (October 15th. Mr. P. C. Cowan). £17,200 for extensions at Purdysburn Asylum; £10,000 under the Small Dwellings Acquisition Act, 1899; £10,000 for street widenings at North-street and William-street South; and £9,356 for other widenings and flood prevention works; and £63,000 for the purpose of permanent paving of streets.—It was explained that the sum of £17,200 was made up of the cost of the erection of two villas known as villas No. 8 and 9. The cost of those villas was £11,000, and there would be accommodation for fifty patients in each. The cost of sewerage would be £3,000, and the council had acquired only acres of land at the net cost of £2,200, with another £100 as the estimated cost of transfer. With respect to the application for a loan for £10,000 for the Small Dwellings Acquisition Act Councillor John M'Caughey, J.P. (chairman of the Law Committee), was examined in relation to the loans already received under the Act. He instanced the Act had worked most satisfactorily. It raised the principle of self-help, and had proved most beneficial to the thrifty and provident. Referring to the cost which the corporation had had to pay under the arbitrator's award for property for street widening, the inspector pointed out that in one case £6,750, and in the other £5,725, had been paid, and though that was gratifying as showing the value of land in Belfast, it seemed a large sum to pay for less than 40 yds. in North-street for a comparatively small improvement. In regard to the loan for flood prevention works, evidence was offered by Assistant Engineer Mr. H. A. Cutler as to the proposed construction of a storm overflow from the high-level sewer in North Queen-street, down through Frederick-street and Gamble-street, to the river. The alterations in the old sewers in May-street and Lagan-street were estimated to cost £4,260, which, with the sum of £5,091, made up the total at £9,356. The loan of £53,000 for the purpose of permanent paving of the streets in different parts of the city was then explained, and particulars given at length by the city surveyor. In the course of his evidence Mr. Cutler mentioned that he considered that Lithofalt blocks were the most satisfactory and lasting form of asphalt paving.

Berwick T.C. (October 18th. Mr. A. A. G. Malet).—£5,000 for the Tweedmouth drainage scheme.—The Tweed Commissioners opposed on the grounds of pollution to the river, and damage to salmon fishing. It was contended that the additional expense of purification works would be £20,000; and to take the drainage to the sea at Spittal would mean £6,000 additional to the present scheme.

Burgess Hill U.D.C. (October 16th. Mr. P. M. Crosthwaite).—£2,250 for the purpose of works of sewage disposal, including works in the parish of Clayton and in the rural district of Cuckfield.—Mr. A. F. Hardwick, clerk, and Mr. E. Brown, surveyor, presented the scheme for the council. It was stated that the scheme was in two parts, high level and low level. The sewage field was 26 acres in extent. The high-level sewage would go over the whole of the land, and the low-level sewage over about 8 acres. During four months of the year, owing to dry weather and the stiff clay soil, the effluent was not satisfactory. Everything had been done to make the soil workable. Peppermint was grown on the farm. It was proposed to put in sedimentation tanks for each level, with fifteen hours' flow. The capacity of the high-level tank was 31,000 gallons, and the low-level tank 60,000 gallons. The sedimentation tanks would be in addition to the present filter arrangements on the farm.

Doncaster T.C. (October 18th. Major J. Stewart).—£3,800 for the erection of a refuse destructor, and £1,215 for the paving of a part of St. Sepulchregate with granite setts.—The town clerk (Mr. R. A. H. Tovey) explained that, owing to the opening of several collieries in the district, and other industrial developments, the traffic on the road, on which they had the entrance to the Great Northern goods yard, had increased enormously in recent years, and it was found necessary to adopt granite setts. The portion was on the Tinsley main road, and the county council approved the proposal. As to the refuse destructor, the borough surveyor, Mr. F. O. Kirby, said that £300 a year would be saved in cartage alone. The destructor would have a capacity of dealing with 40 tons in eighteen hours, and the capacity could be

doubled when necessary. Major Stewart complimented the officials of the corporation on the way in which the case for the two applications had been placed before him.

Newtownards U.D.C. (October 16th. Mr. P. C. Cowan).—£1 300 for the provision of new gas mains.—It was stated that a considerable portion of the sum asked for was to increase the efficiency of the present gas supply. The present gas mains were too small, and it was intended to adopt the high-pressure system.

Ramsgate T.C. (October 8th. Mr. F. O. Stanford).—£3,206 for the extension of the East Cliff promenade. The borough surveyor, Mr. T. G. Clarke, stated that the cost of scarping the cliff and sinking the front footpath would be £500. Many portions of the cliff were overhanging, and it was estimated that 12,000 yds. of chalk would have to be removed. There were some small caves at the base of the cliff which would have to be filled in. It was estimated that the shelter to be erected on the land would cost £550, but since that estimate was procured there had been a considerable advance in prices.

Sheffield T.C. (October 15th. Mr. Edgar Dudley).—£40 000 for various improvements in the city.—Included in the scheme is the provision of a coroner's court and mortuary, with a central court for the holding of inquests. It is also proposed to purchase 30 acres of land at £210 an acre, and 3½ acres at £350 an acre, to preserve Whiteley Woods from being surrounded and overlooked by houses and buildings and to join up Whiteley Woods and Bingham Park to the property of the city. Other sums are to be expended in various street improvements, including the making of double tram lines where at present single tracks only are laid. Evidence was given by the city engineer, Mr. C. F. Wike, and other officials.

Whitby R.D.C. (October 9th. Major C. E. Norton).—This was an inquiry into the complaint to the Local Government Board made by Mr. Tom Pinkney, shipbroker, Sleights and Sunderland, that the Rural District Council of Whitby had made default in providing the village of Sleights and township with sufficient sewers. Mr. Pinkney read a long letter which he wrote to the Local Government Board in May last, complaining that drainage was in a crude and unsatisfactory state, in some places open and in other places only partially covered, with sewage passing down in semi-open drains. An adverse report on the condition of affairs was made by Dr. Cheetham, county council medical inspector, and by Dr. J. B. Laverick, medical officer of health for the Whitby rural district. Mr. Pinkney dealt with those reports, and said the Whitby Rural District Council had also declined to make any arrangement for the disposal of surface drainage. Many houses had been built with cesspools, but with little or no arrangement for dealing with crude sewage, which went into the becks, where cows drank. He complained that there was no definite system, and the danger of disease was great. Mr. W. Seaton Gray, clerk to the Whitby Rural District Council, maintained that his board had forwarded sewerage schemes for the village to the Sleights Parish Council, who replied that no scheme was necessary, and the Whitby Rural District Council had not therefore forced one on the parish without its consent. Mr. John Popple, land agent and surveyor, said that £50,000 worth of new property had been erected in Sleights during the last twenty-five years. Everyone admitted that something must be done, but the outlying farmers objected to contributing to what would practically be an urban scheme. Witnesses in favour of a sewerage scheme gave evidence, and Dr. J. B. Laverick agreed with Dr. Farrar's (Local Government Board inspector) report, that "the present sewerage system cannot be regarded as satisfactory," and said his council had been considering the matter since 1893, since when he had frequently reported that a scheme was necessary.

APPLICATIONS FOR LOANS.

Anglesey C.C. £500 in connection with the North Wales Counties Training College building scheme.

Barry U.D.C.—£400 for school clinic work.

Brampton R.D.C. £980 for a sewerage scheme.

Darlington T.C.—£8,341 for gas main extensions.

Stoke Newington B.C.—£2,100 for widening Church-street.

Wellington (Salop) U.D.C.—£4,700 for a storm-water drainage scheme.

LOANS SANCTIONED.

Brierfield U.D.C.—£8,215 for the extension of the sewage disposal works.

Carshalton U.D.C.—£757 for road improvement works.

Cheadle U.D.C.—£1,573 for private street improvement works.

Darlington T.C.—£47,550 for the extension of the gasworks.

Frinton U.D.C.—£383 for the purchase of land for a cemetery.

Grimsby T.C.—£1,560 for a new sewer in Wellholme-avenue and £850 for sewer ventilation.

Harrogate T.C.—£1,800 for a site for a school.

Harrow U.D.C.—£5,550 for the enlargement of the municipal buildings.

Hayes U.D.C.—£8,717 for workmen's cottages.

Penybont R.D.C.—£1,420 for private street works.

Portland U.D.C.—£15,000 for the extension of the waterworks.

Swanage U.D.C.—£257 for surface-water drainage.

FORTHCOMING INQUIRIES.

OCTOBER.

	£
29.—**Barnsley.** For the purchase of property for street improvements (Mr. Edgar Dudley)	6,110
29.—**Blackpool.** For private street works (Mr. F. H. Tulloch)	9,064
29.—**Liskeard.** For water supply purposes (Mr. R. G. Hetherington)	—
29.—**New Mills.** For the purposes of the gas undertaking (Mr. F. O. Stanford) ...	10,000
29.—**Portsmouth.** For the provision of a salt-water supply for street and sewer purposes (Mr. R. H. Bicknell)	8,000
29.—**Redditch.** For recreation ground, street and sewerage purposes (Major J. Stewart)	4,975
29.—**Stoke-on-Trent.** For electricity purposes (Mr. T. C. Ekin)	16,969
29.—**Twickenham.** For depot, swimming accommodation, street and embankment purposes (Mr. W. O. E. Meade-King) ...	2,525
30.—**Amington and Stony Delph.** For the provision of a burial ground (Major J. Stewart)	800
30.—**Chadderton.** For the purchase of land for street improvement purposes (Mr. Edgar Dudley)	1,860
30.—**Higher Bebington.** For allotments purposes (Mr. Edgar Dudley)	250
30.—**St. Helens.** For electricity purposes (Mr. T. C. Ekin)	5,006
30.—**Southampton.** For cemetery and public convenience purposes (Mr. R. H. Bicknell)	2,968
30.—**Southport.** For promenade extension (Mr. F. H. Tulloch)	8,500
31.—**Axminster.** For sewage disposal purposes (Mr. R. G. Hetherington)	10,000
31.—**Beddington.** For the provision of a recreation ground (Mr. M. K. North)	5,200
31.—**Darwen.** For paving, street and electricity purposes (Mr. T. C. Ekin)	37,250
31.—**Hazel Grove.** For private street works (Mr. F. H. Tulloch)	1,660
31.—**Maidenhead.** For tar paving and road improvement purposes (Mr. Courtenay Clifton)	5,280
31.—**Shardlow.** For sewage disposal purposes (Mr. F. O. Stanford)	8,850

NOVEMBER.

1.—**Bolton.** For street improvement purposes (Mr. F. H. Tulloch)	7,107
1.—**Dudley.** For the provision of public conveniences (Major J. Stewart)	1,450
1.—**Dunmow.** For sewage disposal works (Mr. P. M. Crosthwaite)	3,500
1.—**Manchester.** For electricity, street and sewerage purposes (Mr. T. C. Ekin) ...	121,775
2.—**Crewe.** For works of culverting (Mr. F. H. Tulloch)	2,200

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Building—Ayr £2,700, Ilford £18,000, Newcastle-on-Tyne £36,000; housing and town planning—Llanelly, Moira £16,000; roads and materials—Crompton £3,706; sewerage and sewage disposal—Epsom £6,194, Repton £6,000, Tredegar £24,912, Whittington £7,000, Wigan £21,000, Wrexham £8,400; water, gas and electricity—Llandrindod Wells £4,000.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

BUILDINGS.

Anglesey C.C.—The tender of Messrs. R. & J. Williams, of Bangor, at £4,731, has been accepted for the erection of a school at Menai Bridge.

Ardrossan T.C.—A proposal has been made for the construction of a public swimming pond.

Ayr T.C.—Plans have been prepared of a diphtheria block at the Heathfield Hospital, the estimated cost of the work being £2,700.

Basingstoke T.C.—A new fire station is to be erected in Brook-street, at a cost of £700.

Bradford T.C.—The Bolton and Horton tramway car sheds are to be repaired, at an estimated cost of £500.

Campbeltown T.C.—A gift of £1,000 has been received for building an addition to the infectious diseases hospital, the extension to be for the use of consumptive patients.

Clevedon U.D.C.—A committee has been appointed to report upon a scheme for the provision of a pavilion on the sea front, at an estimated cost of £2,800.

Cromer U.D.C.—A sum of £100 is to be spent on the provision of bathing shelters.

Derbyshire C.C.—A scheme has been adopted for the treatment of consumptives in sanatoria in conjunction with county boroughs and urban districts.

Dundee T.C.—Four properties are to be purchased in connection with the central improvement scheme, at a cost of £9,150.

Ilford U.D.C.—The enlargement of the town hall, at an estimated cost of £18,000, is under consideration.

Newcastle-on-Tyne T.C.—The provision of baths for Heaton, at an estimated cost of £8,000, has been agreed to in principle, and a complete scheme of baths for Benwell, Walker and Heaton is to be prepared at an approximate cost of £28,000.

Newton-in-Makerfield U.D.C.—The new isolation hospital at Earlestown, erected from the plans of the surveyor, Mr. Arthur Bowes, has been completed.

Wycombe R.D.C.—The tender of Messrs. C. H. Hunt & Son, at £527, has been accepted for the erection of an administrative block at the isolation hospital.

HOUSING AND TOWN PLANNING.

Ellesmere Port U.D.C.—The Local Government Board have written that they are prepared to give authority for the preparation of a town planning scheme in regard to an area comprising the whole of the urban district of Ellesmere Port and Whitby (with the exceptions of certain lands already built upon) and some 390 acres situate in the rural district of Chester, immediately to the south of the urban district.

Hyde T.C.—With a view of putting the Town Planning Act into operation, the council have instructed the borough surveyor, Mr. J. Diggle, to indicate on an ordnance map what areas are suitable for town planning schemes, either in the borough or in connection with schemes of neighbouring authorities.

Llanelly U.D.C.—It has been decided to erect 100 additional workmen's dwellings.

Moira U.D.C.—A scheme has been approved for the provision of sixty-eight cottages, at an estimated cost of £16,000.

Newcastle-on-Tyne T.C.—An area of 80 acres on the corporation's Walker estate is to be utilised for a housing scheme.

Tilbury U.D.C.—It has been decided to purchase about 7 acres of land, at £150 per acre, for the erection of workmen's dwellings.

Tiverton T.C.—The Streets Committee have under consideration an exhaustive report by the borough surveyor, Mr. J. Siddalls, under the Housing and Town Planning Act on five suggested schemes for providing houses for the working classes.

Wallasey T.C.—A housing scheme is to be carried out, at a cost of £6,280, including the purchase of the necessary land.

Wirral R.D.C.—The council have under consideration schemes for the town planning of the greater part of the area under their control, and on Tuesday last preliminary conferences in respect of two further areas were held.

York T.C.—The Local Government Board have approved the revised proposals of the council with respect to the erection of thirty houses in Almaterrace.

PARKS AND OPEN SPACES.

Ellesmere Port U.D.C.—A committee has been appointed to consider the provision of a bowling green in the district.

Glasgow T.C.—The new park in Springburn, presented to the city by a donor who does not desire his name to be known, will be handed over to the corporation to-morrow. It is understood that the gift represents a sum of £13,000.

Ilkley U.D.C.—The surveyor, Mr. T. H. Smith, has prepared plans for laying out the Holmes estate.

Kingston (Surrey) T.C.—Two additional gravel lawn-tennis courts are to be laid down at Canbury-gardens.

ROADS AND MATERIALS.

Ballymoney R.D.C.—It has been decided to devote the council's share of the grant of £3,000 to be made to the county council by the Road Board almost entirely to giving a tar-macadam coating to part of the trunk road between Ballymoney and Ballymena, north of Newbuildings Bridge.

Crompton U.D.C.—Plans have been approved for the paving of Rochdale-road at an estimated cost of £3,706.

Downpatrick R.D.C.—Proposals have been passed for works to be executed by direct labour in a section of the district. The most important item is a proposal of £1,000 to raise the Ballydugan-road adjacent to Downpatrick, and this has been passed on condition that the Road Board contribute £750.

Edinburgh T.C.—A project for the formation of a new road and the widening of an existing street has been agreed to with the North British Railway Company, which will necessitate the abolition of the Union Canal Basin. The bargain involves a payment of some £25,000 to the company for the acquisition of land.

Kingston (Surrey) T.C.—The tender of Messrs. Griffiths & Co. to relay the outside tramway margin in part of London-road has been accepted at £63 13s., and for similar work in other roads at £118 14s. 8d.

Maldens and Coombe U.D.C.—The surveyor, Mr. R. H. Jeffes, is to present a comprehensive scheme for the widening of about 750 ft. of Kingston-road, so as to lower the level of the roadway on each side of the bridge, and to reduce the gradient to 1 in 48.

Newport (Mon.) T.C.—The widening of the corner of High-street and Bridge-street is under consideration.

Nuneaton T.C.—Property to the value of £4,500 has been purchased for effecting an improvement in Bridge-street.—At the meeting last week a discussion took place in regard to the system of adopting new streets. Alderman Bates contended that the streets ought to be handed over to the council free of charge. There was no other town in the kingdom which had such a system as theirs. He proposed that all new streets from that date be handed over to the council free of charge. The motion was carried *nem. con.*

SEWERAGE AND SEWAGE DISPOSAL.

Brynmawr U.D.C.—The Local Government Board have declined to entertain the council's application for the purchase of property for municipal offices in view of the urgent need of an efficient scheme of sewage disposal.

Cockermouth R.D.C.—The contract for the Great Clifton sewerage scheme, at £1,024 for the laying of pipes, and £735 for the outfall works, has been given to Messrs. Donaghan & Mulcaster, of Egremont.

Epsom U.D.C.—A storm-water drainage scheme, estimated to cost £6,194 is to be carried out.

Kingston (Surrey) T.C.—The tender of Messrs. F. W. Berk & Co., Limited, for supplying about 300 tons of sulphuric acid for the sewage works has been accepted at 33s. per ton.—A new effluent channel for the filter-beds at the works is to be constructed by the corporation workmen, at an estimated cost of £340.

Repton R.D.C.—With respect to the council's application for a loan of £6,000 for sewage disposal works, the Local Government Board have written that they were satisfied that the scheme was necessary, but they thought that some amendments were desirable in the details of the present scheme. The letter also referred to the proposal to create a special drainage area. Such a proposal was contrary to the wishes of the board, excepting in particular cases, and such an area became a separate contributory place for all purposes. The letter has been referred to a committee.

Tredegar U.D.C.—The tender of Messrs. Barnes, Chaplin & Co., of Cardiff, at £24,912, has been accepted for the sewerage scheme.

Whittington U.D.C.—Consideration is being given to a sewage disposal scheme estimated to cost £7,000.

Wigan T.C.—A scheme for the extension of the sewage works, at an estimated cost of £21 000, is under consideration.

Wrexham R.D.C.—Mr. J. Price Evans, engineer and sanitary surveyor, has submitted a scheme dealing with the drainage of Summerhill, Little Mountain, Wheatsheaf, Glanllyn and Bradley. The cost of the work, exclusive of land, estimated at £8,400. The plans have been referred to the Health Committee for consideration.

WATER, GAS, AND ELECTRICITY.

Aberdeen T.C.—It has been decided that the ratepayers should be consulted before any new water scheme for the city is proceeded with. At present expert reports are before the council, in which preference is given to obtaining a new supply of water for the city from the river Dve, rather than dealing with the present supply from the Dee. On the other hand a section of the council believe that the supply should be taken from the river Avon, a private bill for which was thrown out by a Committee of the House of Lords.

Ayr T.C.—After paying £2,621 for interest on loans, and contributing £2,976 to the sinking fund, there was a net surplus of £996 on last year's working of the electricity undertaking.

Cromer U.D.C.—It has been agreed, subject to the consent of the Board of Trade and the Local Government Board to transfer the electric light undertaking to a private company.

Darwen T.C.—A gasworks improvement scheme, estimated to cost £20,000, is under consideration.

Dromore U.D.C.—Steps are to be taken to obtain a provisional order for an electric lighting scheme.

Hampton U.D.C.—A ten-years' contract is to be entered into with the Hampton Court Gas Company. The terms are: (1) The company to provide and fix at their own expense and maintain automatic controllers for lighting and extinguishing each of the street lamps. (2) The company to provide and fix, at an average of 2s. 6d. each lamp, to be paid by the council and estimated at 246 5s., inverted burners to consume 3½ ft. of gas per hour, by-passes, No. 3 mantles and glass protectors and all records to maintain the same during the period of the contract. (3) The price to be paid by the council (together with a comparison of the price paid under the former contract) is as follows: For each single burner consuming 3½ ft. per hour without by-pass, new price per lamp per annum, £2 15s. 3d.; former price, £3 2s. 6d.; saving, 7s. 3d. The present number of burners is 370. (4) In case of any alteration in the price of gas during the period of the contract there shall be automatic rise or fall of 1s. 3d. per lamp per annum for each penny rise or fall in the price of gas charged to private consumers. (5) The company to repair, light and extinguish the lamps as under former contract, but on schedule times (which were all set out in the report for the whole year). The time for lighting is forty-five minutes after sunset, with the exception of April—July, when the period is sixty minutes. The time for extinguishing is sixty minutes before sunrise, with the exception of November—February, when it is thirty minutes. (6) If the council at any time during the continuance of the contract desire to alter the hours during which the lamps shall be alight, the council to be entitled to an adjustment of price at the rate of 2s. 9d. per 1,000 cub. ft. of gas consumed, each burner being calculated to consume 3½ cub. ft. per hour. The new contract will effect a present annual saving of about £140, the initial capital expenditure involved being only £46. Mr. S. H. Chambers, the surveyor to the council, was cordially thanked for the trouble he had taken in connection with it.

Leeds T.C.—The Parliamentary Committee has been requested by the council to seek powers for the acquisition of a site for a new electricity station.

Llandrindod Wells U.D.C.—A scheme for the improvement of the water supply is to be carried out, at a cost of £4,000.

Mayfield R.D.C.—A scheme of water supply for Waterhouses, at a cost of £725 has been adopted.

Pittenweem T.C.—It has been decided to appoint an engineer to formulate a scheme for obtaining an increased water supply.

Rathdown No. 1 R.D.C.—A water supply scheme for Golden Ball, Sandyford and Ballally is to be carried out, at an estimated cost of £2,500.

Selby R.D.C.—An estimate is to be obtained of the cost of carrying a supply of water from the Selby waterworks, at Brayton, through Burn, West Haddlesey, Chapel Haddlesey, Temple Hirst, Hirst Courtney, to Carlton, Camblesforth and Drax.

Shoeburyness U.D.C.—Improvements are to be carried out at the new well at a cost of £2,092.

MISCELLANEOUS.

Birmingham T.C.—The Tramways Committee recommend the acceptance of the tender of Mr. George Law, of Kidderminster, for the construction of the Hagley-road tramway. Parliamentary power is to be sought for the running of trailer cars.

Burley-in-Wharfedale (Yorks) U.D.C.—The council have approved the proposal of the Leeds Corporation to run a service of trackless trolley cars from the tramway terminus at Guiseley, through Menston and Burley, to Ilkley, on the following conditions: (1) Roads to be widened where necessary; (2) rates to be payable on rateable value; (3) that no power be incorporated in the bill to enable the Leeds Corporation to supply light to Burley-in-Wharfedale except through the council; (4) that the Burley council have power to purchase the undertaking so far as it affects their district at the expiration of twenty-one years; (5) that the fares between Guiseley and Burley are not to exceed 2½d., and that special facilities be granted to workmen, and to the public on special occasions.

Edinburgh T.C.—It has been agreed to accept the estimate of Messrs. Merryweather & Sons, Limited, London for the supply of one petrol motor fire engine, fitted with pumps of the plunger type, and the estimate of Halley's Industrial Motors, Limited, Glasgow, for the supply of one motor chassis for fire tenders.

St. Austell R.D.C.—The following appointments have been made: Mr. B. C. Andrews, architect, St. Austell, to prepare plans of all the council's water and sewer services at an inclusive fee of £20; Mr. N. F. Bellamy, surveyor, St. Austell, £3 3s. fee, to prepare a drainage scheme for Roche; Messrs. Jenkin & Son, Liskeard, £5 5s., inclusive fee, to advise the council on a water supply for St. Stephens.

West Hartlepool T.C.—Dr. E. P. Manby, an inspector of the Local Government Board, has prepared a report with respect to the "sanitary circumstances and administration" of West Hartlepool. Referring to the district known as the Old Town—which, it is expected, will be absorbed eventually by the North-Eastern Railway Company for sidings—he says that if the proposed railway extension does not soon become operative the council should deal with this district, say, by an improvement scheme under the Housing Acts, as the unsatisfactory conditions existing at present should not be allowed to persist indefinitely. He urges that the health department of the corporation should be reorganised, there being evidence of a need for systematic inspection in the poorer districts.

PERSONAL.

Mr. J. C. Matthew, assistant surveyor of Exmouth, has had his salary increased by £20 a year.

Mr. R. H. Jenkins, of York, has been appointed surveyor to the Skegness Urban District Council.

Mr. T. Casson Beaumont, surveyor to the Driffield Rural District Council, has had his salary increased.

Mr. C. H. Godfrey, engineer to the Shanghai Municipal Council, has been delegated to represent that body at the International Road Congress in London next year.

Mr. E. B. B. Newton, borough engineer of Paddington, has been authorised to employ a draughtsman at a salary not exceeding £3 3s. a week for a period of six months.

Mr. James C. Stevenson, assistant in the Ulverston surveyor's office, has been appointed surveyor and sanitary inspector to the Barton-on-Humber Urban District Council.

Mr. F. W. Jones, surveyor to the Frome Urban District Council, has been voted £60 addition to his salary during the ensuing six months for extra services in connection with the sewage works extensions.

Mr. Wm. S. Shell, road surveyor and inspector to the Consett Urban District Council for the past fifteen years, and formerly an architect in the town, died somewhat unexpectedly last week at the age of about sixty years.

Mr. A. H. Jameson, M.SC.(Manchester), M.INST.C.E., has been appointed professor of civil engineering at King's College. Since 1909 he has been resident engineer on the Thirlmere aqueduct, and was formerly in the service of the Derwent Valley Water Board.

Mr. R. O. Wynne-Roberts, M.INST.C.E.—whose inquiry on behalf of the Government of the Province of Saskatchewan, Canada, into the possibilities of lignite fields have already been referred to in this column—has just returned from a 6,000-mile journey of investigation. It included Winnipeg, Toronto, Ottawa, Montreal, New York, Washington, Pittsburg, St. Louis, Austin (Texas), Dallas, Kansas City, St. Paul, Minneapolis and Hebron. Apparently the inquiry is not quite a sinecure!

Mr. J. Siddalls, borough surveyor of Tiverton, was last week congratulated by the mayor (Mr. A. T. Gregory) on attaining his official "silver wedding." It was, said the mayor, twenty-five years since Mr. Siddalls became their borough surveyor. The quarter of a century during which he had served them with marked efficiency and fidelity had been a time of progress creditable alike to the council and their officers. Under Mr. Siddalls' *régime* vast improvements had been effected, and the death-rate, which was 20·6 per 1,000, was now only 12·6. In other words, the number of deaths yearly in Tiverton had gone down by 80. The zymotic death-rate was almost *nil*; typhoid fever had practically disappeared. With all these improvements of the borough, the urban sanitary account was £3,449 less than it was twenty-five years ago. Mr. Siddalls thanked the mayor for his remarks and the council for the way in which they had received them.

Mr. Joseph Owen, of the engineers' department, London County Council, has been appointed assistant city engineer of Fort William, Canada, at a salary of about £400 per annum. Mr. Owen, who is, by examination, an associate member of the Institution of Civil Engineers, a member of the Royal Sanitary Institute, and an associate member of the Institution of Municipal and County Engineers, was articled for five years to Mr. T. Aird Murray, consulting engineer, Sheffield, now in practice at Toronto. Subsequently Mr. Owen was, for four years, assistant to the city surveyor of Sheffield, and for two and a-half years to the borough surveyor of Colchester, entering the service of the London County Council six and a-half years ago. At the annual meeting of the Institution of Municipal and County Engineers in 1905 Mr. Owen read a paper which was awarded a premium, and recently he was elected to represent the associate members of Surrey on the Executive Committee of the South-Eastern District of this body. He leaves England on November 7th with the good wishes of his numerous friends.

Mr. John England, borough engineer and surveyor of Wrexham, who read a paper at the meeting of the Institution of Municipal and County Engineers held in that town on Saturday last, was educated at the High School, Oswestry. He was articled to the then borough surveyor and water engineer of the latter town (Mr. R. O. Wynne-Roberts, M.INST.C.E.), and during this period was engaged on the construction of a large impounding reservoir, alterations and additions to markets, and new sewage works. In 1896 he was appointed assistant at Todmorden, where he was principally engaged upon the plans for a new sewage disposal scheme to cost £50 000. In the following year he was appointed chief assistant at Heywood, remaining there until 1902, the principal works upon which he was engaged being extensions to main sewers, the building of electricity works, refuse destructor works, the provision of a new town's yard, fire station, and the construction of tramways, numerous private street works, and street improvements. In 1902 Mr. England was appointed borough engineer and surveyor of Wrexham, and in this capacity has carried out an entirely new scheme of sewage disposal, extensions to markets and Smithfield, the construction of a recreation ground, and numerous extensive street improvements, and is at present engaged in laying out a park and recreation ground of 17½ acres.

FOR OTHER ADVERTISEMENTS

See End of Paper.

NEWMARKET RURAL DISTRICT COUNCIL.

WATER SUPPLY WORKS FOR THE PARISHES OF CHEVELEY AND WOODDITTON.

TO IRONFOUNDERS.

The above Council invite Tenders for the Supply and Delivery at Newmarket Station (G.E.R.) of about 163 tons of 3-inch Cast-Iron Pipes and Specials, and the Erection of Cast-Iron Tank, and all other work in relation thereto.

Plans and Specifications may be seen, and Bill of Quantities and Form of Tender may be obtained, from the Engineers, Messrs. Sands & Walker, Milton Chambers, Milton-street, Nottingham, on payment of £3 3s. (by cheque), which will be returned on receipt of a *bonâ-fide* Tender, not afterwards withdrawn, and the return to the Engineers of all documents lent to the Contractor for the purpose of making up his Tender.

The successful Contractor will be required to enter into a bond, with approved sureties, for the due and proper performance of his contract.

The Council do not bind themselves to accept the lowest or any Tender.

Sealed and endorsed Tenders to be sent to the undersigned on or before 10 a.m. Monday, 25th November, 1912.

S. J. ENNION, Solicitor,
Clerk to the Council.

Newmarket, Cambs.
October 23, 1912.

NEWMARKET RURAL DISTRICT COUNCIL.

WATER SUPPLY WORKS FOR THE PARISHES OF CHEVELEY AND WOODDITTON.

TO CONTRACTORS.

The above Council invite Tenders for the Carting, Excavating for, and Laying of about 5 miles of 3-inch Cast-Iron Pipes, including Fixing of Valves, Hydrants, &c., and the Erection of Brick Water Tower, and all works in relation thereto.

Plans and Specifications may be seen, and copies of Bill of Quantities and Form of Tender obtained, from the Engineers, Messrs. Sands & Walker, Milton Chambers, Milton-street, Nottingham, on payment of £3 3s. (by cheque), which will be returned on receipt of a *bonâ-fide* Tender, not afterwards withdrawn, and the return to the Engineers of all documents lent to the Contractor for the purpose of making up his Tender.

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Clerk to the Council.

Newmarket, Cambs.
October 23, 1912.

METROPOLITAN BOROUGH OF WOOLWICH.

SANITARY CONVENIENCES, NORTH WOOLWICH.

The Council of the Metropolitan Borough of Woolwich invite Tenders for the Erection of Sanitary Conveniences for both sexes upon a site situate in the Royal Victoria Gardens, and fronting High-street, North Woolwich.

Persons or firms desirous of tendering may, upon depositing the sum of £1 1s., obtain a copy of the Drawing, Specification and Form of Tender at the office of Mr. J. Rush Dixon, M.INST.C.E., Borough Engineer, Town Hall, Woolwich. The deposit will be returned upon receipt of a *bonâ-fide* Tender and the return of the copies of drawing and specification.

The person or firm whose Tender is accepted will be required to pay Trade Union rates of wages, to observe Trade Union hours of labour, and to enter into a formal contract.

Sealed Tenders, properly filled in, on the official form provided, must be sent to me at the Town Hall, Woolwich, not later than 12 noon on Wednesday, the 13th November, 1912, in envelope endorsed "Tender for Sanitary Conveniences, North Woolwich."

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
ARTHUR B. BRYCESON.
Town Clerk.

Town Hall,
Woolwich.
October 24, 1912.

BOROUGH OF RICHMOND (SURREY).

TO BUILDERS.

The Town Council are prepared to receive Tenders for Extensions to the Public Baths, Parkshot, Richmond.

Plans, Specification and Conditions of Contract may be seen, and a copy of the Bill of quantities, &c., obtained, on application to Mr. J. H. Brierley, Borough Surveyor, Town Hall, Richmond, on payment of a deposit of One Guinea, which will be returned on the receipt of a *bonâ-fide* Tender.

Sealed Tenders, properly endorsed, together with the other papers supplied, must be delivered to the undersigned not later than 4 o'clock on Monday, the 11th November, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

HENRY SAGAR.
Town Clerk.

Town Hall,
Richmond, Surrey.
October 23, 1912.

MADRAS CORPORATION, INDIA.

WANTED: ASSISTANT DRAINAGE ENGINEER.

The President, Corporation of Madras, invites applications for the appointment of Drainage Assistant to the Special Engineer, J. W. Madeley, M.A., M.I.C.E., M.AM.SOC.C.E., &c.

The duties will be to assist the Special Engineer in the design, construction and maintenance of works of drainage for the City of Madras.

The salary will be Rs. 500 (£33 6s. 8d.) per mensem, rising by annual increments of Rs 20 per mensem to a maximum of Rs. 700 per mensem. An allowance of Rs.30 (£2) per mensem will be paid to the officer appointed so long as he maintains and uses on the work a first-class motor bicycle in good running order. No other allowance of any kind will be made.

Before sailing for Madras, the successful candidate will be required to sign a three-years' agreement to be prepared by the Corporation. By mutual consent the appointment may be extended for a further period.

The Corporation reserves the right to determine the appointment at any time by three months' notice in writing or by payment of one month's salary.

The officer appointed will be allowed ordinary first-class railway fares and second-class Peninsular & Oriental passage to Madras *viâ* Marseilles and Bombay by P. & O. steamer. A like class return free passage will be granted on the termination of the appointment, subject to the satisfactory service according to the conditions of the agreement. Half-pay will be granted on the voyage out from the date of leaving England.

Leave will be granted on full pay to the extent of one month for every eleven months of active service, but not for more than three months at a time.

The applicant must not be more than 35 years old, and copies of certificates of age, testimonials and medical certificate of fitness for service in India must be enclosed with the application, which must reach the undersigned not later than Thursday, November 14th. They will be sent out to Madras, where the final selection will be made by the President of the Corporation.

The President reserves the right of rejection all applications without giving reasons.

The officer appointed will be required to commence his duties in Madras not later than eight weeks after he has received notification of the acceptance of his application.

Applications must be in writing, and should be sent to the undersigned in envelopes superscribed "Drainage Assistant."

JAMES MANSERGH & SONS,
Agents to the Corporation of Madras.
5 Victoria-street,
Westminster,
London, S.W.
October 23, 1912.

SINGAPORE, STRAITS SETTLEMENTS.

MUNICIPAL ENGINEER'S DEPARTMENT.

The Municipal Commissioners of the Town of Singapore require an Assistant, under 32 years of age and of sound constitution, chiefly for their new Sewage Scheme. He must have received a good technical education, a regular training as a Civil Engineer, and including a practical knowledge of Surveying, Levelling and Estimating. He must also have had special experience in designing and constructing sewerage and sewage disposal works and waterworks, and their maintenance. Preference will be given, other things being equal, to applicants who have passed the Examination of the Institution of Civil Engineers—Associate Members—or that of the Institution of Municipal and County Engineers. The engagement will be for three years, and each applicant is to state the earliest date upon which he could be free to leave for Singapore. The selected candidate must pass a medical examination. A second-class passage will be provided by mail steamer, or a first-class passage by other steamer, with half-pay during the voyage out.

The salary will be 350 dollars per month, paid monthly in dollars, the currency of the Colony, the value of the dollar being two shillings and fourpence sterling. Such local transport allowance as may from time to time be sanctioned by the Commissioners will be paid. Applications, stating age and place of birth, and giving details of education, training, and experience generally, and referring to the above requirements seriatim, accompanied by copies (only) of testimonials, and also personal references, are to be lodged with C. C. Lindsay, Esq., M.INST.C.E., 180 Hope-street, Glasgow (who will give further particulars if requested), not later than Tuesday, 5th November, 1912.

DRAUGHTSMAN required for Public Works Department, Kedah, Malay States. Salary £350 per annum, with furnished quarters. Free passage three years' agreement. Age about 27. Medical examination. Full particulars on application to Box 1,191, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

THEORY OF ENGINEERING CONSTRUCTION. A reference-book for Civil Engineers and Students. By Ernest H. Essex, A.M.I.C.E. 8¾ in. by 5½ in. 216 pp. Cloth gilt, 5s. Post free, 5s. 3d. Comprising a selection of Notes and Formulæ on the Theory of Construction, arranged in the form of Answers to the Questions set at Examinations for the Election of Associate Members of the Institution of Civil Engineers.

"Students of engineering construction are indebted to Mr. Essex for his book. . . . The book will have its use for students who are preparing for examinations, and to go through it will be found an excellent exercise for all who have to allow contemplation as a business. —*The Architect.*

"The examples chosen refer to problems of general professional interest, and the solutions are well executed and lucidly expressed. As an adjunct to scientific text-books they may often be useful, and it may also be serviceable as a guide to candidates for examination. —*The Builder.*

London: St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, E.C.

WANTED. The following numbers of THE SURVEYOR are required: February 5, April 1 and May 6, 1904; May 24 and October 25, 1907; May 21 and June 25, 1909, also Index to Vol. XXXV. Offers to Box 1,189, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

Institution of Municipal Engineers.

FOURTH ANNUAL GENERAL MEETING IN LONDON.

(Conclusion.)

In continuation of our report of the recent annual general meeting of the Institution of Municipal Engineers we print below the discussions that took place on the subjects treated in the four papers reproduced in last week's issue, commencing with the discussion of Mr. Platt's paper on

THE MODERNISING OF BUILDING BY-LAWS

Mr. F. W. Platt, the author, in a preliminary statement, said that most of them would have seen the circular letter from the Local Government Board. There were three codes of by-laws, two of which were publicly known, but the third, the intermediate code, was not likely to be issued to the public, only on request; the board did not propose to print it in model form. It had been found necessary to meet the requirements of the local authorities between rural and urban districts where the urban end was such as was found in a residential district without manufactures, or the latter were of such a secondary thing that their influence was so slight upon the general district as to be almost negligible. The second code was well worthy of consideration, for it enabled local authorities to have a system of by-laws whereby they could fully control the development of their district on lines found necessary with residential districts. They would note that it was necessary to have quietness in residential districts. The code, if they got it from the Local Government Board, would show how the conditions could readily be furnished. It was that thought that led him to write the paper. The Local Government Board were progressing, for they were prepared to make a departure with regard to buildings of the warehouse class which they had never done before. They were prepared to place the responsibility upon the local authority as to what should be required for the due stability of these buildings. As to a reinforced-concrete building they would give a by-law whereby the local authority would be able to secure due stability without specifying in particular words what that stability was. They said that the council—which meant the official—must be satisfied as to what was due stability. He thought that was an advance. The local authority could demand that the building should be of full stability throughout. The second report of the Royal Institute of British Architects on reinforced concrete would help them best as to what they required from the building as to due stability. Any enclosing walls of a building, apart from wind pressure, did not, as a rule, in large buildings carry a great deal of load. The intermediate piers carried the load and those who were familiar with large warehouses practically knew that they rarely got a building equally loaded throughout. Consequently, it was not necessary to have any uniform system of resistance throughout, but such resistance as would be sufficient to meet the demands of the load of the building in any particular part. The different parts of the building stress were set out in the model code. He put it that such a regulation or by-law was well worthy of consideration because it enabled the local authority to meet demands made from time to time for the trial of new material. If the local authority obtained from the responsible person a full table of loads, what the building was likely to be used for, and that, taken at a minimum, it would be such as would have to be ordinarily resisted, and then a set of calculations given in some recognised and explicit form which was known from experience to be a sound formula for a particular purpose, he thought it would be well for the local authority to allow the board to prescribe a by-law. There was just one other point he should like to call attention to, and that was the suggestions made at the top of page 2, the type of buildings and the purpose for which they would be erected, down to class 7. The purpose of that was simple. Having received from the building owner his whole calculation as to what he expected the building to be used for, it was provided that there should be a guarantee handed down from owner to owner, or a series of tenants or sub-tenants, that precaution should be exercised by the person occupying the building as to what load the floors of the building were capable of resisting. He had had an instance of that lately in the case of a mule (machinery) shed on the top floor of the building, where, owing to the circumstances of trade, it was found necessary to increase the amount of machinery. As a result, so much sagging took place, in spite of extra precautions, that the floor was like the waves of the sea. If there had been some attention given to the matter when the plans were drawn, and it was explicitly stated that the floors were only designed for a certain load, the floors would not have been stressed to such an extent; but the tenant thought the floors would be strong enough for all his purposes. If these conditions were imposed he thought the effect would be beneficial. Might he ask the members of the institution to make themselves thoroughly conversant with every form of modern construction put upon the market? Reinforced concrete, while it was a most excellent material when properly adapted, became most dangerous in the hands of unscrupulous people. Unless, therefore, the surveyor, whether of a large or small district, was thoroughly conversant with every recognised form and with the methods of calculation, he did not stand much chance with the gentleman who came along with building schemes. Many people had written to him asking what they would do in certain circumstances, saying they had no experience. A great deal might be done in such cases by the transfer of such experience as they had, and he thought that if the members, when they saw anything of particular note, communicated with the secretary of the institution much good would be done.

Mr. Horace Cubitt (London) proposed a vote of thanks to the author of the paper. Those of them, he said, who followed the work of the institution in the North would know that Mr. Platt had done very valuable service with regard to the subject he had dealt with, and they were pleased to see him in the South to give them the opportunity of discussing one of his papers. The subject of building by-laws was not an easy one, and he did not think it always received the attention it should. Personally, he (Mr. Cubitt) might look at it from rather a useful standpoint, because at one time it was his duty to supervise, and as he was now in private work it was his duty to obey; so he saw both sides of the shield. There was no doubt that the necessity for modernising the codes had become a very urgent matter. He rather thought that the subject divided itself into two parts: there were by-laws applying to ordinary forms of construction, and by-laws which were not usually expected to apply to these official forms of construction. As regarded the first, he had found a good many cases in which there was room for amendment, and Mr. Platt had mentioned some. Then with respect to setting back the window frames 4½ in. He (Mr. Cubitt) did not think it was a general requirement, and he certainly did not think it was of much value in London. No doubt there were other by-laws which might require modification. There was another thing which applied in London—*viz.*, the by-law for a 14-in. wall if an attic roof was put in and the building made a three-storey building. He had no hesitation in saying that there was no constructional necessity to make a building 14 in. at the bottom if it was taken up three storeys, and he did not think that opinion was a singular one, for he remembered reading of a prominent member of the institution stating the same thing. It would help the progress of cheap and sound building if the schedule of the requirements as to thickness of walls was modified to allow 9-in. walls with three-storey buildings. Then there was the question of construction. Apparently the Local Government Board were willing to allow each authority to act "on its own" in this matter. This might be good or bad policy, but it was not a healthy state of things for the outside person who was to build. Something might be said for different by-laws when there were different circumstances in dealing with the ordinary system of building, but when they came to steel-frame and reinforced-concrete construction it seemed to him the same whether the building was in Cornwall or Caithness there was no reason why the same requirements should not apply in all districts. It would be a very different matter for each local authority when its

own standard requirements were applied to those special buildings. Mr. Platt advised them to take the report of the Royal Institute of British Architects. That was sound advice, but if the Local Government Board framed a model code for ordinary buildings, might it not do so as applicable to special types? A model code was wanted certainly, but it was wanted even more so in the case of special types. He (Mr. Cubitt) went with him to the extent that the warehouse type of building must be specially strong, not by hard and fast rules but as to structure. It was reasonable that the construction should be investigated and approved by the local authority, but as regards Mr. Platt's suggestion that the maximum load on the floor should be stated in written form, he (Mr. Cubitt) thought he could go better than that. In London if they built a steel-frame building the amended Building Act required a notice to be exhibited stating what was the maximum load per square foot that the floor was to be constructed to bear. A similar requirement, he believed, obtained in American cities. Surveyors would appreciate that such a method was sounder than having the particulars given in a written form. This subject was worthy of a good deal of discussion, and seeing that the Local Government Board have thrown it open to publicity by their recent letter, he thought the institution might be inclined to appoint a special committee to consider and report as to whether action should be taken.

Mr. H. C. Adams (London) seconded the vote of thanks. Personally, he said, he had been engaged in building for commercial purposes, and he must say that usually they calculated everything very carefully as regarded the stability of walls, and they found there was not much to complain of as regarded the requirements of the by-laws. The question of the load to be taken on the floors suggested a difficulty. If they specified that the weight to be taken on the floor was not to exceed 1 cwt. per square foot a man wanted to know how this was to be applied—on each single square foot or the big area of the floor as long as the weight did not exceed the gross. It made a great difference as to how the load was to be brought upon the building. A man who wanted to put up a cheap building would make the loads as low as possible, and he could persuade the surveyor to accept his figures. It did not seem to be fair to pass a building of this sort, because the building was, perhaps, let to people for other trades who might put other loads on it, and it might not be safe to have in the district. The difficulty would be to know how to take the load—to distribute it so as not to cause unequal loading. The necessary details for safe loading could not be handed down from tenant to tenant, and therefore the only satisfactory way was to have a figure which experience showed was as low as was safe, or as high as was likely to be required.

The President remarked that there were many points in the paper which were extremely interesting and valuable to municipal engineers. He thought that the institution might take the matter up and appoint a small committee to give it adequate consideration. Municipal surveyors would thus get advantage of the experience of others, and as the committee would sit in London it could communicate with those in authority better than those who were a distance from London.

Mr. Platt, in reply, expressed a hope that the paper might prove of service to municipal engineers. The special code of by-laws would shortly be issued to all authorities, but at present one code was not issued. The notice mentioned by Mr. Cubitt had been tried in Manchester and Salford, but it was generally covered up by packing cases or some other article being placed in front of it. The tenant found that the floor would carry the load or more. He agreed that there should be a minimum load, and that local authorities should advise as to what methods should be adopted in individual cases.

THE LOCAL GOVERNMENT BOARD ON THE INTERCEPTING TRAP.

Mr. H. C. H. Shenton (Westminster) remarked that there were one or two points he would like to [illegible] as supplementary to his paper on the Local Government Board report on the intercepting trap. One was that the report of the Departmental Committee seemed to show that sewer gas was a very different thing from drain gas. He should like to know whether members had found this to be so. It seemed to him that very often sewer gas might be just as bad as drain gas and *vice versa*. The great objection to the intercepting trap was that it was liable to be stopped up, but he did not know much personally of cases in which the trap either was or had been stopped up. He would ask whether, in their experience with drains which had been badly laid, members had found that these also became stopped up, or whether the fact of removing the intercepting trap would have prevented these drains from being stopped up from other causes. Of course, there were many drains which had been badly laid, and he would like to hear the experience of members with respect to that part of the subject. Then there was the question whether intercepting traps were not effective in keeping back rats. If they were not effective it seemed a curious thing that they did not get rats in London houses to the extent they formerly did. The point which seemed to call for most discussion was how they were going to proceed when they came to put the new by-law into operation; when it was decided there were to be no more intercepting traps, what did they intend to do? Would they put in a system of drains without a trap or leave out the subways to the intercepting trap? He asked that question because personally he had not the experience which members of the institution had in municipal matters, and because private engineers might, perhaps, look at the matter from a different point of view.

Mr. Baldwin Latham (London) proposed a vote of thanks to Mr. Shenton for his paper. He had not, he said, read carefully through the Local Government Board report, but in the course of his practice he had put in many thousands of intercepting traps and had never found one to block. An intercepting trap that was laid in the line of the sewer was certain to stop, but one which had an abrupt fall would never stop. There was one of his own, there was the Buchan trap, and there was one brought out by the late Dr. Buchanan; none of those traps failed; but of all the earlier traps, which were merely floating syphons, he had never known one which did not block. As to rats, they were never found in a properly constructed drain. Could a rat stand the quantities of boiling water that were thrown down a drain? Rats were always found with old brick sewers, in old buildings where common mortar had been used, and the drains were all to pieces. He was not going to say that the intercepting trap was necessary for health, because they must remember that a great change had taken place in our ideas with respect to sewer air. It had been shown to be freer from bacteria than the air of the streets, and quite reasonably so. But supposing there was a connection with the house drains or rain-water pipes, which was usually the case, what happened? If there was no intercepting trap the air from the sewer could pass into the house, and if the sewer air was deleterious a nuisance was set up. It used to be said that typhoid was caused by sewer gas. In America they did not find sewer gas mentioned as being the cause of typhoid; the only things mentioned in such a connection were water and flies. He thought they were indebted to Mr. Shenton for bringing this subject before them, and he trusted that when intercepting traps were used they would be of such a kind as had an abrupt fall, for others were not safe.

Mr. H. Percy Boulnois (London) said he seconded the vote of thanks to the author of the paper all the more heartily because his dear friend Mr. Baldwin Latham had proposed it. He had a great deal of sympathy with all that that gentleman had stated. He had been an advocate all his life for the use of the intercepting trap, and he must confess that the report of the Departmental Committee came upon him as somewhat of a bombshell. After careful investigation by a duly appointed committee the members practically came to the conclusion that the intercepting trap was not only useless, but a danger to the health of the inhabitants. They had, doubtless, all read the report, which consisted of a considerable volume of seventy-eight pages, and he could say personally that he had read it carefully. What were the indictments against the intercepting trap? The committee stated that the fresh-air inlet might become an outlet even though it might be provided with a mica trap, and that the outlet was often so placed as to become a positive danger to the inhabitants. The answer to this was that the outlet need not be so placed that it was wrongly constructed if it was so placed, and that if there was a mica trap this acted as a detective, or that there must be something wrong with the drain or trap, and therefore that it served a useful purpose. A still graver indictment was that the intercepting trap was constantly choked, and that as a consequence the drain became choked and the inhab-

tants not being aware of the chokage the soil became saturated and a great evil ensued. It might be urged that the trap became choked by foreign articles, such as dusters, brushes or other things, allowed to get in by carelessness. Careful experiments carried out by Mr. Paton Barber showed that the trap did accumulate a great deal of solid matter passing through the drain, and it was proved conclusively by a number of experiments with all kinds of traps, including the Buchan trap, with cascade action that they all retained a great deal of solid matter, some 79 per cent, and the lowest something like 42 per cent. This might be so; but was it not possible that if there was a greater flush of water it would not occur? He did not know whether Mr. Paton Barber observed whether the solid material in the drain itself was readily moved by the brushes. He (Mr. Boulnois) had carried out experiments with drains laid on small gradients, and he found that a 2-gallon or 3-gallon flush did not remove fæcal matter, and that it was necessary to bring a series of successive flushes to bear in order to remove it. If the drain did not move the solid matter it was not to be wondered at that the trap retained the matter. Another indictment was that the retention of the matter added considerably to the noxious gas given off by the sewer, increased the smell of the sewer, and that if the trap was not there the sewer could be ventilated through the house drain. That would be so, but when they said that the house drain should become the sewer ventilator it was rather a large order, because if no precaution whatever was taken to prevent the gas from the sewer—which might possibly contain the germs of disease from an adjoining house—passing up the drain it might enter the house. He believed that was the principal reason why the trap was first introduced; now the Departmental Committee said it was useless to prevent such a thing occurring. On the question of rats he had a few words to say, for lately the matter arose because rats were accused of spreading [illegible] diseases. An instance had been adduced [illegible] passing through a trap. The fact was that rats would do this when actuated by fear, and animals when actuated by fear would do courageous things. If pressed they dived through the trap. He was certain that a trap would [illegible] rats under normal conditions, and to do away with the trap on old or improperly constructed sewers where there might be rats would be almost certain to encourage these animals. The flush of hot water might kill them, but the flush might not be given at the proper moment. One of the best things in the admirable report of the committee was the investigation of the chemistry and bacteriology of the house drain. They came to the conclusion that the air in the sewer was practically harmless, that it was no worse than the air of the surrounding atmosphere, but that the air of the drain itself might be exceedingly impure and more dangerous than the air of the sewer. That was a most important conclusion to arrive at, and how the difficulty was to be got over he did not know. The reason given for the air of the drain being more full of microbes was the splashing that took place in the drain. How this was to be avoided he did not know, unless the soil pipes were made on a spiral so as to bring the sewage down on a proper gradient without splashing. As Mr. Shenton stated in concluding his remarks, if the trap was to be omitted how were they to proceed in the future? The committee, very properly to his mind, stated that iron drains should be substituted for stoneware drains. That would be one cure. If the whole of the drainage passed through iron pipes with perfectly sealed joints and sinks, there would be no danger or harm in the want of a trap. But if they were to employ stoneware pipes there was always a danger of leaking. Personally, he should like to feel that he had a trap between himself and the sewer, rather than run the risk of admitting sewer air into his house or receiving it from the house of his neighbours. The points raised in the admirable report of the Departmental Committee required the most careful consideration, and he [illegible] municipal surveyor would endeavour to make his own observations by way either of confirming the conclusions or pointing out their disadvantages.

The President said that personally he was very grateful to Mr. Boulnois for his presence and for the excellent demonstration he had given on the report of the Departmental Committee, which would be very valuable to them as officials. It was an excellent thing for them to hear speeches from such able men.

Mr. E. A. Stickland (Windsor) observed that what struck him was that whatever point they went into there was no guarantee that the whole of the house was disconnected from the sewer. The by-laws might insist that this should be done, but unfortunately in the past the by-laws were not directed to altering what was already in existence. If the disconnecting trap was to be fixed, it should not be done in halves or two-thirds. It was, perhaps, a very difficult matter, but it seemed to him they should take the standpoint that every house should or should not have the regulations applied to it. The by-laws stated that the disconnecting trap should be placed as near the sewer as possible, but he knew houses which stood 200 yds. or 300 yds. from the road. In such cases solid matter was bound to get into the drain, for how could they expect the flush from the drain to clear out the trap at such a distance? If they wanted that they must put the traps as near the house as they possibly could. At Eton they had automatic flushing tanks at the top, and this, though expensive, kept the drain clean. But as a matter of fact there was not fair treatment all round, as, while so many houses had disconnecting traps, some had none, and others had ventilators.

Mr. A. J. Martin (London) was reminded of the story of the man whose trousers, having been made too long, were made a bit shorter by his mother and sisters unknown to each other. That seemed to him a good illustration of what was going on in relation to some of the public health work. We taxed the householder over and over again for a number of overlapping precautions which were not only not required, but in some cases actually defeated the object in view. As regarded sewers, we endeavoured to make them self cleansing by providing abundant flushing facilities, and provided ventilators in order to keep the air in the sewers pure. Then we put down an appliance which was expressly designed to keep offensive matter decomposing in the neighbourhood of the house. Now it seemed to him that the arguments used in favour of the trap in the past had largely been based on the conditions which the trap itself had brought about. We put in a trap, we said, because the air in the sewer was apt to become offensive. But why? In a modern system of sewers there was no stagnation, and any decomposition which took place was principally due to the matter held back in the trap. We seemed to assume that the sewer itself was a reservoir of foul, stagnant air. He held that this could only be because we insisted upon a multiplicity of traps which prevented ventilation. It seemed to him that with the trap abolished there was no reason why the air should not be fresh and harmless. The whole system in connection with the ventilation of house drainage was based on a series of assumptions not warranted by fact. A good deal has been made of the argument that it was not fair to allow the householder's drain to be used for the ventilation of the public sewer. That seemed to him to be based upon a false view of the obligation of the citizen. If it was no business of the householder to ventilate the sewer, whose business was it? After all the municipality was only all the householders rolled into one. It was no more hardship to call upon him to ventilate the sewer than it was to take money out of his pocket for this purpose. They must not lose sight of the fact that the sewer air must go somewhere. Bristol was a happy town with no sewer ventilation, but the air must be displaced, and it seemed to him a most unsatisfactory state of things to have large volumes of air displaced if it was not known where these were going to. Then there was the question whether it was better that the air should go out at a few points. Was it not better that it should go off at a large number of points than that it should be concentrated at a few? With respect to the case mentioned by Mr. Shenton of a single house ventilating a long length of sewer, of course, such a state of things should not be allowed. He was going to say that he would not advocate the general doing away with the intercepting trap, but people were too apt to swing from one extreme to the other, and he would therefore remark that it was best to be moderate in their judgment of the house trap. If they did away with it as applied to the modern system of sewers they must retain it on the old sewers. Then with regard to the point raised by Mr. Boulnois and Mr. Baldwin Latham as to drain pipes. If they strictly separated the systems, they would be safe and happy with a trap; but if they were going to admit rain water to the sewers they should consider carefully what was going to happen. If the rain pipes were brought right into the drains, as the soil pipes were brought, there would be a risk of the air being discharged from the neighbourhood of the windows. It must be remembered that the trap and

rain-water gulley was a broken reed in time of long drought. In bringing water into the sewers, the only safe plan was to bring the rain-water pipe into a gutter that should run into a gulley into which the kitchen, bath-house, or continuous source of supply is being constantly discharged.

Mr. F. W. Platt (Salford) observed that there was one aspect of the subject they could not lose sight of, and it was important. When the intercepting trap was introduced in 1877, the science of bacteriology was hardly known. It was introduced because most of the sewers and the drains leading to the sewers were bad. The whole condition of affairs was that the soil round the drain was more or less permeated with sewage matter. This did not exist in modern drainage with watertight pipes, and most of the sewers laid since 1885 were laid with socket watertight joints. The chemists told them that the danger was not in the sewer, but in the drain air. If, then, air came from the sewer, what did it matter? If it was the drain water there was nothing more to say, because the pathogenic germs were not there.

Mr. E. R. Capon (Epsom) was not surprised to hear the remark that rats would dive through a syphon. He had seen them dive through water-closet traps. They did it from fear, no doubt, but if they did it once they would do it again. He favoured the retention of the intercepting trap, and he could not help thinking that it was going to be a very difficult matter to abolish the whole of the traps throughout a district. It would be a big job at the expense of the local authorities, for he did not think they would get private owners to do it, because they would say it would be ventilating the sewers for the whole district.

INFLUENCE OF TOWN PLANNING ON PUBLIC HEALTH.

Mr. A. R. Bleazard (Clitheroe) opened the discussion of Mr. W. Louis Carr's paper on "The Influence of Town Planning upon the Public Health." Everybody would agree, he said, that the influence of town planning on public health was very great, for it was the fact that in all the large towns the death-rate was higher in the densely populated districts than in the more open. He thought it behoved all municipal engineers to be in the front of town planning, because it was undoubtedly part of their business. It seemed as if it must be very expensive to have a dozen houses to the acre instead of forty, which was the number in North Lancashire. People would live near their work; in North-East Lancashire people lived close to the works. What he would like to know was how would Mr. Carr get over the difficulty of people living in one district and the works being in another?

Mr. E. R. Capon remarked that Mr. Carr had a large district to deal with, and he must have had considerable experience in town planning, judging from his carefully prepared paper. Town planning would mean the putting into practice of a happy ideal, but it was very difficult to say when it was going to be carried out. The difficulties to be surmounted in putting the Act into operation were enormous, so enormous, indeed, that many local authorities were prevented from taking the subject up. In his (Mr. Capon's) case the matter had been under consideration for two years, and they were not much "forrarder," but Mr. Carr had met the same difficulties to contend with, and matters were thus simplified. When there were twelve or fourteen owners to deal with, their difficulties might be said to commence. They might get nine owners out of ten into one, but the remaining one might stand out. In that case what was to be done? It seemed to him that the only way out would be for the local authority to buy the land, and that would be costly to the ratepayers. He thought he was sorry to sweep away old property wholesale in order to carry out a town planning scheme. He hoped Mr Carr would show them how they were to get the cheap roads that were spoken about. He was one of those who believed that roads well made were the best and most economical roads. Unless great care was exercised in a new district there might be considerable waste of land in, say, laying out cemeteries, unless an extensive alteration in the Act was made. Mr. Carr stated that the people to benefit from town planning schemes would be the ratepayers. He (Mr. Capon) hoped that gentleman was correct, but he was afraid town planning would be a costly matter to them. He noticed that in the by-laws adopted the proposed height of the living-room was 8 ft. No doubt builders of small property would agree, but he (the speaker) thought it was too low. Small property required a higher living-room, because there were generally so many children. He was glad to find Mr. Carr was so situated that he did not expect any offensive trade. He (Mr. Capon) could not have any such expectation in his own case, but he hoped Mr. Carr's ideal would be fulfilled.

Mr. A. E. Prescott (borough engineer of Eastbourne) said town planning had been before them for a considerable time, and it was almost impossible to look at the technical papers without seeing something about the subject, which was really of very great importance. It had been suggested by previous speakers that town planning would bear heavily upon the ratepayers. He took the view that any improvement in sanitary matters—the health of the individual—instead of an expense would be a cheap thing in the end. He noticed in The Surveyor recently that the Local Government Board inspector had complimented Mr. Carr upon the manner in which he had worked out his scheme. He was pleased to see that, and he only hoped the scheme would come to fruition soon, and that Mr. Carr's efforts would be successful. He extended an invitation to the members to visit Eastbourne in order to see a town laid out as it ought to be. There they had plenty of fresh air, something which was not always appreciated. There were two ground landlords to deal with, both of whom made it their business to work with the corporation, not in getting as many houses as possible per acre, but in laying out the land on a particular line with grass verges. There were 12,000 trees in Eastbourne, and with most of them they had verges. He was bound to admit the verges looked nice, but they were expensive to maintain. It was absolutely impossible to maintain them as they ought to be maintained, for dogs were continually scratching. They might, of course, be protected by a rail or guard, but this increased the cost. As an alternative they might put down gravel verges, which were quite as good, and did not cost so much. Setting out wide roads added to the expense, but after all the chief thing was to have good, wide arterial roads to a central point and main roads diverging from them. With respect to slum property, that was a matter they provided for at Eastbourne under the Town Improvement Act. Where property was insanitary it paid the town to clear it away, and proceed to lay out the town as it ought to be laid out, with good wide streets. Also he considered it was a good thing, with a view to the prevention of overcrowding, to limit the number of houses per acre. We had been too much in the hands of the jerry-builder in the past—too much at the mercy of men who built two houses where there should only be one. Again, in Eastbourne they had been met very liberally by the landowners, which was satisfactory, as it depended very much upon the way these gentlemen looked at this question whether town planning was going to be successful or not.

Mr. E. A. Stickland (borough surveyor of Windsor) thought that every facility should be given for the erection of crematoriums in connection with town planning schemes. This would be preferable to sinking thousands of pounds in cemeteries—preferable so far as the welfare of the present generation was concerned, and also the future generation.

Mr. E. E. Ryder (surveyor to the Bushey Urban District Council) said he would like to know how the difficulty of contour was met before the principal lines of roads were made out in a town planning scheme; also what was the cost per acre; and whether municipal surveyors were able to get satisfaction from the Local Government Board as to what they (the board) wanted before the plans were sent in.

Mr. Horace Cubitt (London) inquired what would be the maximum of the most subsidiary form of road that could be used.

Mr. Horace Boot (Westminster) would like to hear something about the correct position for locating the various municipal works, dust destructor, electricity undertaking, and so on. It behoved surveyors of small districts to get rid of the insanitary method of dealing with refuse in heaps, for there was no doubt that a great deal of disease was spread by this practice. It would also be interesting to know whether Mr. Carr had considered the question of having a combination scheme of working these matters under a single administration. Then there was the question of advertisement hoardings. He was aware there was no Act of Parliament which enabled a municipality to disallow hoardings, but he thought some concerted

action might be taken to insist upon hoardings being less unsightly. It might be suggested, indeed, to a certain famous taxer that he might be able to obtain revenue from hoardings. Then, again, there was the question of food storage. He had recently been called upon to design cold-storage works, and he was not at all sure it should not be the duty of the surveyor to provide for cold storage along with other works. It was well-known that large profits were made out of cold storage.

The President remarked that Mr. Carr was one of the most enthusiastic members of the institution, and he did not know anybody in the country who had taken more interest in town planning than he had. He had written a great deal on the subject, and displayed considerable industry in preparing plans, while he had also attended a large number of public meetings and conferences at which the matter was discussed. In fact, he had gone into the subject with a whole-hearted thoroughness that was greatly to his credit.

Mr. W. Louis Carr, in reply, said he would be delighted to give any information he possessed to municipal engineers at any time in connection with the work in his district, and if any members would like to see his plans he would be pleased to show them. He had received visits from municipal engineers who had told him how pleased they were with his scheme, and a deputation from the Keighley Council had gone thoroughly into the question, and he had been able to satisfy them on nearly all points. As to the question of Mr. Bleazard with respect to the limitation of the number of houses, there must always be differences on that head. They might depend upon it, however, that if they started a town planning scheme they would not be allowed to build forty or forty-five houses to the acre. Personally he did not think any compensation would be payable for scheduling any district. The general opinion was that in the future twenty houses would be about the minimum; but it would certainly be less than forty, and no compensation would be paid. As to how the thing was to be done, they did not really know until they had started with a scheme. They had had a tremendous lot of trouble at Ruislip-Northwood, but they got hold of the chairman of the National Housing Council, and they had gone on better since then. So much depended upon the fact whether the landowners were reasonable, when they were up against the scheme from the beginning it was impossible to go on. At Ruislip-Northwood they had 180 owners to deal with, and 175 leaseholders. They would allow a claim to be made for compensation, but in return they would make a claim for betterment on the owner, and put betterment on the adjoining owners where they got an advantage. There was no doubt there were many ways in which they could improve a town without pulling down old buildings. Then as to roads, there were by-laws which demanded an unreasonable style of construction in the first instance. They considered at Ruislip-Northwood, and he thought they were upheld by the Local Government Board, that the by-laws in the first instance should not be stringent. Landlords objected to the first cost of the roads, and they had nothing in their by-laws as to how they should be made up. He thought this was a great advantage. He did not see why in the case of a 24-ft. road, where there was no heavy traffic, the road should not be taken over in a lighter form when the houses were building, for the owners would possibly make it up in a thorough manner to the satisfaction of the local authority without going to the heavy cost in the first instance. In their scheme they had made agreements for 11 acres of open space, which would not cost a penny to the council. Some of the land was adjoining the station, and was valued at £800 per acre. With regard to the height of the rooms, he might say that in the first instance it was put at 7 ft. 6 in., but they had raised it to 8 ft., with 7 ft. 6 in. subject to proper ventilation near the top of the window. One of the most important points was to get on well with the landowners. If the surveyor could meet them and point out to them the advantages they would derive from a scheme he would make a good start. They did that at Ruislip-Northwood, and he was pleased to say the landowners saw their arguments, so that they made a good start with their scheme. On the south side they had put down main lines of sewers, and the site of the sewage works, and they showed roads along the line of sewers which had been agreed to with the landowners. Those were absolutely the lines which the outfall must take, and the owners laid out their land accordingly. Except for levelling on the south side of the district with regard to roads, nothing had been contoured, and unless the district was extremely hilly he did not think that contour absolutely necessary. The cost of the scheme up to date was £267. What was that with 11 acres of open space obtained, besides the widening of roads that had been agreed to? He might explain that they were supplied with water and electricity from outside, and as to refuse disposal, they had promised to schedule land for that and other purposes. As to advertisement hoardings, they had got most excellent regulations embodied with respect to the sites, this having been brought about chiefly through the instrumentality of the Urban District Councils Association. The minimum width of the roads was 20 ft.

Mr. Platt: You yourself have not been paid.

A Voice: That is to be added later. (Laughter.)

SUPERANNUATION AND SECURITY OF TENURE.

The discussion of Mr. Winter Gray's paper on "Superannuation and Security of Tenure" was opened by

Mr. E. A. Stickland, who proposed a vote of thanks to the author. The energies of the members, he said, with respect to the subjects treated by Mr. Winter Gray were not increasing—certainly there was no furore among them—and it seemed to a large extent as if it was a case of beating the wind.

Mr. C. Chambers Smith (London) remarked that Mr. Winter Gray knew his subject thoroughly, but there was one part of the paper he did not follow. Mr. Winter Gray seemed to have gone a little away from his former views as to security of tenure. He (the speaker) considered it absolutely essential that municipal officers should have security. There was no objection to medical officers, poor-law officials, members of the constabulary and the civil service having security of tenure. The membership of a local authority was temporary, and in consequence of the change in the character of the representatives there was no guarantee of the municipal surveyor's tenure of office; in fact, it became more and more risky. Large councils might offer safety, but small councils were unsafe. It was therefore, in his opinion, essential that municipal officers should ask for security of tenure. The surveyor occupied a position of difficulty because he came more into contact with interested property owners than any other official. The medical officer did not come so much in contact with property owners, yet he received superannuation. The speaker instanced a case in which an appeal against a council's decision was made to the Local Government Board, and they at once intimated that they could not accept the explanation as to why the officer's services should be terminated. That officer still held his appointment, and there were many cases similar to that. He mentioned that as an illustration of the absolute necessity for security of tenure. Superannuation, he considered, could only come in conjunction with the National Association of Local Government Officers, and he thought they should combine with that association in order that the matter should go through a common medium. There was yet another matter that was important to municipal officers—*viz.*, combination for the establishment of a mutual defence fund. It was well known that a number of municipal surveyors had to go through the mill in defending actions after suffering greatly, and there were others who suffered very severely who could not institute legal actions against those who were continually slandering them. If a mutual defence fund was formed for the purpose of giving legal advice and taking up such cases the lot of the municipal surveyor would be infinitely better. Mr. Winter Gray was an expert on this subject, and he (the speaker) hoped he would keep it more and more to the front, and eventually succeed in bringing about both fixity of tenure and superannuation.

The President said that Mr. Winter Gray had undoubtedly taken a great interest in this subject, and he echoed the wish of the last speaker that he would continue to maintain that interest, not only by reading papers, but by agitation, and that sooner or later they might be able to compliment him upon the fact that he had been the main spirit among them to achieve for municipal officers something which would enable them to carry out their duties with a free mind. A municipal surveyor could not do that when he was

continually harassed by certain councillors who seemed to imagine that an official was paid to lie on a couch all day long. They found the same spirit prevailing all over the country, and none of them escaped. There was, however, one saving grace, and that was that in the majority of cases the official was backed up by the majority. He (the speaker) could always get seven-eighths of the town council to back him up. But there remained, of course, in the mind of the officer a feeling of uncertainty, and the public generally looked at the matter against the official with the remark that there was "never smoke without fire." He had known friends pass him in the street because of remarks passed in a committee of the council; and he was grateful to say that the Mayor of Penzance had worked very hard on his behalf, so much so that he felt he could never sufficiently thank that gentleman. The mayor had sacrificed certain friends and a certain amount of quietude in his office for himself (the speaker) as an official when things without foundation were launched out against him, with the result that after getting twenty-three out of twenty-four councillors to back him up he finally got the whole twenty-four. Though he might be tripped up, an honest official would invariably fight, and in the end he would get the majority of the council to support him, and the mud did not stick.

Mr. A. Winter Gray, in reply, remarked that the only way to make mutual defence effective would be to make it part of the subscription to the institution. He had heard something about it hitherto, but so far he had not seen any money put on the table.

EASTERN DISTRICT MEETING AT GODMANCHESTER.

Under very favourable circumstances, and in beautifully fine weather, a meeting of the Institution of Municipal Engineers was held for the first time in the borough of Godmanchester on the 15th inst. The number present was between thirty and forty, and included Messrs. Frank Latham (president of the institution), W. T. Unwin (chairman of the Eastern District), C. F. Mayfield (Godmanchester), G. A. Penwill (Peterborough), A. Paterson (St. Faiths), W. R. Kipling (Swaffham), A. W. Broker (Wimblington), Solden Hipwell (Chatteris), W. R. Bailey (Holbeach), John Bailey (Spalding), G. E. Mathews (South Holland, Spalding), W. A. Norris (Swaffham), P. S. Bennett (Ramsey, hon. secretary Eastern District) and B. Wyand (secretary of the institution). Among the visitors were Messrs. J. P. L. Durrell Stable, J.P. (mayor of Godmanchester), Aubury Markham (deputy-mayor of Godmanchester), F. W. Bird (borough treasurer of Godmanchester), J. T. Dewey (Peterborough), Leonard Cooper (London), G. W. Heathcote (London), F. J. Read (Huntingdonshire), E. Newbury (Huntingdonshire), J. E. Cardell (Huntingdonshire), Wm. Morgan (Ashwell), H. Bowman (Ashwell), H. Sargeant (Beaconsfield), R. Ash (London), Robt. Wade (Doddington) and J. W. Walshaw (Peterborough).

Shortly before mid-day Mr. Charles Mayfield, borough surveyor, met the visitors at Godmanchester Railway Station, and their attention was first directed to a piece of "Roemac" road now in course of construction between the north end of the borough and the Great Eastern Railway level crossing. Later on a call was made at the corporation depot, where Mr. Mayfield explained and pointed out methods of sewer flushing in action worked from the old water flour mill. A visit along the mill bank to the two reinforced concrete bridges, one spanning the flood-gates and the other the largest overfall, was next on the programme, and they proved of much interest, there being something novel and original about their construction.

After luncheon, at which the mayor (Mr. Durrell Stable) presided, some of the ancient charters and documents were viewed, first and foremost being the original of King John's Charter, dated 1213. The mayoral memorial chain was also laid upon the table for inspection.

The Mayor rose, and said he was very glad indeed to have the opportunity of seeing so good an assembly of the profession that he had before him that day on this their first visit to this ancient borough, the date of which went back to a very remote period. He supposed it dated back to before the Roman period. At any rate, the Romans had a camp here, and established themselves, and there had never been any break in the existence of the borough from that period down to the present time. They made road and did all that was necessary. There was a king of such a name as Guthrum or Gurum. Some time after that the charter that they had before them was granted by King John, and he believed that every king from John to James I. granted a charter of some kind to this borough. Having referred to the Fee-farm Rent, and the meeting of King John by agriculturists with plough and teams of horses on the London-road, which caused much pleasure to the King, his Worship proceeded to go into detail of what was known as the "surrender at free bench" in the case of some property in the borough changing hands. The man who bought was not entitled to take the title of his purchase from the man who sold until the wife surrendered her right to the mayor, who handed it over to the proper person. He had acted in that capacity as mayor once or twice. (The deputy-mayor said he had sat three times.) When the time came for the document to be signed, effect was given to it by the wife handing gloves to the mayor. That was one of the old customs that was still retained in the borough. Another custom peculiar to this borough was that when a new sovereign was proclaimed the high sheriff did not attend to make the proclamation, but the mayor for the time being did it on horseback outside the town hall. He was attended by his chaplain, members of the council, and others. Prayers were said, and the proclamation was read by the mayor. The ceremony was repeated on the middle of the stone bridge at the boundary of the two boroughs. The procession then returned to the town hall. He believed there were about three boroughs that had this privilege; at any rate, this borough valued it highly, and would not give it up. They saw the mayor's chain on the table, and he must tell them that it was arranged to erect a panel in that hall containing 600 names of bailiffs and mayors from the year 1604. He explained that in ancient times there were bailiffs instead of mayors. He must tell them that the chain had been worn at the Lord Mayor's banquet several times and much admired. Having alluded to the various charters, he referred to the maintenance of roads, remarking how necessary it was that they should be well maintained now that they had such an increase of motor traffic. He spoke of Mr. F. W. Bird's book of memories of the borough, which he said was most interesting reading, and contained a good deal of the history of the borough. Again, his Worship expressed his pleasure in meeting so many on the present occasion.

Mr. Unwin (district chairman) moved a vote of thanks to the mayor for presiding. He said if there was anything he wished to give expression to that day it was to thank his Worship for his kindness in presiding over their gathering on the present occasion, and also for the lucid explanation he had given of the old customs of the borough. He thought it went to prove how well qualified his Worship was to hold the position he did in the borough. As chairman of the council, or as mayor, he must know something about the particular town or borough in which he lives, and he was sure his Worship had that qualification, and on behalf of all present he begged to thank him most heartily for the kindness he had shown them in presiding at their gathering. (Hear, hear.) He must add how much they all appreciated what their surveyor had shown them that morning, and the many little details he had pointed out to them in the work he had accomplished. The reinforced concrete bridges they had seen spoke well of the ingenuity and inventive powers of the surveyor, and showed that he took good care of their finances, and no doubt caused the rates to be lower than they otherwise would be. He could assure his Worship that they had all been much gratified with what the surveyor had shown them of his own work. He then proceeded to speak of the institution of which he was chairman. He was sure they had a very good and able president in the person of Mr. Latham. It was the first time he had met him, but he knew him to be a man of influence and specially fitted for his position. He had a large work in hand, and he trusted he (Mr. Latham) might be able to carry it to a successful issue. He hoped they might all benefit by their visit to Godmanchester, for they had seen much to interest them, and he thought it went to show how little towns could carry out the work. He considered their surveyor was doing most excellent and exclusive work for them here. He would now ask Mr. Latham (the president of the institution) to second the vote of thanks.

The President said he had much pleasure in

seconding the vote of thanks to the mayor for so ably presiding over their meeting that day. He also desired to thank the ex-mayor for his presence, and Mr. Mayfield (the surveyor) for showing them over the works. The mayor had given them a nice little lecture in detailing many things pertaining to this ancient and honourable borough. In the borough of Penzance, to which he belonged, they had some ancient rights in common with Godmanchester. For instance, the mayor had the right to proclaim a new king, although he did not perform the ceremony on horseback. Originally Penzance possessed a number of gold maces, but the Spaniards in the wars did great damage to the town and stole the maces. They had many charters granted to the borough from time to time which gave them certain privileges. He could assure them that it was of great interest for him to come from one ancient borough to another that day. He must congratulate the town of Godmanchester in having a mayor who had so ably presided over their gathering, and who took an interest in all around him. To be able to trace all those things through generations, and hand them down from one to the other was extremely interesting in connection with a borough of this importance. He spoke in high terms of the work of the surveyor (Mr. Mayfield), and said from what they had seen that morning showed them that he had specialities of his own. He carried out things not in common practice, but gave effect to his own thoughts and designs. He then proceeded to speak upon the institution of which he was president, and said how grateful he was to have something of this kind. There was nothing of more importance to municipal engineers than meeting together and discussing matters relating to the profession. Those who took up observation were the men who made improvements—going on taking things up and materialising them. To rub shoulders with one another gave them an opportunity of developing knowledge. He showed the advantages of belonging to the institution, and the difficulties he experienced in his young days before there was anything of this kind in existence. But they had every opportunity now. They met together in different towns, and there were good fellows among their number who were determined to get on, and the institution did all it could to encourage them and give them knowledge in municipal engineering. He alluded to the library in connection with the institution, and spoke of its usefulness to members, who could obtain books from it on a variety of subjects. The work of the library, he could assure them, was of a highly satisfactory character, and the more it was known the more satisfactorily it would work. There were many important matters connected with the institution, and they had some most honoured men connected with it. Some interesting papers were read at the meeting, and he specially noted one that he heard read last Friday. They wanted in their institution downright sturdy work, and men who put their whole heart in the work and who would do the best for the community. After alluding to the examination question, he said the most common-sense line was to get in the minds of members themselves a firmness in their work, and get them to develop new plans and methods to carry out their work. They must have solid, good, practical work, both untheoretically and theoretically, and experimental work as well. In conclusion, he said they had at present 900 members, and they hoped to see the number up to 1,500.

Mr. S. Hipwell (Chatteris) briefly moved a vote of thanks to Mr. Mayfield for the kindness in showing them what he had that morning. He considered he was a veritable encyclopædia in himself. He had told them things that were both interesting and instructive.

Mr. J. W. Worsnop Peterborough seconded the vote of thanks. He took it as a compliment to be invited to Godmanchester, and it afforded him much pleasure to be there that day. The incorporation of the city of Peterborough was nothing like so old as Godmanchester. He was a member of the municipal borough about thirty-five years ago. There were some old customs that they kept up. For magisterial purposes it was called the Soke of Peterborough, and that it was really a county. One curious feature was that they could try a prisoner for murder. They still kept up the old custom of proclaiming a fair. What Mr. Mayfield had shown them had been of special interest. It was a picturesque little borough despite its flat site and low lying, and possessed the advantages that Godmanchester did.

Mr. Mayfield responded in a short speech. He commenced with the Roman station in 400, and passed on to the medallion representing the Danish fort in 880. He next came to the representation of the old water mill, which was built in 1066, and came to King John's Charter in 1213, and another charter granted by King James in 1604, when the borough was incorporated. He alluded to the order that was made for every owner to place down a causeway of pebbles known as "kidneys," 3 ft. wide in front of his houses, and added that had his friends visited Godmanchester in those days they would not have found the footways very soft to their feet. After some further remarks, he thanked them for the vote of thanks.

The Mayor briefly acknowledged the vote of thanks on behalf of himself and the ex-mayor.

After a further inspection of the documents, the visitors had a walk round the town and viewed, among others, the following items of interest: A road made on the tarviated principle which had sustained a fairly heavy traffic for more than three years without any signs of wear whatever, and another road made of gravel dredged from the river and mixed with tar. This road, which was laid in 1906, is as good as ever, and its cost was only 1s. per square yard.

The party then inspected about twenty new cottages, some of which presented novel and attractive features. The cost of the cottages, all of which have three bed-rooms, was stated to be from £120 to £175 each. Next attention was drawn to some splendid examples of sixteenth century architecture, including one old house with a delightful oriel bay window set in a gable of open timber work with rope-pattern carved oak verges and most ornate chimneys. The last items showed were two rooms built as a back addition to a cottage, on quite novel lines. This work is the last word in cheap construction combined with durability. The walls consist of two bricks on edge, separated by a cavity, and tied every fourth course by lattice-girder fencing wire. The floor and roof each consist of a reinforced slab, 4 in. thick, and the walls are built in cement mortar and painted inside. A special flue ventilates the ground and first floor rooms. The cost was £15 per room, and altogether it represents a system of building which should do much to solve the housing question in the country districts.

Some outbuildings built of a single brick on edge were also shown. These walls, which are built in cement mortar and reinforced with ½-in. steel rods, were built at a cost of 1s. 8d. per yard super., and the row of barns, which measure 22 ft. by 7 ft., were all built for less than a £5 note. One more example of concrete work remained—viz., a concrete wharf, with [illegible] constructed in situ with unskilled labour.

The party then returned to the Horseshoe Temperance Hotel, where tea was provided by Mr. Mayfield, who was congratulated on the success of his efforts to provide a most enjoyable day's outing.

JOINT DISTRICT MEETING.

A joint meeting of the Yorkshire and Northern districts of the institution was held at Harrogate on Saturday last. Among the members present were the following: Messrs. J. H. Halstead (chairman, Yorkshire District), J. W. Moncur (chairman, Northern District), H. G. Firth (hon. district secretary, Yorkshire District), John Robinson (hon. district secretary, Northern District), R. Atkinson (Durham), G. W. Battye (South Crosland), J. Davison (Morpeth), G. Gregson (Durham), C. F. Hodgson (Otley), R. Heath (Emley), J. W. Holbrook (Houghton-le-Spring), J. Howard (Worsley), A. Light (Otley), H. W. Marsden [illegible], J. W. [illegible] (Ripon), G. Symon (Blaydon-on-Tyne), R. E. Wilson (Knaresborough), R. Appleby (Newbiggin-by-Sea), R. Alves (Ripon), W. J. Coulson (Cramlington), T. G. Easdale (Northallerton), J. Firth (Shelley), C. H. Hearder (North Ormesby), B. Hinchliffe (Gomersal), F. Hargreaves (Burley-in-Wharfedale), R. H. Kilburn (Guisborough), J. Nuttall (Hunslet), J. T. Pegge (Durham), L. Simpson (Middleton-in-Teesdale), W. Wilby (Gildersome), W. B. Thomas (Southwick-on-Wear), M. Turnbull (Shildon) and B. Wyand (secretary of the institution). Among the visitors were Messrs. C. E. Rivers (borough engineer of Harrogate), W. J. Thorpe (surveyor of highways, Harrogate), W. Atkinson (chairman, Knaresborough Rural District Council), J. Smith (clerk to Knaresborough Rural District

Council), Councillor Duff (Ormesby), Anderson (Howden). J. Thompson (Easingwold), A. Routledge (Stanley), Hiscock, Gilderdale and Greaves. Several ladies also were present and accompanied the members on the visits, afterwards attending the dinner.

The party met at Harrogate station and drove by motor chars-à-banc to the corporation depot, Wetherby-lane, where the very excellent new tarmacadam mechanical-mixing plant (supplied by Messrs. Ord & Maddison, of Darlington) and the stone-beaking machine were witnessed in operation. The process is mechanical from the entry of the stone into the breaker to its final delivery—broken, graded, tarred and mixed—into the corporation carts.

After a brief interval for refreshments visits were made (to programme time) to the North sewage outfall works, where the new septic tanks and percolating filters, new aërating sprinklers and special apparatus for sludge treatment were viewed; the Royal Baths, with their eighty-six different forms of treatment, many of which were carefully explained; the Iron Gate and Harlow Hill reservoirs, with sand bed and mechanical filters; the corporation stables and town's yard, and the corporation fire brigade station. The whole of the visits had been arranged by the kind permission of the Harrogate Corporation, and Mr. C. E. Rivers, the borough surveyor, accompanied the party, and furnished all necessary explanations.

At the dinner, which was held at the North-Eastern Hotel, Mr. J. W. Moncur presided, and at its conclusion proposed "Success to the Institution," coupled with the name of Mr. Wyand, who "suitably responded" in the two minutes which his departing train allowed him. A vote of thanks to the Harrogate Corporation for their kindness in allowing the members to visit the works as they had that day was heartily carried, Mr. W. J. Thorp replying in the unavoidable absence of Mr. Rivers. Mr. J. T. Pegge, in the course of a few remarks, laid stress upon the flourishing condition of the institution and the well-maintained increase of membership. Meetings such as that they were holding that day were both instructive and beneficial to all concerned. The toast of the visitors was responded to by Messrs. Atkinson and J. Smith, respectively chairman and clerk to the Knaresborough Rural District Council.

A business meeting of the Yorkshire District was held afterwards, with Mr. J. H. Halstead in the chair, when the following resolutions were passed: (1) That, as a temporary arrangement only, the East and West Ridings of Yorkshire join the North-Western District and the North Riding joins the Northern District, and that notice be sent to the members of the three Ridings of meetings held in both the Northern and North-Western Districts. (2) That the council of the institution be requested to hold general or council meetings at Leeds, York and other centres.

Lambeth Bridge Rebuilding.—The London County Council have decided to go to Parliament with the old scheme for rebuilding Lambeth Bridge.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

Local Authorities and Heavy Motor Traffic.—At Richmond on Tuesday it was reported to the Executive Committee appointed by the recent conference of local authorities on the western side of London, with respect to the question of heavy motor traffic, that another conference had been called by the Ilford Council to co-ordinate all the authorities on the eastern side of the Metropolis. The Wood Green Council have set on foot a larger conference still to embrace all England, and have sent letters to every district of over 20,000 inhabitants. The subjects for consideration will be the maintenance of the main trunk roads of the country, to which it is suggested the State should contribute directly the county main roads, and first and second class district roads.

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Ltd. Price 10s. 6d.

THE ROAD BOARD.

THE FUNCTIONS OF COLONEL CROMPTON.

The following question appeared on the order paper of the House of Commons on Thursday of last week, addressed by Mr. T. M. Healy to Mr. Lloyd George:—

To ask Mr. Chancellor of the Exchequer whether he can state what salary is paid to Colonel Crompton as consulting engineer to the Road Board, and whether the conditions of his employment allow him to be interested in particular methods of forming road crusts; whether the board have the advice of any salaried engineer other than Colonel Crompton in distributing among local authorities the large sums which they devote to the improvement of road crusts; whether Colonel Crompton is a director of Crompton & Co., Limited, and of the Aron Electricity Meter Company, which have business with local authorities; whether he is aware that on October 5, 1911, Colonel Crompton and a relative jointly applied for a patent for a method of road surfacing, and that on May 22, 1912, Colonel Crompton and another applied for a patent for road rollers; whether he is aware that two companies, called Taroads, Limited, and the Praed Construction Company, Limited, are engaged in exploiting Colonel Crompton's method of road surfacing; whether Colonel Crompton's relative, who was on October 5, 1911, the joint applicant for a patent for this process, is in the employment of these companies or either of them; whether he is aware that on September 6, 1912, Colonel Crompton addressed from the Road Board offices a letter to road surveyors in the employment of local authorities, who are or may be applicants for grants from the board, asking them to visit with him a road reconstructed by Taroads, Limited, on his method, and to remain with him to tea, visiting his laboratory and various means of testing road materials; and whether Colonel Crompton's employment by the Road Board will be continued.

The following reply to Mr. T. M. Healy's question was circulated with the Parliamentary Papers on Friday, the question not having been reached within the ordinary time for answering questions orally at Thursday's sitting:—

The salary paid to Colonel Crompton, as consulting engineer to the Road Board, is £670 per annum, out of which he provides his own office and staff. The conditions of his employment are that he is employed only as consulting engineer, his advice being sought on technical questions within the scope of his knowledge and experience, when considered necessary. He has no general or executive duties. The board have in their employment a fully qualified road engineer, and also have the assistance of an advisory engineering committee, whose constitution and duties are set forth in Appendix No. 10 in the first annual report of the board. Colonel Crompton carries on business as a consulting engineer on his own account, and I understand that in the ordinary course of his business he prepared a specification for surfacing roads with a mixture of asphalt and sand. This specification is neither patented nor proprietary, and Colonel Crompton has no interest in the two companies, Taroads, Limited, and Praed Construction Company, Limited, but he frequently acts as consulting engineer for them. The Kensington Borough Council, without any communication with the Road Board, contracted with Taroads, Limited, for the execution of surfacing work in Addison-road in accordance with Colonel Crompton's specification and, following a common practice of engineers, Colonel Crompton invited a company of expert road surveyors to inspect the work being executed. This was done without any communication with the Road Board. It is true that the invitations were printed on paper with a printed heading "The Road Board," supplied to Colonel Crompton for use in connection with matters referred to him for advice, but Colonel Crompton has explained to the board that this was due to a mistake in his office. The board have no intention of ceasing to avail themselves of Colonel Crompton's services as consulting engineer.

The matter is further referred to in "Minutes of Proceedings."

"THE SURVEYOR" BOOK DEPARTMENT.

In response to suggestions from numerous readers, resident in remote districts at home and abroad, who find it difficult to procure the books they require, we have decided to establish a department for the supply of technical and scientific books, a selected classified list of which will shortly be published in our advertisement pages.

ROAD GRITTING.

COUNTY SURVEYOR ON THE SHOEING OF HORSES.

Ham Urban District Council had before it last Friday the question of the main road through Ham which the Surrey County Council have had repaired with a material leaving a hard glossy surface very dangerous for horses (reports the *Times*). As there had been many accidents, the district council directed a letter to be sent to the Surrey County Council asking that grit or sand should be placed on the road to give the horses foothold. Mr. A. Dryland, the county surveyor, replied: "As nearly all the main roads throughout the county now have tarred surfaces, to spread grit or sand on them, except in the case of frosts, would mean the expenditure of a considerable sum of money. The whole tendency of modern road maintenance is towards surfaces less suitable for horse traffic as at present shod. It seems to me what is now necessary is a method of shoeing which will give a better foothold. Everything else has changed, but the horseshoe has not."

Mr. Barnard said that letter was tantamount to an intimation that they must no longer keep horses, and the council thought the letter was most unsatisfactory. The clerk was directed to write a strong letter, pointing out that there were still many people who kept horses, and they had as much right to consideration as motorists, and requesting that the main road should be so made as to be safe for horse traffic.

At a recent Local Government Board inquiry at Belfast into an application of the corporation for sanction to the carrying out of extensive road works, the inspector, Mr. P. C. Cowan, said that both from the health and cost point of view he was quite certain that asphalt was the best form of street paving if owners of horses could only be got to shoe their horses properly.

INSTITUTION OF MUNICIPAL ENGINEERS.

President, Mr. Frank Latham, M.Inst.C.E., F.S.I., Borough Engineer and Surveyor, Penzance.

NORTH-WESTERN DISTRICT.

It has been decided to hold a social evening at Manchester on Saturday, December 7th. The approximate expense per head will be 4s., and it is desirable that members should give notice, at the earliest possible moment, of their intention to attend. Full programme will be issued later.

"Beamwood," Jas. W. Gleave,
Commassie-street, *Hon. District Secretary.*
Heywood.
October 12, 1912.

Subscriptions, 1912-13.—Members and others are requested to note that annual subscriptions for 1912-13 are now due.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*

ROYAL SANITARY INSTITUTE.

PROVINCIAL SESSIONAL MEETING, ALTON.

To-morrow (Saturday) a sessional meeting of the Royal Sanitary Institute will be held in the Assembly Rooms, Alton, at 11.15 a.m., when discussions will take place on "Housing Problems in County Areas"—to be opened by Dr. Robert A. Lyster, county medical officer of health, Southampton, and "Municipal Work in Alton"—to be opened by Mr. G. Bertram Hartfree, F.S.I., surveyor to the urban district council. Among those who are expected to take part in the discussion are Messrs. R. W. Cass, surveyor to the Farnham Urban District Council; C. G. Mason, Assoc.M.Inst.C.E., borough engineer, Guildford; W. J. Taylor, M.Inst.C.E., county surveyor, Southampton; and F. C. Uren, M.Inst.C.E.I., surveyor to the Aldershot Urban District Council.

The chair will be taken by Mr. H. Percy Boulnois, M.Inst.C.E., chairman of the council of the institute.

At a meeting of the Royal Sanitary Institute, to be held at 90 Buckingham Palace-road, S.W., on Tuesday, November 12th, Mr. H. Percy Boulnois, M.Inst.C.E., chairman of council of the institute, will open a discussion on the recently issued report of the Departmental Committee on Intercepting Traps in House Drains.

The chair will be taken at 8 p.m. by Sir Maurice Fitzmaurice, C.M.G., M.Inst.C.E., chief engineer to the London Council Council.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1369 Holborn), subject to later confirmation by letter.*

INSPECTOR OF NUISANCES AND DISTRICT SURVEYOR.—October 25th.—Luton Rural District Council. £180 per annum.—Mr. W. Austin, clerk, 7 George-street West, Luton.

CHIEF ENGINEER.—October 28th.—Municipality of Karachi (India). 500—750 rupees per month.—Mr. Measham Lea, chief officer and chief engineer, Municipal Office, Karachi.

JUNIOR ENGINEERING ASSISTANT.—October 28th. Finchley Urban District Council. £70 per annum.—Mr. E. H. Lister, clerk.

ASSISTANT INSPECTOR OF NUISANCES.—October 31st.—Twickenham Urban District Council. £90—£120.—Mr. J. Saunders, clerk.

SURVEYOR AND INSPECTOR.—October 31st. Swanage Urban District Council. £200 per annum. Chairman of the Works Committee.

INSPECTOR OF NUISANCES.—November 2nd. Weymouth Port Sanitary Authority. £100 per annum. —Mr. J. J. Roberts, clerk.

TEMPORARY ASSISTANT INSPECTOR.—November 4th. Coalville Urban District Council. £2 5s. per week.—Mr. Thos. E. Jesson, clerk.

INSPECTOR OF NUISANCES.—November 5th.—Sheerness Urban District Council. £120—£150 per annum.—Mr. V. H. Stallon, clerk.

SURVEYING ASSISTANT.—November 5th. Corporation of Manchester. £3 3s. per week.—Mr. Thomas Hudson, town clerk.

CLERK OF WORKS.—November 12th. Stalybridge and Dukinfield Joint Sewerage Board. £3 3s. per week.—Mr. W. Moss, clerk, Market-place, Ashton-under-Lyne.

INSPECTOR OF NUISANCES.—November 12th. Southborough Urban District Council. £104 per annum.—Mr. Philip Hanmer, clerk.

MUNICIPAL ENGINEER.—November 21st.—Municipal Board of Cawnpore. 800—1,000 rupees per mensem.—Mr. C. E. Goument, C.S.I., M.Inst.C.E., c/o Messrs. Thos. Cook & Son, Ludgate-circus, London.

ASSISTANT WATERWORKS ENGINEER.—November 30th.—Bombay Municipality. 800 rupees per mensem.—Messrs. John Taylor, Sons & Santo Crimp, Caxton House, Westminster, S.W.

ASSISTANT SURVEYOR OF ROADS.—Public Works Department of the Gold Coast Government. £300—£350, with allowances.—Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W. Quote M 5,497 on left-hand top corner of application.

MUNICIPAL COMPETITIONS OPEN.

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GLASGOW.—October 29th.—Preliminary sketch designs are invited by the corporation for the extension of the municipal buildings. Honorariums of 100 guineas to five selected designs.—Mr. John J. Burnet, A.R.S.A., 239 St. Vincent-street, Glasgow, is assessor.—Applications to the clerk, Mr. J. Lindsay, town clerk.

LLANDUDNO.—October 31st.—Designs for laying out about 20 acres, for the urban district council. A premium of 50 guineas is offered.—Mr. A. Conolly, clerk.

HUDDERSFIELD.—October 31st.—Designs for laying out certain areas as a town planning scheme, for the corporation. Premiums of 100, 50, and 25 guineas. —Mr. J. Henry Field, town clerk.

ROSCREA.—November 1st.—Plans, specifications, and estimates of a complete sewerage scheme, for the No. 1 Rural Council.—Mr. Thomas Dooly, clerk, Roscrea Workhouse.

RHYL.—November 18th.—Plans, specifications and estimates for strengthening Rhyl pier, for the urban district council.—Mr. A. Rowlands, clerk.

CARLISLE.—December 2nd.—School buildings, for the corporation.—City Surveyor, 36 Fisher-street, Carlisle.

ORSETT (Essex).—January 1st.—For the construction of a sewerage and sewage disposal scheme in the parish of South Ockendon, for the Orsett Rural District Council. Premiums of £50 and £25 are offered.—Mr. James Beck, clerk, 2 Orsett-road, Grays.

DUBLIN.—(No date.)—Designs for municipal offices, for the Estates and Finance Committee of the corporation.—City Architect, Municipal Buildings, Cork Hill, Dublin.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, but those *responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1369 Holborn), subject to later confirmation by letter.*

Buildings.

BANDON.—October 26th.—For building twelve cottages, for the rural district council.—Mr. A. Haynes, clerk.

BIRKENHEAD.—October 26th.—For converting premises into a public lavatory, for the corporation.—Mr. J. Fearnley, town clerk.

CHELTENHAM.—October 26th.—For the erection of domestic science buildings, for the Education Committee.—Messrs. Chatters & Smithson, architects, 17 Regent-street.

BLACKPOOL.—October 26th.—For the extension of a workshop, for the corporation.—Mr. J. S. Brodie, borough engineer and surveyor.

STAFFS.—October 28th.—For the erection of a school, for the County Education Committee.—Mr. Graham Balfour, Director of Education, County Offices, Stafford.

SOMERSET.—October 28th.—For the erection of a council school, for the Education Committee.—Mr. G. H. Bottomley, secretary, Weston-super-Mare.

BASFORD.—October 28th.—For alterations and additions to outfall works, for the rural district council.—Mr. Henry Stone, clerk.

HARROGATE.—October 28th.—For alterations to public baths, for the corporation.—Mr. C. E. Rivers, borough engineer.

MANCHESTER.—October 28th.—For the construction of public conveniences, for the corporation.—Mr. Thomas Hudson, town clerk.

MANCHESTER.—October 28th.—For alterations for filtration plant, for the corporation.—Mr. Thomas Hudson, town clerk.

LONDON (City).—October 29th.—For alterations and extensions of the convenience in Billingsgate market, for the corporation.—The Town Clerk.

NORTH RIDING.—October 29th.—For the erection of a school, for the Education Committee.—Mr. E. G. Fletcher, architect, Prince Regent-street, Stockton-on-Tees.

DEVON.—October 30th.—For strengthening Axe Bridge, Colyford, for the county council.—Mr. F. Bailey, clerk.

ESSEX.—October 30th.—For the erection of a school, for the Education Committee.—Mr. H. J. Goodwin, clerk, Education Offices, Loughton.

PEMBROKE (co. Dublin).—October 31st.—For the erection of a pier, promenade, sea and other baths, pavilion, and repairs to existing baths, for the urban district council.—Mr. J. C. Manly, clerk.

KIRKCALDY.—October 31st.—For the erection of public conveniences, for the corporation.—Mr. W. L. Mactaggart, town clerk.

BARNSLEY.—October 31st.—For the erection of shops and conversion work at public market, for the corporation.—Mr. W. P. Donald, town clerk.

RAMSGATE.—October 31st.—For the erection of a room for fire-alarm fittings and other works at the fire brigade station, for the corporation.—Mr. T. G. Taylor, borough engineer.

QUEENSTOWN.—November 1st.—For the erection of fifty houses, for the urban district council.—Mr. J. H. Campbell, clerk.

MERTHYR TYDFIL.—November 1st.—For the erection of attendant's house at reservoir, for the corporation.—Mr. T. Aneuryn Rees, town clerk.

MAIDENHEAD.—November 2nd.—For additions to the electricity station, for the corporation.—Mr. H. E. Davies, town clerk.

BATH.—November 4th.—For constructional work in Orange-grove, for the corporation.—City Surveyor.

SLOUGH.—November 6th.—For the erection of buildings at the pumping station, for the urban district council.—Mr. G. H. Charsley, clerk.

HADHAM.—November 6th.—For the erection of six cottages, for the rural district council.—Mr. A. G. Gwynn, clerk.

WANSTEAD.—November 7th.—For the erection of a fire brigade station, for the urban district council.—Mr. C. H. Brassey, surveyor.

MARGATE.—November 11th.—For repairs to the water tower, for the corporation.—Mr. Edward Brooke, town clerk.

CLEETHORPES.—November 11th.—For the erection of a bandstand, for the urban district council.—Mr. C. H. Waithman, engineer and surveyor.

PORTSMOUTH.—November 19th.—For the erection of stores, for the corporation.—Borough Engineer.

NORWICH.—November 22nd.—For the erection of a shelter at the cemetery, for the corporation.—Mr. A. E. Collins, city engineer.

RAWTENSTALL.—October 26th.—For alterations at central fire station, for the corporation.—Mr. J. Johnson, borough surveyor.

Iron and Steel.

MALDON.—November 4th.—For laying 370 yds. of 6-in. water main, for the corporation.—Mr. F. H. Bright, town clerk.

EALING.—November 5th.—For the supply of iron fencing, for the corporation.—Mr. Geo. E. Brydges, town clerk.

KEIGHLEY.—November 9th.—For laying line of water pipes and other works, for the corporation.—Mr. W. Bagshaw, town clerk.

KNOTTINGLEY.—(No date.)—For the supply of 10-in. and 6-in. cast-iron rising main and specials, for the urban district council.—Mr. W. Swaine, clerk.

Roads.

TURTON.—October 26th.—For the supply of 13,500 tons of Welsh granite setts and two traction wagons, for the urban district council.—Mr. J. B. Goulburn, clerk.

SHREWSBURY.—October 26th.—For paving the cattle-market avenue with granite setts, for the corporation.—Mr. W. Chapple Eddowes, borough surveyor.

HEADINGTON.—October 26th.—For making up two streets, for the rural district council.—Mr. A. Walker, surveyor.

RUISLIP-NORTHWOOD.—October 26th.—For laying stone slab paving and granite kerbing and channelling, for the urban district council.—Mr. W. L. Carr, surveyor.

WALTON-UPON-THAMES.—October 28th.—For the supply of broken granite and broken flints, for the urban district council.—Mr. R. Wilds, surveyor.

MALDENS AND COOMBE.—October 28th.—For making up part of Dickerage-lane, for the urban district council.—Mr. R. H. Jeffes, surveyor.

SHOREHAM.—October 28th.—For the supply of granite quartzite or elvan stone, for the urban district council.—Mr. A. W. Nye, surveyor.

TIVERTON.—October 28th.—For making up kerbing and pitching, for the rural district council.—Mr. A. J. Mildon, highway surveyor, Ash Thomas, Tiverton.

PRESTWICH.—October 28th.—For works of private street improvements, for the urban district council.—Mr. Lewis A. Orford, clerk.

LONDON (City).—October 29th.—For street repairs and maintenance, for the corporation.—Town Clerk.

ALTRINCHAM.—October 29th.—For making-up and tar-macadamising work, for the urban district council. Mr. H. E. Brown, surveyor.

TYNEMOUTH.—October 29th.—For making-up work in certain streets, for the corporation.—Mr. J. F. Smillie, borough surveyor.

LLANDAFF. October 29th.—For works of private street improvement, for the rural district council.—Mr. M. Warren, clerk.

SHEFFIELD.—October 31st.—For the widening of the south-west approach of Hillford Bridge, for the corporation.—Mr. R. M. Prescott, town clerk.

HAMPTON WICK.—November 2nd.—For the supply of 200 yds. of broken granite, for the urban district council.—Mr. H. Fawssett, clerk.

ENNISKILLEN.—November 4th.—For the supply of road metal, for the urban district council.—Mr. A. W. G. Ritchie, town clerk.

MONK BRETTON.—November 4th.—For the execution of private street works, for the urban district council.—Mr. James Gibson, clerk.

WALTHAM.—November 4th.—For laying wood-block paving, for the urban district council.—Mr. W. C. Holloway, engineer and surveyor.

WEALDSTONE.—November 5th.—For the supply of granite chippings, for the urban district council.—Mr. H. Walker, surveyor.

EALING.—November 5th.—For making up Haslemere-avenue and York-road, for the corporation.—Mr. Geo. E. Brydges, town clerk.

BARKING.—November 6th.—For carrying out private street works, for the urban district council.—Mr. C. F. Dawson, surveyor.

WANSTEAD.—November 7th.—For making up certain streets, for the urban district council.—Mr. Bruce Blewitt, clerk.

MIDDLETON.—November 8th.—For private street works, for the corporation.—Mr. W. Welburn, borough surveyor.

HASTINGS.—November 9th.—For the supply of 1,200 yds. of best unbroken blue stone, for the rural district council.—Mr. A. R. Inskipp, clerk, 11 Wellington-square, Hastings.

WILLINGTON.—November 9th.—For work of making up, for the urban district council.—Mr. J. H. Gardner, clerk.

SKIPTON.—November 11th.—For work of making up, for the urban district council.—Mr. Richard Wilson, clerk.

RAWTENSTALL.—November 13th.—For work of paving and sewering, for the corporation.—Mr. J. Johnson, borough surveyor.

BARNSTAPLE. November 14th.—For the hire of steam roller, for the corporation.—Mr. L. Y. Saunders, borough surveyor.

Sanitary.

BEXHILL-ON-SEA.—October 26th.—For the construction of storm-water overflow sewers, enlargement of brick culvert, and extension of storage tanks, for the corporation.—Mr. G. Ball, borough surveyor.

NORTHWOOD.—October 26th.—For the construction of sewers, manholes, and other works, for the urban district council.—Mr. E. R. Abbott, clerk.

ST. COLUMB MAJOR.—October 28th.—For constructing sewers and under-drains and laying out irrigation ground, for the rural district council.—Mr. C. E. Whitford, clerk.

BECKENHAM.—October 28th.—For laying a 12-in. diameter relief sewer, to include 9,001 ft. of 12-in. pipes and sixteen manholes, for the urban district council.—Mr. F. Stevens, clerk.

RUGELEY.—October 29th.—For the removal of refuse, for the urban district council.—Mr. W. L. Orgill, clerk.

LLANTWIT FARDRE.—October 30th.—For laying stoneware pipe sewer, for the rural district council.—Mr. W. Spickett, clerk.

SEDGEFIELD.—October 30th.—For work of scavenging, for the rural district council.—Mr. J. W. Lodge, clerk, Sedgefield, Ferryhill.

LICHFIELD.—October 31st.—For the construction of 7,828 yds. of 6-in., 9-in. and 12-in. diameter stoneware, cast-iron and steel pipe sewers, including 12-in. sewer in deep channel work, manholes, ventilating columns, tanks, bacterial filters and rotary distributors, for the rural district council.—Mr. Thomas Moseley, clerk.

GLASTONBURY.—October 31st.—For the erection of pumping machinery at the sewage disposal works, for the corporation.—Mr. Reginald T. Gould, town clerk.

HAVANT.—November 6th.—For laying concrete tubes and manholes, for the rural district council.—Mr. W. L. Hibberd, surveyor.

HALIFAX.—November 16th.—For the construction of 9-in. earthenware pipe sewers, for the corporation.—Mr. Percy Saunders, town clerk.

ARDSLEY.—(No date.)—For the construction of small sewerage works, for the urban district council.—Mr. C. McNaughton, clerk.

Stores.

LEIGH.—October 30th.—For the supply of the steam slack required at the electricity works (4,000 tons), for the corporation.—Mr. W. H. Cowburn, town clerk.

WOKING.—November 16th.—For the supply of oil, sludge press cloth, gulley frames and gratings, brooms, shovels, mud scrapers, pickshafts, fagging hooks, pennant kerb, tar paving, dust skips coke, coal, lamp standards and lanterns, Izal disinfecting fluid, Izal empty pint tins, Izal soft soap, Izal sulphur candles, Sanitas No. 2. hard soap, gummed rolls for disinfecting, disinfecting powder, lime and oats, for the urban district council.—Mr. Robert Mossop, clerk.

Miscellaneous.

MANCHESTER.—November 1st.—For the supply of two four-cylinder petrol-driven motor fire pumps, for the corporation.—Mr. Thomas Hudson, town clerk.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BARNSTAPLE.—For drainage work, for the corporation.—Mr. E. Y. Saunders, borough surveyor:—

S. H. Allen, Barnstaple	£10
W. Gammon & Sons, Barnstaple	8

BELFAST.—For the supply of setts, for the Harbour Commissioners:—

Penmaenmawr and Welsh Granite Company, Limited, Penmaenmawr.

CHISWICK.—For the making up of Grantham-road, for the urban district council.—Mr. E. Willis, engineer:—

G. Wimpey & Co., Hammersmith	£1,511
E. Free & Sons, Maidenhead	1,465
F. G. Brummell, Willesden	1,329
J. Ball, Chiswick*	1,237

EAST HAM.—Accepted for tar-paving playgrounds, for the Education Committee:—

Constable, Hart & Co., Limited, London, E.C. 1s. 7¼d. per super. yard.

FLAMBOROUGH.—For main extension.—Messrs. Elliott & Brown, engineers, Nottingham:—

J. Woodhead, Wakefield	£341
J. Webster, Marton	318
J. Clark, Netherfield	291
J. Pickthall, Leeds	287
J. Sheldrake, Hornsea*	271

HARROGATE.—For the erection of boundary walls to cemetery, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor:—

W. Webster, Harrogate	£725
C. Dawson & Son, Harrogate	605
T. Godfrey, Harrogate	600
A. Hymas, Harrogate	574
Kershaw & Hill, Harrogate	569
G. & C. Winterburn, Harrogate	488
W. R. Birkinshaw, Harrogate	449
C. A. Nettleton, Harrogate*	442

HARROW-ON-THE-HILL.—For the construction of two conveniences, for the urban district council.—Mr. J. P. Bennetts, surveyor:—

P. F. Whyborn, Wealdstone	£276
J. Smith, Harrow	234
Strand Building Company, London	233
A. J. Orchard, Pinner	230
W. Payne, Watford	229
J. Batchelor, Harrow	205
J. Simmons, Harrow*	186

HARROW-ON-THE-HILL.—For making up private streets, for the urban district council.—Mr. J. P. Bennetts, surveyor:—

F. G. Brummell, Willesden	£6,957
A. B. Champness, Harrow	6,736
Wimpey & Co., Hammersmith	6,626
J. Mowlem & Co., London	6,506
A. Wooster, Wealdstone	6,433
N. French & Co., Buckhurst Hill	6,304
Free & Sons, Maidenhead	6,226
T. Adams, Wood Green	6,200
G. P. Trentham, Birmingham	6,096
J. Young, Rugby	6,024
Willis & Powis, Wembley*	5,072

HORSHAM.—For the supply of tar for surface treatment, for the rural district council.—Mr. W. Dungate, surveyor:—

	s. d.
Bristowe & Co. (Tarvia)	19 2
Crow & Sons (distilled tar at per barrel of 40 gallons d/d.)	16 3
Carchpole & Son " "	15 10
Grindley & Co. " "	15 0
Standard Tar Company " "	15 0
Forbes, Abbott & Leonard, Shoreham " "	14 4

LONDON.—For the supply of (1) three electrically-propelled shop trucks, and (2) three wheel-turning lathes for the third section of the central car repair depot, for the county council:—

(1) Three Electrically Propelled Shop Trucks, &c.

Hurst, Nelson & Co., Limited, Motherwell	£975
British Westinghouse Electric and Manufacturing Company, Limited	916
S. H. Heywood & Co., Limited, Reddish	908
Schuler & Co., Limited, London, E.C.	753
Brush Electrical Engineering Company, Limited, Loughborough*	730

The estimate of the chief officer of tramways comparable with the tenders was £570.

(2) Three Wheel-turning Lathes.

	Lathes fitted with hand screw gear for the headstock rams.	Lathes fitted with power gear for operating the headstock rams.
Pollock & MacNab, Limited, Manchester	£2,650	£2,720
Tangyes, Limited, Birmingham	2,573	2,589
Buck & Hickman, Limited, Whitechapel-road, E.*	2,115	2,531

Estimate of the chief officer of tramways, £2,950.

LONDON.—For the supply of a pair of chairs for one of the filth screens at the southern outfall, for the county council:—

J. Wright & Co., Tipton	£271
Gibbons Brothers, Limited, Dudley	141
Leech, Goodall & Co., Leeds*	128
Walton & Clough, Bradford	112
T. Larmuth & Co., Limited, Salford	65

The last two firms quoted for chains not in accordance with the council's requirements.

LONDON.—For the provision of electrical discharges for use in the tramways sub-stations, for the county council:—

Ferranti, Limited, Hollinwood	£2,903
The General Electric Company, Limited, Birmingham	2,860
Snagnoletti, Limited, London, W.	2,785
The British Westinghouse Electrical and Manufacturing Company, Limited, Manchester	2,734
Johnson & Phillips, Limited, Charlton*	2,040

Estimate of the chief officer of tramways, £2,200.

SOUTHEND-ON-SEA.—For the erection of pumping station and destructor buildings, inclined roadway, two cottages, and other works at the sewage disposal works, for the corporation:—

Dennis Peerless & Co., Eastbourne	£16,649
A. N. Coles, Plymouth	15,586
Chessum & Son, London, E.C.	15,321
G. Brown, Grays	15,[illegible]
J. Greenwood, Limited, London	14,890
J. C. Flaxman, Southend-on-Sea	14,700
C. Gray, Acton Park	14,611
W. E. Davey, Southend-on-Sea	14,077
S. E. Moss, Southend-on-Sea	13,755
Young & Son, Norwich	13,736
R. & E. Evans, Plymouth	13,712
G. Coxhead, Leytonstone	13,423
Davey & Armitage, Southend-on-Sea	13,333
E. & B. H. Davey, Southend-on-Sea*	13,195

WEMBLEY.—For the work of street improvement, for the urban district council.—Mr. C. R. W. Chapman, engineer and surveyor:—

	Without refuge.	With refuge.
W. Johnson & Co., Limited, Wandsworth Common	£361	£396
A. Wooster, Wealdstone	275	300
O. T. Gibbons, Leytonstone	205	225
F. Tribe, Alperton	196	220
Willis & Powis, Wembley	179	202
F. G. Brummell, Willesden	169	187
F. G. Brummell (alternative tender for Victoria Indurated Paving)	162	180

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

OCTOBER.

28.—Junior Institution of Engineers. Week-end Visit to Sheffield.

26.—Royal Sanitary Institute: Meeting at Alton; Discussions on "Housing Problems in County Areas" and "Municipal Work in Alton." Town Hall, 11.15 a.m.

NOVEMBER.

4.—Royal Institute of British Architects: Mr. Reginald Blomfield, A.R.A., delivers his presidential address. 8.30 p.m.

12.—Royal Sanitary Institute: Discussion on Report of Departmental Committee on Intercepting Traps in House Drains, 90, Buckingham Palace-road, S.W. 8 p.m.

14.—Concrete Institute: Mr. E. P. Wells delivers his presidential address. 7.30 p.m.

28.—Concrete Institute: Mr. John M. Theobald, F.S.I., on "Bills of Quantities for Reinforced Concrete Work." 7.30 p.m.

DECEMBER.

12.—Concrete Institute: Messrs. R. Wheeler and Lawrence Gadd, F.S.I., on "The Effects on Concrete of Acids, Oils and Fats." 7.30 p.m.

APPOINTMENTS OPEN.

COALVILLE URBAN DISTRICT COUNCIL.

TEMPORARY ASSISTANT SANITARY INSPECTOR.

The above Council invite applications for a Temporary Assistant to the Sanitary Inspector. Preference will be given to the holder of a Certificate of the Royal Sanitary Institute, and be subject to one month's notice on either side. Salary £2 7s. per week. Applications, accompanied by not less than two recent testimonials, to be forwarded to me not later than Monday, the 4th day of November, 1912.

THOS. E. JESSON,
Clerk.

Council Chamber,
Coalville.

IMPORTANT!

Please mention

"The Surveyor"

when replying

to

ADVERTISEMENTS.

GLUTRIN

The BEST GROUT for

MACADAM
FLINT
GRAVEL
ROADS
and
PARK FOOTWAYS.

ROBESON PROCESS CO.,
17 Fenchurch Street, E.C.

Scottish Representatives:
FLEMING & CO., 31 Robertson Street, Glasgow.
Yorkshire Representatives:
ARTHUR NEWSOME, Burley-in-Wharfedale.
South Wales Representatives:
C. H. DAVID, 135 Bute Street, Cardiff.

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

Horse-shoes and the Road Crust.

We have sufficient faith in road surveyors to believe that they will be able to meet the difficulties that arise from the fact that the kind of road surface which is found to be suitable for motor traffic is not always satisfactory with respect to the foothold provided for horses. As regards, for instance, the slipperiness of tarred roads in drizzling autumn weather or in the early winter, it is being found that if the actual film of tar is kept as thin as possible, and if the second application of tar is limited to what is absolutely necessary in places where the tarry part of the crust near the surface has actually worn away, the period of greasy slipperiness will not last long, the tarred road beginning to exhibit the appearance of a dark-coloured ordinary broken-stone crust some time in the autumn, the actual date depending upon climatic and traffic conditions. Greasy slipperiness is especially inconvenient to cyclists, and generally a slippery state of the road is by no means regarded with favour by motorists. It may be suggested that some of the experiments recently made with road crusts of unusual kinds point to the unsuitableness of crusts which, though the surface wear is small and the surface usually hard, have not, on the whole, longer lives than crusts which wear down more steadily and with less tendency to become bumpy on the small scale. This small-scale bumpiness may be tolerated by luxuriously sprung motor cars, but it is a condition very unfavourable to the comfort of the users of other vehicles, especially cycles, and under heavy traffic it results in the crust being severely punished and its foundations severely tried. While we believe, however, that on the whole surveyors are alive to the difficulties imposed by the necessity for accommodating traffic of widely different kinds, and able to meet these difficulties, it is inevitable that some cases will occur in which provision for one kind of traffic or the trial of a new kind of crust inflicts some hardship upon one class or another of road users. As reported in last week's issue, such a case seems to have occurred at Ham, Surrey, and the representations made in the matter to Mr. A. Dryland, the county surveyor, led to his remarking that "the whole tendency of modern road maintenance is towards surfaces less suitable for horse traffic as at present shod," and the suggestion that some better method of shoeing might be found. This raises a large question, with which we hope to deal in our next issue, the matter being one of great moment to a very large number of owners of horses, and one which demands the serious attention of road surveyors.

For the moment we content ourselves with pointing out the three main facts which dominate the subject. First, the nature of the shoes which are worn by horses is in a great measure decided by conditions which are not necessarily average conditions, but may be those of a relatively small mileage of the roads on which the horses have to travel. If surveyors could guarantee that some of the most trying road surfaces should be permanently improved in this respect, one obstacle to the improvement of horse-shoes might be removed. Secondly, some of the worst effects of horse-shoes are those which are felt when the shoes are studded or sharpened in order to enable the horse to obtain a foothold on roads which are slippery in frosty weather. This points to the need for careful attention being given to such conditions, and to the means which can be taken to reduce the frequency with which they occur. Thirdly, it is quite useless to expect the owners of horses to evolve improved shoes unless they have some idea of what the ordinary road surfaces will be like for a good many years ahead. The kind of shoe that can be used depends, for one thing, upon the kind of horse employed, and while horse breeders are quite capable of keeping the state of the roads in mind, it must be remembered that the working life of a horse is a long one, and that changes in shoeing which depend even to a small extent upon the breed of horse employed must necessarily be made slowly. When horses work in a small area in which one kind of pavement predominates, the case is quite different, and of several ways of shoeing at present employed one may give better results than others. In the course of a recent inquiry at Belfast, Mr. P. C. Cowan, chief engineering inspector of the Local Government Board of Ireland, suggested that the farriers of Belfast might effect improvements in their present methods of shoeing horses for work in that city; and as regards our present point it does not matter whether he alluded to bad shoeing or to a method inferior to others in ordinary use—inferior, that is, in view of the conditions in Belfast. Looking at the matter as a whole, it is very important that the fact should be grasped that it is not one for generalisation based upon experience in a limited area. The different climates of the British Isles vary in few respects more than they do in regard to the slipperiness of roads.

Rapid Methods of Construction.

The importance of taking into account the facilities which are ready to the hand of the modern engineer ought not to be overlooked. The many mechanical appliances useful to the constructional engineer which have been invented or improved upon since the application of electrical power became possible alone provide the contractor with a host of labour-saving appliances. By means of these the rate of progress of work of various kinds may be increased enormously, while the work itself is better done and carried out at a much lower rate of cost. With the increase

of such facilities the power of the engineer who possesses the knowledge, genius, courage and judgment required becomes almost infinitely greater, and the possession or lack of these qualities will form the distinction between the true engineer and the man of lower grade. The one will be a true leader of men, and the other will be a machine doing the work he is set to do, useful enough in his sphere, but in no way ranking with the man who is able to apply all the many and various forces and powers which are the heritage of the modern engineer. Hence it behoves the municipal engineer not to overlook the many facilities which now exist. We in this country are slow to trouble our heads about new methods, but it is daily becoming more evident that those who will not learn will be rapidly superseded by those who take a wider view of their responsibilities.

In the descriptions of works which are from time to time given in these pages there is abundant evidence of the satisfactory application of new methods. The construction of the Hemlocks dam given elsewhere in the present issue is a further illustration. Here we read of light motor trucks covering 70 miles of road a day, conveying cement and other materials to the works. The transportation of mixed concrete along an overhead cableway at the rate of 1,800 ft. a minute is mentioned, and we see that by the use of larger skips, ample power and plant, this work is being done very rapidly and effectively. Such methods go far to eliminate many risks which face the contractor on ordinary work; similarly rapidity of construction must enable the engineer to give the work more personal and perfect supervision. Without doubt there are many excellent appliances hitherto almost unheard of in this country which might be adopted most advantageously, even on comparatively small work. Further, it is desirable that municipal authorities should consider the desirability—one might better say the necessity—of possessing such equipment.

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The Municipal Waterworks Association.

The representative character of the attendance at the first annual meeting of the recently formed Municipal Waterworks Association affords ample evidence, if such were needed, that the new society is destined to fill an important place in the ranks of professional bodies. In his presidential address on Saturday last Mr. Barnard pointed out that, although the various authorities have their own peculiar difficulties to face, there are many matters of common interest, the full discussion of which must result in mutual benefit. He divided the future work of the Association into four main parts—*viz.*, administration, public health, finance and physical. Under the first heading comes the vital question of central control, which has for some time been advocated in these columns. Mr. Barnard put the matter very aptly when he said that if any large city or town applies to Parliament for powers to appropriate an area or a source, there seems to be no machinery by which the claims of other localities or authorities can be considered except as to the extent to which those localities and authorities can incur the cost of putting their claims before Parliament. Admirable as this procedure may be in its application to individual cases, it nevertheless fails to deal with many important aspects in relation to the country at large, and as the years roll on and the undeveloped sources of supply become fewer and fewer, it may, perchance, be found that a more general consideration of the subject would have been in the public interest. Under the heading of Public Health comes the important question of purity and adequacy of supply; while it is evident that questions of finance are of the greatest consequence as affecting the cheapness of a commodity which is a necessity of life. In discussing physical questions, the president referred to the possibility of using sea water for non-domestic purposes, and said that, sooner or later, if the population of this country continues to increase, that question would become one of practical politics. It may be that that day is nearer than some of us anticipate, and the question may, perhaps, be usefully borne in mind in connection with our consideration of the needs of the country as a whole with regard to water supply. The new Association is certainly a very healthy infant, and we are convinced that it will perform a very valuable public work in aiding the solution of problems which affect all classes of the community alike.

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Percolating Filters.

An interesting feature of the recently issued annual report for 1911 of the chief engineer of Baltimore, U.S.A., is the account of the experimental work which was carried out in connection with the preparation of the scheme of sewage disposal for dealing with the whole of the sewage of that city. In particular, the results of the investigations with regard to the most efficient grade and depth of material for the percolating filters are well set out, and will be valuable for reference to all workers in the same field. These results agree with the generally adopted practice in this country. It was found that the finer the grade of the material used the greater was the degree of purification obtained, but the liability to clog was also greater. On the other hand, although the coarser material did not become clogged, the degree of purification was not sufficient. It was obviously a case of finding the happy medium, and after a number of experiments with material of grades varying between ½ in. to 4 in., and 4 in. to 6 in., it was decided to adopt stones broken to pass through a 2½-in. circular opening, and be retained upon a screen with 1-in. circular openings. It was found that this grade would give the required degree of purification without undue clogging. With regard to the most suitable depth of material, it was found by careful experiments that the amount of purification per foot of depth decreases as the bed increases in depth, with the exception of nitrification, which seems to vary almost directly as the depth of the bed. On the other hand, there was a considerable increase of purification between the depths of 6 ft. and 9 ft., but relatively very little increase between the depths of 9 ft. and 12 ft. The desirable depth was thus considered to be 9 ft. in the case of Baltimore, and this result was acted upon in designing the large complete scheme of sewage disposal. In these experiments the various depths of material received a uniform volume of sewage, and thus no information is available as to the relative volumes which can be efficiently purified in each case. It would be very desirable to have equally accurate figures on this point, as the question of cost would be affected considerably if it were found, for example, that the *volume* which could be efficiently purified by a filter 9 ft. deep was less than one and a-half times that which could be dealt with by a filter 6 ft. deep, with the same degree of efficiency.

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The London County Council Engineership.

In our issue of the 25th ult. we were able to give the list of candidates selected for the important post of chief engineer to the London County Council, in succession to Sir Maurice Fitzmaurice. Since then a further selection was made, the "elect" being reduced, we understand, to six, and of these Mr. H. T. Wakelam, the county surveyor of Middlesex, had the prescience to withdraw from a contest which was never perfectly open and fair. On the 28th ult. it was decided unanimously to recommend to the council from the short "leet" the election of Mr. G. W. Humphreys, the deputy engi-

neer to the county council, and on Tuesday next he will, we have no doubt, be duly appointed. We have not, of course, a word to say against the fitness for the post of the successful candidate. On the contrary, we have always upheld the principle of promotion, and it is right and proper that an official should in due course receive the reward of good service by stepping upward into the first vacancy he is qualified to fill. But we do protest, as we have for years past, against the pernicious practice of advertising a vacancy when there is already the "man on the spot"—the holder of office temporarily or permanently, or a "local candidate"—waiting to step into the vacant post. Why, in the name of common decency and consideration, cannot the appointing body decide first whether they have in their field of view an individual qualified for appointment; and if there be no such person, then (but not otherwise) raise the hopes of others, put them to trouble and expense, and more or less prejudicially affect their relations with the authorities they serve? Advertising such foredestined appointments is not even a sop to the ratepayers, who see through the thin device, and rightly look upon it as a futile waste of time and money. It is, of course, too late for our latest protest to be effective in the instance of the London County Council appointment, but we are not without hope that it may be borne in mind by other authorities when they have to make appointments.

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Municipal Engineers in Canada.

It may be some small consolation to municipal engineers in this country to know that, however severe their official worries may be, and however insecure their tenure of office is, neither the worries nor the insecurity are comparable with what are met with by Canadian engineers. We gather from the *Canadian Engineer* just to hand that Mr. George Wright, city engineer of London (Ontario), has handed in his resignation as the result of statements and criticisms made by the mayor and members of the city council with respect to the construction of certain footpaths. Mr. Wright is one of a rapidly increasing list of ex-city engineers of London, the most recent of those who accepted the position, only to leave it at an early opportunity, being Mr. Graydon and Mr. A. H. Van Cleve; while, as proving that not in London alone is the life of the officer made miserable and his position untenable, the recent trouble in Calgary is quoted, as well as the fact that an investigation is now pending in Ottawa into the city engineer's department. The *Canadian Engineer* suggests that the predominance of politics in the town councils is at the root of the mischief, and demands the introduction of what is known as the "commission form of municipal government." Whatever the cause of the evil may be, there seems to be no doubt about the facts, and these will tend to press upon municipal engineers on this side the conviction that to transfer themselves from the Mother Country to Canada in the hope of bettering their conditions of life will be tantamount to jumping from the frying-pan into the fire.

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Rural Housing.

The question of the provision of adequate housing accommodation in rural areas is now generally recognised as being at least as urgent as the corresponding urban problem. At the last meeting of the Royal Sanitary Institute some of these aspects of the housing question which are more prominent in rural districts were considered, the subject being introduced in an instructive paper by Dr. Robert A. Lyster, the county medical officer for Hampshire. While not agreeing with much that has been said and written in regard to the supreme importance of good housing conditions for securing the health of a community, Dr. Lyster expressed the opinion that housing is a factor which has a profound influence upon the mental and moral development of the individual. He proceeded to propound the question, What are reasonable essentials to demand in considering any particular house? In answering this it must be remembered that the reasonableness of requirements of this kind is determined by considerations affecting the economic position of the owner as well as the comfort and convenience of the tenant. We agree, however, that in all cases adequate windows and ventilation, absence of dampness, healthy surroundings and a good water supply are desiderata. Dr. Lyster concluded by facing some of the difficulties which beset the path of a conscientious local authority in their endeavours to enforce their requirements. The paper, extracts from which will be found in another column, will amply repay perusal.

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Municipal Work in Alton.

At the meeting just referred to, a report of which appears on another page, a paper on "Municipal Work in Alton" was read by Mr. G. Bertram Hartfree, F.S.I., the surveyor to the district council. The district, which is urban in character, has been developed in the face of many difficulties, particularly with regard to the entry of subsoil water into the sewers. Thus in 1874, while the estimated dry-weather flow was 100,000 gallons, ten times that amount arrived at the works. This state of affairs has been considerably improved, and Alton is now possessed of an excellent sewerage system with modern disposal works, together with a good water supply. Some anxiety has been felt, however, as to the adequacy of the latter, and during the hot summer of 1911 continual observations were made. Owing to the development of building sites on the hills further improvement at the works is under consideration. Among the many matters dealt with in Mr. Hartfree's very interesting paper were those of revision of by-laws and disposal of refuse. Alton now uses the series known as the Intermediate Model By-laws, which contain a special clause for permitting the erection of galvanised-iron dwellings in the rural parts of the urban district. As regards refuse disposal, the system in use at Farnham has been adopted, the refuse being mixed with sewage sludge. The resulting mixture is readily saleable as manure. Some extracts from Mr. Hartfree's paper will be found elsewhere in this issue.

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Accommodation Subways.

The construction of accommodation subways for sewers, gas and water mains, electric ducts, and so forth is a question which is frequently discussed, and we believe there is comparatively general agreement that the adoption of such a system would result in great public convenience and considerable annual saving in the cost of street openings. The matter was raised in a recent issue of our contemporary *Scientific American*, from which we ventured to quote in our last issue. It was there stated that the city engineer of New York objected to any placing of pipes in an open gallery, no matter how well designed, on the ground that the character of municipal employees had so deteriorated that it was unsafe to place the maintenance in their hands of pipes in a common gallery. So far as our experience goes, these observations are not applicable to the British municipal employee. Nevertheless, in this country the practical adoption of the subway save in exceptional cases, is unfortunately barred by considerations of finance. If the governing authorities of our cities only had unlimited funds at their disposal, what could they not do in this and other directions? Certainly municipal engineers are ready to design and carry out such works whenever they come within the sphere of practical politics.

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Road Materials in Some European Countries.

By A. MESNAGER, Paris.

[From a report submitted to the Sixth Congress, New York, of the International Association for Testing Materials.]

We are indebted to *Engineering and Contracting* for the lengthy abstract from which the following notes are taken. Mr. Mesnager's report includes statements received from several European countries; but, while the subject seems to be primarily the actual testing of road materials, the individual statements include descriptions of the materials used, specifications as regards material and as regards form and size, and procedure with respect to contracts, as well as descriptions of laboratory tests. It seems that the stage at which the most careful precautions are taken to ensure the use of good materials varies in different countries. If, for instance, the stone used comes from quarries which produce uniformly good material, regular laboratory tests are not necessary as far as those materials are concerned. In other cases the national temperament doubtless has an influence upon the relative importance of, for instance, specification and actual tests. No general analysis or comparisons of the statements included will be made here, the object of these notes being to collect a few leading facts, and to place them before the reader in a form convenient for reference.

MATERIALS IN USE.

Natural Stones: Setts.—Porphyry and sandstone setts are used in Belgium, granite and basalt cubes in Budapesth for heavy traffic, and stones such as trachyte and andesite for lighter traffic. Trachyte is also used in this town for the paving of footways. In the Netherlands the following stones are used for setts: Porphyry from the Quenast and Lessines quarries, basalt from quarries between Lintz and Obercassel, lava from quarries at five places, and melaphyre. Sandstone is also used from quarries along the river Ourthe, and from several other places.

Natural Stones: Road Metal.—Stones mentioned as being in use in Austria for road metal or setts include granite, diorite, porphyry and basalt. Other stones mentioned are sandstone, granwacke and conglomerates. In Belgium hard road metal is got from the Quenast and Lessines quarries (porphyry), sandstone being also used to some extent. In Denmark road metal is obtained from old setts, but considerable quantities of stone are got from Sweden and Bornholm. In Budapesth trachyte and pyroxene-andesite are used for road metal. In the Netherlands basalt, granite, porphyry and quartz are used for road metal, and the fact that in some cases the contractor is allowed to supply either porphyry or basalt shows that these two materials give about equally good results. Broken flints and hard gravels are also used.

Asphalt.—Both rammed and poured asphalt are mentioned as being used in the Netherlands and in Germany. Asphalt is also referred to as in use in Belgium, Denmark and Christiania.

Artificial Products.—Artificial flagstones are made in Germany and Denmark, cast slag blocks in Germany and in the Netherlands. Various kinds of bricks are made in the Netherlands, including "clinker" bricks and blue bricks. "Clinker" brick is also used in Copenhagen.

POINTS FROM SPECIFICATIONS.

Stone Setts.—In Budapesth the setts are cubes of 18 cm. ($7\frac{1}{16}$ in.), and blocks 18 cm. by 18 cm. by 13 cm. to 14 cm. ($7\frac{1}{16}$ in. by $7\frac{1}{16}$ in. by $5\frac{1}{8}$ in. to $5\frac{1}{2}$ in.). Bonding setts, about $\frac{3}{4}$ in. and $\frac{1}{8}$ in. shorter, are allowed, but must not exceed 5 per cent in any delivery. The joints of first-class sett paving must not exceed 12 mm. (or about $\frac{1}{2}$ in.) in width. Second-class setts are allowed up to 10 per cent of the deliveries, the maximum joint allowed being just over $\frac{3}{4}$ in. (20 cm.). The trachyte footway setts are 26 cm. by 26 cm. by 15 cm. (10¼ in. by 10¼ in. by 5⅞ in.). In Norway small setts are specified by the number which fills a square metre of area. In the case of setts 8 cm. ($3\frac{1}{8}$ in.) high a divergence of 5mm. (about $\frac{7}{16}$ in.) is allowed, greater or less. In the Netherlands the following are approximately the sizes of porphyry setts: $7\frac{1}{2}$ in. by $6\frac{1}{2}$ in. by 7 in., $6\frac{1}{2}$ in. by $5\frac{1}{2}$ in. by $6\frac{1}{2}$ in., $5\frac{1}{2}$ in. by $5\frac{1}{2}$ in. by $5\frac{1}{2}$ in., $5\frac{1}{2}$ in. by 4 in. by $4\frac{1}{2}$ in. 4 in. by $3\frac{1}{2}$ in. by 4 in. For sandstone and granwacke setts usual dimensions are, approximately, top $5\frac{1}{2}$ in. by $7\frac{1}{2}$ in., base $4\frac{1}{2}$ in. by $7\frac{1}{2}$ in., height $4\frac{1}{2}$ in. to $5\frac{1}{2}$ in., and top 4 in. by $6\frac{1}{2}$ in., base $3\frac{1}{2}$ in. by $5\frac{1}{2}$ in., height $5\frac{1}{2}$ in. As regards quality the specification follows the ordinary lines, but it may be noted that sandstone setts must be free from veins; those of basalt must give a clear resonant note when struck; melaphyre setts must have no stratification.

Road Metal.—In the Netherlands coarse porphyry road metal must pass through a 5-cm. ring, and be retained by a 2-cm. ring, say 2 in. and $\frac{3}{4}$ in.; for small porphyry road metal the sizes are 4 cm. and 2 cm., say $1\frac{5}{8}$ in. and $\frac{3}{4}$ in.; for coarse basalt the sizes are 5 cm. and 3 cm. (2 in. and $1\frac{3}{16}$ in.); and for small basalt 3 cm. and 2 cm. ($1\frac{3}{16}$ and $\frac{3}{4}$ in.). Five per cent, or in some cases 3 per cent, may be larger or smaller. The colour of the basalt must be pale, almost blue, and free from white spots.

Asphalt.—An asphalt binder used in Germany is specified as containing 55 per cent of Trinidad Lake asphalt, 36 per cent of ground rock asphalt, 5 per cent of petroleum residuum, and 4 per cent of vaseline oil. The lake asphalt must contain between 50 per cent and 60 per cent of material soluble in carbon disulphide. The melting point should be 93 deg. Cent. (199·4 deg. Fahr.). In the Netherlands rammed asphalt must be made from native rock asphalt, and must contain 10 per cent to 14 per cent of bituminous substances. It must not lose more than 2 per cent when heated for six hours at a temperature of 225 deg. Cent. (437 deg. Fahr.).

Other Materials.—In Norway Portland cement for use in road work must make a mortar, 1 to 3, which will have a tensile strength of 227 lb. per square inch, after setting one day in air and twenty-seven days under water, and a crushing strength of 2,275 lb. per square inch. In the Netherlands paving bricks must have a strength of from 4,764 lb. to 7,110 lb. per square inch, the higher figure being frequently demanded, this being the minimum for warped bricks. The bricks must not absorb more than 10 per cent by volume of water. This is regarded as too high, and a lower figure is sometimes required. "Iron" bricks, it may be noted, must not have a fracture exhibiting mottled colours, but must be blue throughout.

METHODS OF TESTING.

In Germany considerable importance is attached to freezing tests. The strength of the material is tested after soaking in water, and similarly soaked blocks are tested for crushing strength after being frozen and thawed twenty-five times. The loss of weight due to the freezings and thawings is found, and the specimens are inspected with magnifying glasses. The temperature of freezing is 10 deg. to 15 deg. below zero Cent., 14 deg. to 5 deg. Fahr. The specimens are thawed with a definite quantity of distilled water at 15 deg. to 20 deg. Cent., 59 deg. to 68 deg. Fahr. Generally the importance of testing road materials under service conditions is recognised in Germany, but the more rapid artificial tests are also valued. Attrition tests are carried out by the French method in revolving cylinders.

Stone setts are tested for crushing strength, absorption of water, loss by freezings, loss by grinding (with a disc), loss under the sand blast, and resistance to impact. Road metal is tested in the Deval machine, by impact, by blows with a pick, and by suddenly applied loading, the last tests being made on the material when dry, when wet, and after repeated freezings. Similar tests are made in Austria, where the freezing test is regarded as of much importance. In Belgium and in Denmark most of the stone used is consistent in character, and little testing is done beyond examination by the working staff. In Frederiksberg, Denmark, the English Road Board Specifications for road tar have been adopted. In Budapesth a system of service tests has been adopted, the behaviour of trial strips of road being carefully recorded, with measurements of wear. A notable feature is the provision of a standard strip of proved material, laid alongside the strip of paving which is under test. In the Netherlands flagstones made of basalt or Quenast chippings and cement are tested for breaking strength on a span of about 30 in. These flags are also tested by an abrading machine for absorption of water, and by impact.

Housing Problems in County Areas.*

By ROBERT A LYSTER, M.D., B.Sc., D.P.H., County Medical Officer, Hampshire.

Before discussing actual problems and difficulties connected with housing, I wish to refer in a very few words to the place that housing should occupy in any campaign for improving the public health. A close study of the annual reports of many medical officers of health would give the average reader the impression that bad housing conditions were responsible for nearly all the ills that human flesh is heir to. Such annual reports usually contain tables of statistics which are alleged to prove the direct relationship between housing conditions and disease and death. The compilation of such tables must represent a vast amount of labour, but in practically every case they are entirely unreliable and fallacious. . . .

Nothing could be more unscientific than a mere compilation of mortalities or case incidences arranged according to housing conditions, and the classification of families according to housing conditions. Of course, it is inevitable that in the worst-housed families there will be the greatest mortality, but such mortality is not necessarily due to housing at all. My own opinion is that this is one of the less important factors in the production of a high infant mortality or in the causation of consumption. People who live in undesirable and apparently unhealthy habitations are usually forced there by circumstances owing to lack of means to pay for better accommodation. . . . I believe that most people with actual practical experience in the matter will agree that environment is largely the product of the man, and that the undesirable houses or slums in towns are largely occupied by the mentally and physically unfit, who have drifted into such surroundings from all ranks of society and will wherever they may live, will inevitably tend to exist among degrading and unhealthy surroundings.

In my opinion the modern requirements as regards housing cannot be regarded as belonging to the essentials for a healthy existence, such as food, for instance; and we shall only be endangering our cause by making ill-founded claims of this kind. Housing belongs to those other factors which have a profound influence upon the mental and moral development of the individual, and it is on this ground that we should take our stand when we demand a general improvement in housing conditions. On the other hand, all medical officers of health are constantly having brought to their notice houses which, from the most elementary point of view, need attention before they can be considered possible as human habitations, and it is the problems connected with such houses that I propose to refer to briefly.

Reasonable Essentials.

The first question that arises is "What are reasonable essentials to demand in considering any particular house?" In reply to this question I make the following list of requirements:—

(1) *Windows.*—These should be of sufficient area to render the rooms reasonably light, and should be made to open so as to be of value as ventilators.

(2) *Ventilation.*—A room with a fireplace, and a window of satisfactory size that will open so as to make an opening of at least half its area, can usually be ventilated satisfactorily if the occupier really desires ventilation.

(3) *Dampness.*—The roof must be watertight, and the walls should be provided with dampcourses, and outside protection as well in some cases. No soil should be in contact with the walls above the level of the ground floor.

(4) *Cleanliness.*—This is a responsibility shared by the occupier and the owner. The owner should be expected to keep the walls and floors sound, and the facilities for dealing with excreta and house wastes of such a character as to represent the best methods available for the district in which the house is situated. The occupier should be expected to maintain the house in a state of cleanliness.

(5) *Surroundings.*—Houses must not be so shut in as to render it impossible for them to be lighted and ventilated satisfactorily. Such circumstances are rarely met with in practice. In the majority of instances the available means of ventilation are rarely or never used.

(6) *Water Supply.*—A suitable water supply must be available within reasonable distance.

Assuming that a district council undertakes any serious inspection, there is little difficulty in finding houses and tenants that are unsatisfactory, and then the troubles begin. Some of the difficulties are as follows:—

(1) *The Owners.*—The average owner is willing to carry out reasonable repairs if approached with tact and consideration. There are two classes of owner, however, that give great difficulty. These are (1) the poor owner, who depends entirely upon the small rents of a few cottages, and (2) the wealthy owner, who declines to do anything and is quite willing for the houses to be condemned. The poor owner is very common in this county, and cases are constantly met where it seems cruel and oppressive to take vigorous action. Quite often the owner lives in one of the cottages in question, and is in many cases sharing the disadvantages of poverty with his tenants. A case was recently reported to me where the closure of three cottages resulted in the admission of the three families and the owner of the cottages into the workhouse. Wealthy owners often declare their intention of doing nothing, and say that they have no objection to the houses being condemned. The best plan of dealing with these houses is to proceed under the nuisance clauses of the Public Health Acts, and so compel the owners to deal with the defects.

(2) *The Tenants.*—Quite commonly the tenants in the unsatisfactory houses are such as to make one hesitate about the necessity, or even the desirability, of improving their surroundings. Experience tells us that when their present house is improved, or if they move into a better house, they will continue to live in the same filthy condition. On the other hand, one constantly meets clean, healthy families living in the most unsatisfactory houses.

(3) *The Supply of Houses.*—Most closing of houses makes matters worse instead of better, as a rule, because there are no other houses available. The families ejected either have to leave the district or go to the workhouse, or find accommodation in houses already more than full. Everyone with experience knows that the scarcity of houses is the real reason for the steady depopulation of rural areas.

Some Suggestions.

The above constitute the immediate difficulties that may be met, and I suggest that ways of meeting them are as follows:—

(1) The poor owner is not in a position to improve the property, but it is obviously desirable to improve rather than condemn the houses, not only because other dwellings are not available, but also because the elevation of the average class of people who live in these houses can only be a gradual and slow process. Housing authorities should have the power to purchase such property at a fair price, and to repair the same. Such powers are far more likely to be utilised than the present powers of provision of new houses, because such investments are much more likely to be remunerative. The property of the wealthy but obstinate owner should be dealt with as I have advised above, by using the powers under the Public Health Acts rather than the Housing Acts.

(2) *The Tenants.*—Efforts should be made in every district to improve the filthy, careless and destructive tenant who is so common in cottage property. There is no doubt that sanitary authorities have been very lax in this respect, and have devoted much attention to the owners, while they have overlooked the fact that the tenant is really not fit for better surroundings. Notices on occupiers are rarely or never served in many sanitary districts. My own experience as a local medical officer of health has convinced me that owners of property are much more reasonable and far more willing to effect improvements if they know that every effort is being made to make the dirty and destructive tenant realise his responsibilities.

(3) *The Supply of Houses.*—The supply of houses is deficient in nearly every district for the following reasons: (*a*) The stringency of the local by-laws. By-laws ought to be more elastic, so as to allow something to be built that will be between the permanent and perfect structures that are the aim of the modern

* Extracts from a paper read on Saturday last at a Provincial Sessional meeting of the Royal Sanitary Institute at Alton.

by-laws and the tumbledown and insanitary structures that people are compelled to inhabit for lack of anything better. The man who has saved a little money and has a site that would be quite satisfactory for his purpose, while neither his means nor his accommodations will allow him to build a residence that will serve for his great-grandson. Such men rarely have any ambition to build for posterity, and they should not be forced to do so. Builders also are prevented from supplying the need for more houses. The price of land and the modern by-laws combine to prevent the possibility of obtaining any return on this form of commercial enterprise.

Of course, the district council has power to build cottages, but they are not likely to do so, because the cost of such schemes is usually out of all proportion to the small rateable value of a rural or small urban area. The result is that their natural anxiety to keep down the local rates overcomes their inclination to relieve the urgent need for additional houses. Unfortunately, when the district council decides to do nothing the matter, in practice, ends there. It is true that under the Housing and Town Planning Act, 1909, the county council has power to act if the district council fail to do their duty, but it is unreasonable to expect any county council to declare war in this fashion with one of its constituent areas unless things have become so bad as to become a public scandal. There is no doubt in my mind that matters would be improved by giving the county council concurrent powers, and by making them directly responsible for dealing with housing conditions all over their area. It is no use to expect a county council to become involved in local quarrels with district councils over matters for which it has been given no definite or direct legal responsibility, but as soon as the responsibility became theirs every county council would act. An expenditure that is a heavy burden on a parish or a district council becomes a light and hardly noticeable charge when spread over a county area. If, in addition to giving county councils definite responsibilities concerning housing, it was arranged for subsidies to be forthcoming from Imperial funds, I have little doubt that some very substantial improvements in housing would soon be apparent.

At the same time it must be remembered that considerable care will be necessary in order to prevent such public provision being used for lowering wages in rural areas.. In fact, it is the opinion of many experts that the provision of cheap, rate-aided cottages is simply putting back the time when the agricultural labourer will receive sufficient wages to pay a reasonable rent, and that local doles and Parliamentary grants, however disguised, are mere temporary palliatives.

TOWN PLANNING AT HALE.

COMPETITION AWARDS.

The Town Planning Committee of the Hale (Cheshire) Urban District Council, with their adviser, Mr. Percy D. Lodge, F.R.I.B.A., of 3 Ridgefield, Manchester, at a meeting held last week, made the awards in connection with the above competition.

The first premium of £50 was awarded to Mr. R. Dunn, of Messrs. J. Cheal & Sons, Limited, Lowfield Nurseries, Crawley, Sussex, and the second premium of £25 to Messrs. Robert Bennett, A.R.I.B.A., and Wilson Bidwell, architects, Letchworth (Garden City), Herts. The design coming next in order of merit was that of Mr. John C. Thompson, of the Earle Estate Office, Manchester, and 12 Dunham-road, Altrincham.

The committee present, which consisted of a majority of the council, were unanimous in their decision.

The plans of the two successful competitors will be used as the basis for the scheme proposing which the council intend to make application to the Local Government Board for permission to prepare, the first step in which will be the acquisition of the area to be included in the scheme. This question will come up at the next meeting of the committee, which is to be held at an early date.

Institution of Civil Engineers.—The first ordinary meeting of the present session will be held at the Institution of Mechanical Engineers, Storey's-gate, S.W., on Tuesday next, when Mr. R. Elliott Cooper, the president, will deliver his annual address, and medals awarded by the council will be presented. The chair will be taken at 7 p.m.

DISPOSAL OF SEWAGE SLUDGE.

OLDHAM CORPORATION'S NEW PLANT.

At the sewage works of the Oldham Corporation, on Saturday, the new plant constructed under the direction of Dr. J. Grossmann for the disposal of sewage sludge was formally opened. The process for which the new works have been designed is one for the conversion of what have formerly been the waste products of sewage into marketable commodities—fertiliser and grease. Dr. Grossman, who is its inventor and patentee, has (the *Manchester Guardian* states) been working for the last five or six years under the Oldham Corporation as engineer to the Health Committee. The process has been thoroughly tested on an experimental scale, and the new plant, which is sufficiently extensive to deal with all the sewage of the borough, has been installed as the result of the preliminary experiments. The question of the disposal of the sludge from its sewage works has been in recent years of considerable difficulty to the Oldham Health Committee, and it is estimated that the new process will mean a saving in working costs to the corporation of about £1,000 a year. In addition to this, Dr. Grossmann has undertaken to take out of their hands the products of his process.

At the formal opening of the new works Dr. Grossmann, who gave a short account of the arrangement under which the corporation had adopted his process, said that with the old methods they had great difficulty and expense in disposing of the sludge at all. The first great advantage of the new system was that the sludge was disposed of, all the difficulties were removed, and the Health Committee would find itself £1,000 a year in pocket. He himself took the products of the process from the corporation and paid for them. But the advantage did not stop there. It was a question of public health, and it was generally agreed that wherever sludge was carried infection might be carried too; to put it on to the land, in fact, was to go against all the laws of hygiene. He had been working on the process now for some fourteen years, during six of which his time had been given to the town of Oldham. He had succeeded in disposing of all the grease with which they could supply him for several years to come, and for the fertiliser, which would need enriching before it became marketable, he had found purchasers up to the end of March.

By Dr. Grossmann's process about 1,000,000 tons of valuable manure capable of recovery, and at present running to waste, could, it is pointed out, be produced in this country, and 50,000 tons of phosphates, 50,000 tons of potash salts, and nitrogen equal to 100,000 tons of sulphate of ammonia taken back to the land. These constituents have an intrinsic value of about £2,500,000, and would be available for manuring at least 3,000,000 acres of land. The manure produced by Dr. Grossmann's process is a brown, odourless, perfectly sterilised powder, and the results obtained with it on farms in Cheshire and elsewhere have been good.

The plant at Oldham is capable of dealing with all the sludge produced from the whole population of Oldham. The settled sludge is pumped into special draining tanks, in which it is reduced to a slimy consistency. From these tanks it is moved by mechanical means into a receptable below, from which it is taken by bucket elevators to the top of the building into a storage tank. From this storage tank it is distributed into six hoppers, each of which is connected with a drying machine, which it automatically feeds. These drying machines, which are bricked in and heated by coal, contain an internal arrangement, driven by gearing and pulleys, by means of which the sludge is automatically moved from the inlet to the outlet, and the movement is adjusted in such a manner that by the time the sludge arrives at the outlet it is completely dried. Each drier has placed underneath it a distillation retort. In this it is automatically mixed with a little acid and moved along towards the outlet of the machine, from which the finished manure is automatically discharged. The building in which the plant is housed is 120 ft. by 45 ft., and 30 ft. high.

Lower Thames Valley District Surveyors' Association.—A meeting of this body, the president of which is Mr. H. F. Cowles, Assoc.M.Inst.C.E., will be held at the Town Hall, Twickenham, to-morrow (Saturday), at 6.30 p.m. It is hoped that members will note the change and endeavour to be present.

The Municipal Waterworks Association.

NEW INSTITUTION'S FIRST ANNUAL MEETING.

Founded with the object of safeguarding the interests in common of waterworks, and facilitating the acquisition of experimental, statistical and scientific knowledge relating to the construction, control and management of municipal water undertakings, the Municipal Waterworks Association held its first annual meeting on Saturday last in London. Membership of the new body is for the present confined to representatives of municipal water authorities serving communities of not fewer than 40,000 persons, but we believe it is not unlikely that before long this rule will be relaxed with a view to permitting representatives of areas with smaller populations being enrolled as members of the institution, the first president of which is Mr. E. B. Barnard, chairman of the Metropolitan Water Board.

At last Saturday's meeting, which took place at the offices of the Metropolitan Water Board, members were present from towns and districts supplying over 16,000,000 out of the total of 23,000,000 consumers within municipal areas, the attendance being as follows: Accrington—Mr. C. Harrison (manager); Ashton-under-Lyne—Mr. Alderman Fentem, Mr. Alderman Hall, and Mr. Fred Dixon, ASSOC.M.INST.C.E.; Barnsley—Mr. J. H. Taylor, M.INST.C.E.; Bolton—Mr. Jas. Hollywood, Mr. W. T. Braithwaite, Mr. R. Hamilton (secretary), and Mr. F. W. McCullough, M.INST.C.E.; Birmingham—Mr. Alderman Bewlay, Mr. E. A. Lees (manager), Mr. F. W. Macaulay, M.INST.C.E., and Mr. W. Gray, ASSOC.M.INST.C.E.; Bolton—Mr. Councillor Rimmer, Mr. Alderman Parkinson, and Mr. L. Mitchell, ASSOC.M.INST.C.E.; Bradford—Mr. Alderman Milner, Mr. Alderman Gadie, and Mr. Jas. Watson, M.INST.C.E.; Brighton—Mr. Jas. Johnston, M.INST.C.E.; Coventry—Mr. Alderman Drinkwater and Mr. J. E. Swindlehurst, M.INST.C.E.; Croydon—Mr. G. F. Carter, M.INST.C.E.; Derby—Chairman, Deputy-Chairman, and Mr. John Ward, M.INST.C.E.; District of the Lancashire Mid-[illegible]—Mr. J. M. M[illegible]; Doncaster—Mr. Councillor Halmshaw, Mr. Alderman Spencer, and Mr. F. O. Kirby, ASSOC.M.INST.C.E.; Dundee—Lord Provost Urquhart, Deputy-Chairman, and Mr. George Baxter, M.INST.C.E.; Dunfermline—Mr. D. Mackenzie; Edinburgh District—Deputy-Chairman, Mr. Wm. A. Tait, M.INST.C.E., and Mr. W. C. Reid; Falkirk—Mr. C. Mac[illegible], F.[illegible] District—Mr. Alderman Bickerstaffe, Deputy-Chairman, Mr. John Cook, ASSOC.M.INST.C.E., and Mr. G. Arthur (secretary); Glasgow—Mr. Bailie Campbell, Mr. Bailie Maclure, and Mr. J. R. Sutherland, M.INST.C.E.; Greenock—Mr. Thos. Mitchell, Mr. J. W. Bailey, and Mr. D. Macalister, M.INST.C.E.; Heywood—Mr. J. Diggle, ASSOC.M.INST.C.E., and Mr. S. Diggle, ASSOC.M.INST.C.E.; Hull—Mr. C. B. Newton, M.INST.C.E.; Keighley—Chairman, Deputy-Chairman, and Mr. M. K. Barnett, M.INST.C.E. Lancaster—Mr. [illegible] Huntington and another Member, and Mr. A. G. Bradshaw, [illegible]; Leeds—Mr. Alderman [illegible], Mr. Alderman Willey, and Mr. C. G. Henzell, M.INST.C.E.; Lincoln—Chairman, Deputy-Chairman, and Mr. N. M. K. Barnett, M.INST.C.E. Liverpool—Lieut.-Colonel R. S. Porter, Mr. W. P. Wethered, and Mr. Joseph Parry, M.INST.C.E.; Metropolitan Water Board—Mr. E. B. Barnard, Mr. John Sheehan, Mr. W. B. Bryan, M.INST.C.E., Mr. A. B. Pilling (clerk of the board), Mr. W. Moon (solicitor to the board), Mr. A. Newton (accountant to the board), Mr. W. J. G. Norris (deputy-clerk), and Mr. J. Restler, M.INST.C.E.; Northampton—Chairman, Deputy-Chairman, and Mr. F. Tomlinson (engineer and manager); Nottingham—Mr. Councillor A. R. Atkey and Mr. F. W. Davies (engineer); Plymouth—Mr. F. Howarth, M.INST.C.E.; Pontypridd—Mr. E. W. Terrey, A.M.I.MECH.E., and Mr. F. J. Alban (accountant); Reading—Chairman, Deputy-Chairman, and Mr. L. C. Walker, A.M.I.MECH.E.; Rotherham—Chairman, Deputy-Chairman, and Mr. E. B. Martin, ASSOC.M.INST.C.E.; Salford—Chairman, Deputy-Chairman, and Mr. L. H. A. Gaunt, ASSOC.M.INST.C.E.; Sheffield—Chairman, Deputy-Chairman, and Mr. W. Terrey (manager); Tynemouth—J. W. McKerrow, ASSOC.M.INST.C.E.

In the course of the proceedings Mr. E. B. BARNARD delivered the following

PRESIDENTIAL ADDRESS.

This is an age of associations, an age when men are engaged in different branches of public work find themselves together with one great aim in view—the advancement of the public interest. It is, perhaps, a singular thing that until the formation of this association no attempt had been made to organise and bring together the representatives of the great municipal water undertakings, for it might be difficult indeed to find a more fertile field of work, and I venture to entertain the confident belief that great advantage to the community at large will result from our bringing to bear upon the problems and anxieties that beset us the concentrated experience and wisdom of those who for many years have been so actively engaged in providing for the people of this country one of the prime necessities of life. The man in the street is but too apt to take for granted the provision of a proper water supply; but the fact remains that the very life of the community depends upon such a supply, and no one knows better than we who are present to-day how huge is the work which has to be performed in order to safeguard and protect that most vital public service.

It may be thought that each particular community is quite able to look after its own interests, and to deal, without the assistance of any outside persons, with the problems which confront it. It may be that London has its particular problems, and that the questions which confront Glasgow are not those with which Birmingham or Sheffield have to deal; nevertheless, there are many things which, while of first-rate importance to each individual undertaking, can be, indeed must be, considered from the broader aspect of the whole country.

[illegible] the committee rooms of Parliament afford ample opportunity for the discussion of matters of this kind. But that, I feel, [illegible] and [illegible] treatment of the case, for while each one of us will acknowledge and deeply appreciate the great care and attention which the Committees of Parliament give to our requests, and the marked ability which invariably characterises their deliberations, the fact remains that there is a vast amount of work which ought to be undertaken before we enter the Parliamentary arena, so that public opinion in connection with water supply may be assisted and guided on lines which have been proved [illegible]. Those who have had many dealings with the State departments appreciate to the full how welcome to them are the practical views and opinions of those who, equipped with ripe experience and knowledge, are best able to judge of the various questions which arise from time to time, and I cannot conceive anything but cordial welcome to an association such as our own which will provide machinery for the consideration of the great questions connected with the public water supply of this country.

The work of our association lies in the future, and time will only permit of my indicating in the broadest outline the questions which I hope will be dealt with in due season. That work, perhaps, will naturally divide itself under four main headings—namely, (1) administration, (2) public health, (3) finance, (4) [illegible].

ADMINISTRATION.

Under the heading of administrative problems perhaps one stands out with special prominence—that of the constitution of watershed conservancy authorities; for I suppose that no problem is greater than that of apportioning the natural water supplies of the country between the various communities. Hitherto there seems to have been little policy but one of "first come first served." If any large city or town applies to Parliament for powers to appropriate an area or a source, there seems to be no machinery by which the claims of other localities or authorities can be considered except to the extent to which those localities and authorities can incur the cost of putting their claims before Parliament. Admirable as this procedure may be in its application to individual cases, it nevertheless fails to deal with many important aspects in relation to the country at large, and as the years roll on and the untouched sources of supply become fewer and fewer, it may, perchance, be found that a more general consideration of the subject would have been in the public interest. The matter has already been brought forward by the Royal Commission on Sewage Disposal, who, in their Fifth Report, [illegible]

whose duties should comprise the protection of water supplied from pollution, the collection of information as to water supplies available in various parts of the country, and as to the need of water in different areas. Whatever may be said as to the establishment of a new department or authority to deal with this matter, I think the various problems thus foreshadowed would derive the greatest assistance if they could be discussed in an association such as we have now formed.

PUBLIC HEALTH.

The next department of work to which I have referred is that relating to public health, under which I deal with the question of the purity of our supplies. I suppose every member in this room will admit that the primary aim of any authority responsible for a water undertaking should be the provision of a supply whose purity is beyond reproach. Here, again, difficulties of infinite variety confront the different undertakings throughout the country; the problems of an authority supplying a river-derived water are not those which have to be dealt with by one whose supply is derived from natural or artificial lakes, and the cares and responsibilities of those who draw their water from wells sunk deep in the chalk are very different from those of undertakings which depend upon peaty uplands. Nevertheless, it does seem to me that a body of men familiar with the difficulties of individual localities would, by a joint discussion of the whole question of the quality of water supplied, perform a work of incalculable benefit to the community at large.

FINANCE.

The third heading—namely, that of finance—would bring us to a matter upon which we shall, no doubt, have widely divergent views. But here again I think the opportunity of comparing the systems in force in different parts of the country will be of the greatest possible interest and practical importance, and I look forward with a good deal of gratification to the opportunity which I think this association will afford of enabling one to compare the systems of charge adopted in different parts of the country, and of studying the various aspects of the relationship of the water consumer to the ratepayer, of the domestic consumer to the trader, and other problems of a like character.

Under this heading, too, will arise questions which to me are of peculiar interest—namely, those relating to assessment and rating. It is suggested that a question of great practical importance is arising in connection with the assessment of compensation reservoirs. This, perhaps, is only one of many rating problems which confront us, and I hope that during the year we shall have an opportunity of discussing these matters in some detail.

PHYSICAL QUESTIONS.

The last heading to which I have referred relates to what I call "physical" questions. Under this heading I include problems relating to the construction of works of all kinds, and the great responsibility of securing a first-class supply from the point of view of "quantity." In this matter, as in others, we all have our peculiar difficulties. Nevertheless, I think this is a subject on which we might give one another valuable assistance, and ideas in discussing, for instance, such things as the normal consumption per head of population supplied, in describing experiments with apparatus invented from time to time, in dealing with problems of underground water, in recording statistics of rainfall, and in the other innumerable questions which will arise in this connection. It may be even that some of you will desire to look so far ahead as to discuss the possibility of using sea water for non-domestic purposes. I suppose that, sooner or later, if the population of this country continues to increase, that question will become one of practical politics. It may be that that day is nearer than some of us anticipate, and the question may, perhaps, be usefully borne in mind in connection with our consideration of the needs of the country as a whole with regard to water-supply.

It is impossible in the time at our disposal this morning to proceed to the discussion of the various matters to which I have briefly alluded, and perhaps this is not the time at which it could be usefully undertaken. None the less, I hope we shall have an early opportunity of discussing some, at all events, of these problems, and perhaps this morning the most useful work we can undertake is to consider how to provide opportunities for their full and adequate discussion.

CONCLUSION.

In conclusion I can only say this—that I appreciate to the full the vital importance of the work upon which we are entering, and it is therefore with a sense of deep responsibility that I undertake the office of first president of the association. I regard my election to that office in no personal sense, and I believe that you have done me the honour of electing me in my capacity of chairman of the Metropolitan Water Board. I am therefore speaking on behalf of the largest water authority in the country, probably in the world, when I say that the Metropolitan Water Board appreciates the honour which has been done to it by the water authorities throughout the country, and will always be glad to render any assistance in its power to other municipal authorities in their efforts to provide the water consumers for which they are responsible with an adequate supply of pure and wholesome water.

ELECTION OF VICE-PRESIDENT AND OFFICERS.

Mr. James Watson, the engineer of the Bradford Waterworks, afterwards proposed, and Mr. Alderman Pickersgill, of the Leeds Waterworks Committee, seconded, that Mr. Bailie Archibald Campbell, J.P., chairman of the Glasgow Water Committee, should be elected to the office of vice-president. This motion was carried unanimously.

The following appointments were then made:—

Joint Honorary Secretaries: Mr. C. G. Henzell, M.INST.C.E., engineer of the Leeds Waterworks, and Mr. William Terrey, manager of the Sheffield Waterworks.

Honorary Treasurer: Mr. E. Antony Lees, manager of the Birmingham Waterworks.

Honorary Solicitor: Mr. Walter Moon, the solicitor of the Metropolitan Water Board.

Honorary Auditors: Mr. R. Hamilton, of Belfast, and Mr. C. Arthur, of the Fylde Water Board.

EXECUTIVE COMMITTEE.

As the result of ballot the following gentlemen were elected as members of the Executive Committee: Sir William Slater Brown, Lord Provost of Edinburgh; Messrs. A. R. Atkey, chairman of Nottingham Corporation Waterworks; J. Cook, ASSOC.M.INST.C.E., engineer to the Fylde Water Board; J. Hollywood, chairman of Belfast and District Waterworks; Joseph Parry, M.INST.C.E., waterworks engineer, Liverpool; A. B. Pilling, clerk of the Metropolitan Water Board; W. Rimmer, chairman of Bolton Corporation Waterworks; J. R. Sutherland, M.INST.C.E., waterworks engineer, Glasgow; William Terrey, waterworks manager, Sheffield; L. C. Walker, A.M.I.MECH.E., waterworks engineer, Reading; James Watson, M.INST.C.E., waterworks engineer, Bradford; and the Chairman of the Birmingham Water Committee.

Millars' Timber and Trading Company, Limited.—We understand that the order has been placed with this company for the sleepers for relaying the whole of the line of the Central London Railway in their well-known fire-resisting hardwood "Jarrah."

Shorland's Patent Manchester Stoves.—The Spittlesea Hospital, Luton, is being supplied with Shorland's warm air ventilating patent Manchester stoves with descending smoke flues and patent exhaust roof ventilators by Messrs. E. H. Shorland & Brother, Limited, of Failsworth, Manchester.

Business Announcement.—We are informed that the Canadian Mineral Rubber Company, Limited, of 32 Victoria-street, Westminster, have secured the services of Mr. C. O. Seymour, who is well known to a large number of county, municipal and other surveyors. Mr. Seymour has acted for the past two and a-half years with much success in the management of the Roadoleum branch of the Anglo-American Oil Company. This latter company, we understand, have given up the active marketing of Roadoleum; and as Mr. Seymour is nothing if not active and enthusiastic in bituminous road work, we congratulate him, and in no less degree his present principals, on what must be a satisfactory connection on both sides. Mr. Seymour asks us to state that he will now bring before his friends the merits of "Camarco" for road purposes. This is a bitumen without a trace of coal tar or pitch, nor is it a petroleum residue. The basic material of this high-class asphalt is gilsonite, the purest form of bitumen known, and it is claimed that this natural base gives to "Camarco" more elasticity, adhesiveness and tensile strength than any competitive materials, while it also possesses the imperishability and resistance to extreme weather conditions so necessary for a road binder.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

COUNCIL MEETING.

At a meeting of the council of the Institution of Municipal and County Engineers, held at the offices of the institution on Saturday last, there were present Messrs. R. J. Thomas (president, in the chair), T. W. A. Hayward, J. S. Pickering, J. S. Brodie, J. W. Cockrill, A. D. Greatorex, N. Scorgie, W. Stubbs, W. N. Blair, J. Patten Barber, J. A. Brodie, J. L. Redfern, W. H. Prescott, H. T. Wakelam, O. E. Winter, C. F. Wike, E. B. Martin, Chas. Brownridge, W. Harpur, A. E. Collins, Thos. Cole (secretary) and H. A. Giles (assistant secretary).

New Offices Committee.—Mr. Carter was elected chairman. The committee further considered the acquirement of suitable headquarters.

Roads Committee.—Mr. J. Scott, president of Scottish Road Surveyors' Association, and Mr. J. Willmot, county surveyor, Warwickshire, were co-opted members of the committee.

A letter of thanks from the council of the International Roads Congress was received for the donation of 100 guineas towards the technical expenses of the congress. It was resolved that the whole council of the institution be appointed delegates to the congress.

On the recommendation of the Standardisation Committee the council approved the principle of specifying as the basis of a street lighting contract "illumination" instead of "candle power," as suggested by the Joint Committee of the Institution of Electrical Engineers, Institution of Gas Engineers, Institution of Municipal and County Engineers and the Illuminating Engineering Society. Subject to amendment in details the draft scheme prepared by the Joint Committee was approved.

The secretary having reported that the first edition of the "Standard Specification for Concrete Flags" had been exhausted, and that a number of orders could not be executed, the council, on the recommendation of the committee, gave instructions for the preparation of a second edition.

On the recommendation of the committee the council agreed to certain amendments proposed by the Sectional Committee of the Engineering Standards Committee on Vitrified Ware Pipes.

Election of Members.—Messrs. E. E. Rich, engineer and surveyor to the Bushey Urban District Council: W. H. McLean, municipal engineer, Khartoum City: J. Mathison, engineer and surveyor to the Langport (Somerset) Rural District Council; G. Palmer, assistant county surveyor, Cornwall County Council; and F. Stanghe, surveyor to the West Sterling Rural District Council.

Election of Associate Members: Messrs. G. Dyke, engineering assistant, Walsall Corporation, and S. C. Lloyd, assistant county surveyor, West Sussex.

Election of Students.—Messrs. H. E. Bradley, surveying assistant, Worcestershire County Council, and E. Bleakley, pupil to F. E. Jones, Tyldesley.

Transfer to Member: Mr. D. Cattanach, burgh surveyor, sanitary inspector and master of works for Tobermory (affiliated member).

The General Purposes Committee reported in reference as to arbitration clause, as proposed by the Builders' Federation, the Builders' Merchants' Alliance and the Bituminous Paving Manufacturers' Association.

The council learned with much regret of the deaths of Messrs. J. Smith, W. J. Press and F. W. Richardson, and letters of condolence were ordered to proceed.

On the recommendation of the Constitution Committee, Mr. Hayward was elected a member of the committee.

The secretary was instructed to forward a cheque for the balance of sitting moneys received for the Will am Jones Fund, and the account was accordingly closed.

Mr. W. H. Prescott was elected honorary secretary and treasurer to the Mansel Davies Fund, and a sub-committee was appointed to prepare a scheme for the working of the fund.

It was resolved that the offices of the institution be placed at the disposal of the District Committees for meeting purposes by arrangement with the secretary.

On the recommendation of the Town Planning Committee, the question of printing and circulating to the members of the institution a report by Mr. J. S. Brodie as to advertisement hoardings was referred to the Finance Committee. Mr. Hayward was appointed a member of the committee.

The council resolved that a Town Planning Conference be held at the next annual meeting, and that steps be taken with a view to obtaining the sanction of the Local Government Board for the payment of expenses of delegates attending. The council resolved that a competition open to all members, associate members and students of the institution for the laying out of a seaside pleasure resort be held in connection with the conference. The rules governing the competition were ordered to be drawn up and circulated.

On the recommendation of the Tramways Committee, the council resolved that Mr. Wakelam be asked to submit a report of the committee as to corrugation of tramway rails in the shape of a paper, and that the paper be submitted to and discussed at a meeting of the institution to be held in the Metropolitan District on Friday, December 6th, at 8 p.m.

The report of the Finance Committee recommending the payment of various accounts was received, and cheques were ordered to be drawn.

Testamurs were granted to the following candidates who passed the examination of the institution in October last: Messrs. G. Rigby, G. Stanley, G. Smith, R. H. Davies, J. R. Hill, F. J. Harris, W. B. Acton, B. Archer, T. S. Soorma, F. H. Holden, H. E. Griffiths, P. E. Harvey, E. Pilling, E. Wickenden, G. R. Folland, F. W. Dean and H. Anderson.

The attention of the council having been drawn to the appointment as surveyor to a district council of a gentleman having no engineering qualifications, a letter was ordered to be sent to the district council and a copy to be sent to the Local Government Board.

Messrs. A. D. Greatorex and N. Scorgie were reappointed delegates from this institution to the N.A.L.G.O.

The secretary reported intervention on behalf of a member whose competence to hold his position as surveyor to an important urban district council had been attacked without justification, and the council learnt with satisfaction that such intervention had led to the charge being defeated.

The secretary reported the satisfactory completion of the arrangements made jointly by Mr. Bryan, chief engineer to the Metropolitan Water Board, and the institution, for the visit of the Association Générale des Hygiénistes et Techniciens Municipaux. The visitors expressed themselves as delighted with the programme of visits to works arranged for them, and the council learnt with pleasure that during their visit Mr. Cole was elected an honorary member of the association.

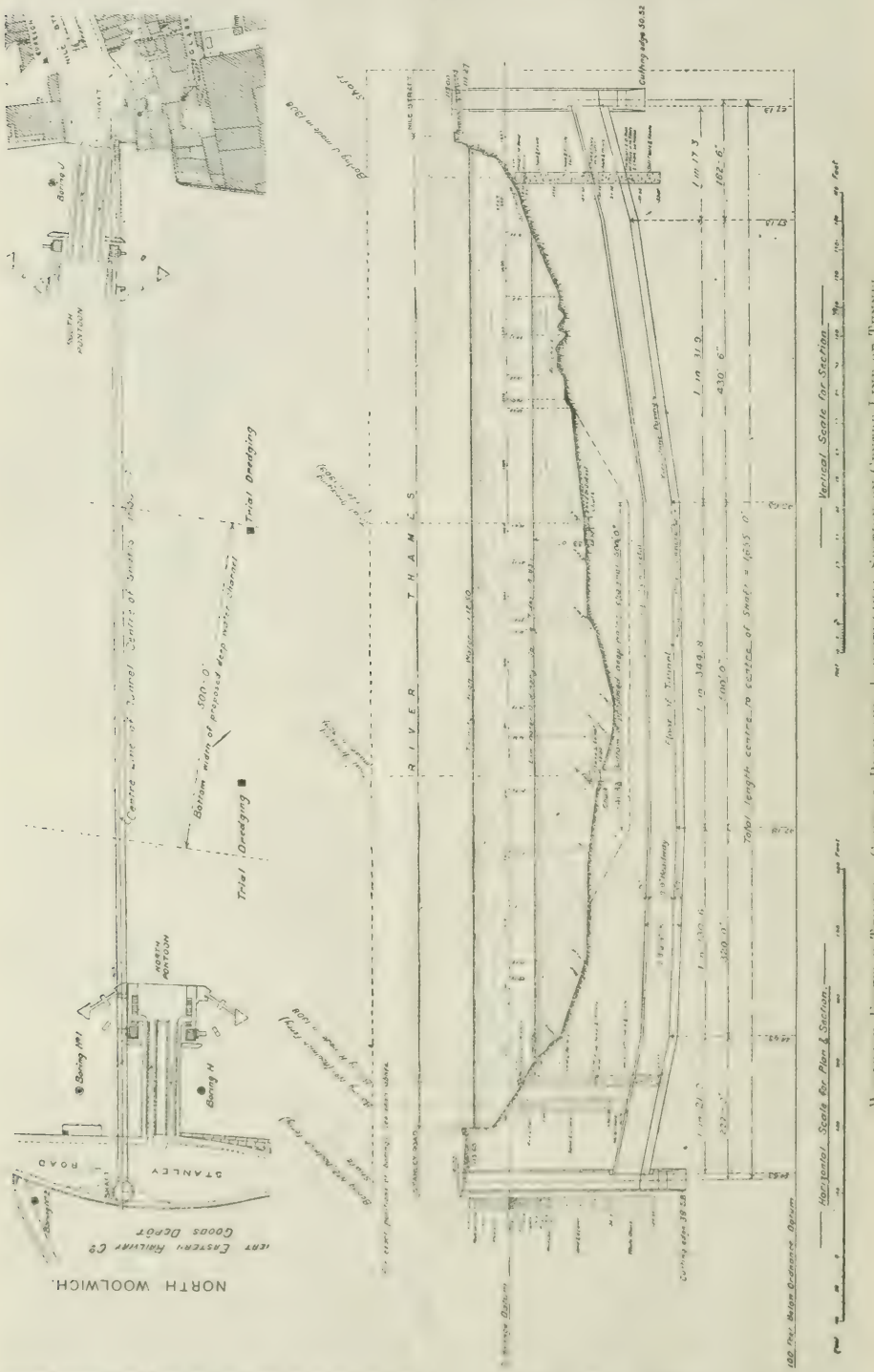
Leiston (Suffolk) Water Supply.—For many years past the Urban District Council of Leiston-cum-Sizewell, Suffolk, has been dependent for its water supply on a well belonging to a local engineering company, but recently steps were taken to obtain an independent supply. On the advice of Mr. Chas. H. Warren, of Woodbridge, a trial well was sunk on a site a short distance from the railway station, and water was found from 18 ft. to 20 ft. from the surface, the final depth of the boring being 40 ft. A fourteen-days' continuous test gave an average supply of 6,333 gallons an hour, and the water on being submitted to analysis was found to be of good quality. The cost of the preliminary work has been £500, and it is expected that a further £800 will be spent in providing permanent pumping machinery.

Road Tarring in Uxbridge.—Reporting specially to the council on the use of tar on the highways, the surveyor to the Uxbridge Urban District Council, Mr. J. W. Harrison, writes: "In the method used by me crude cold tar is hand-painted on the road by means of rubber squeegees, and only about 3½ sq. yds. can be done with 1 gallon of tar, whereas if the tar were put on hot, from 5 sq. yds. to 7 sq. yds. can be done with 1 gallon. This, of course, is a great saving in the cost of tar, but against this must be put the cost of tar-boilers (and more than one would be required to expedite the work), also the fuel, so that for the first year or two the cost would probably be more than with cold tar. As the cost of tar is increasing each year, and has gone up to us from 1¼d. to 2½d. since we started, and as we may get some help from the county council or the Road Board if we comply with certain conditions, I do not advise you to do this work departmentally after the next year, and only for the next year, as you have already contracted for the tar, and if let to contract it should be let a long time ahead, so as to make it a condition that it was all done by the end of May, weather permitting."

WOOLWICH FOOTWAY TUNNEL OPENED.

DESCRIPTION OF THE WORK.

On Saturday last Lord Cheylesmore, chairman of the London County Council, opened the new footway



Woolwich Footway Tunnel. General Plan and Longitudinal Section on Centre Line of Tunnel.

communication across the river Thames for the eastern districts of London was initiated in 1889, when a ferry was established at the point where the new tunnel has been constructed, three vessels being employed on the service. Two causes, however, militated against the continuous working of the ferry—fog and,

...which has been constructed by that authority to connect North and South Woolwich.

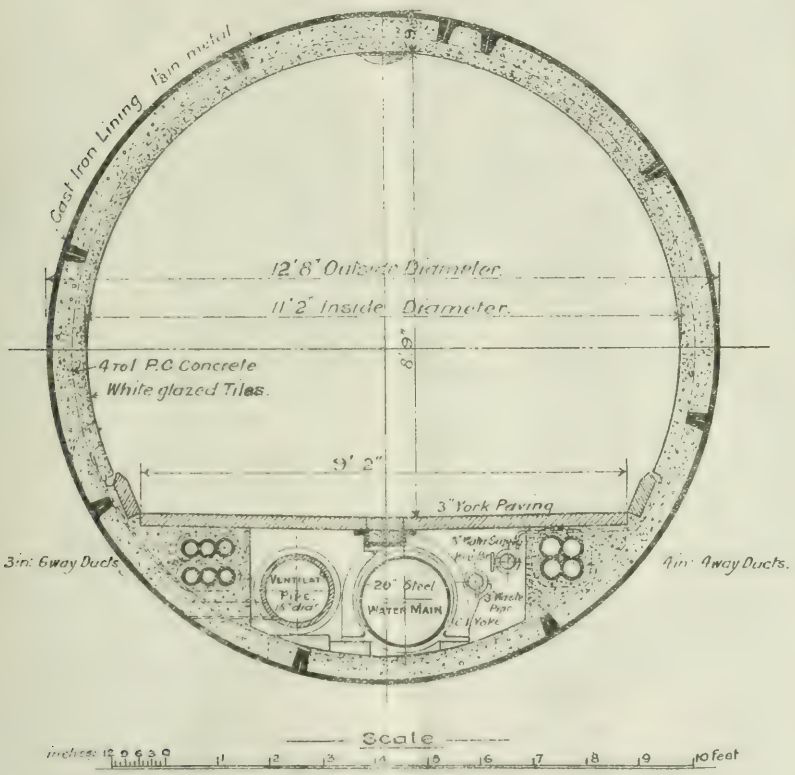
The first successful attempt to provide free means of

in exceptionally severe winters, ice. For instance, during the eight years 1900–1907 the ferry was suspended, owing to fogs, for no fewer than 833 hours, or

an average of 104 hours a year. In 1907 it was suspended for as many as 187 hours. In 1895, owing to floating ice, the ferry was suspended on a part of every day from February 7th to 23rd—on one day for more than fourteen hours. The stoppages, especially those from fog, usually occurred during the early morning, when workpeople had to cross the river to their work and serious hardship was thus inflicted on a large number of persons. In view, however, of the heavy cost of constructing and maintaining the ferry, the council did not feel justified for some time in incurring further expenditure on cross-river communications at Woolwich, but turned its attention to similar works of even greater urgency and importance in other parts of London. The chief of these, the cost of which amounted to about £2,000,000, were the reconstruction of Vauxhall Bridge and the construction of Rotherhithe Tunnel. The former was completed in 1906 and the latter in 1908, and in November of the latter year the council felt that it was in a position to submit to Parliament a scheme for the construction of a tunnel for foot passengers between North and South Woolwich. It was pointed out that, if such a tunnel were constructed, it would no longer be necessary to provide a practically continuous service of ferry boats, and the council accordingly decided to obtain, and were subsequently granted, Parliamentary authority for the reduction of the ferry service. Tenders were invited, and the lowest, that of Messrs. Walter Scott and Middleton, Limited, amounting to £78,860, was accepted in December, 1909.

In accordance with sec. 21 of the Tunnel Act, plans of the works, designed so as to allow of dredging the river to a depth of 30 ft. below low water, were submitted to the Port of London Authority for its approval. The authority admitted that the plans were in order and that such a depth would probably be found adequate for some years to come. They pressed the council, however, to modify the plans so as to allow of the river being dredged over the tunnel to a depth of 40 ft. The Tunnel Act authorised the council to deviate to an extent not exceeding 10 ft. from the levels shown on the deposited plan, and, as a deviation of 5 ft. was made when the plans were prepared, the council could not, without special Parliamentary authority, deviate to the full extent suggested by the authority. The contractors required an additional payment of £1,500 if the tunnel were lowered 3 ft., £4,500 for a lowering by 5 ft., and £10,000 for a lowering by 10 ft. The council, while anxious to meet the views of the authority, was not prepared to cause the delay and to incur the considerable extra expense which the adoption of the authority's proposals in their entirety would have entailed. It agreed, however, to lower the tunnel by 3 ft., thus enabling the river at this point to be dredged to a depth of 33 ft. The authority expressed themselves as satisfied with this concession.

The scheme adopted by the council did not include the provision of lifts, although the works were so arranged that, if necessary, lifts could be added at a future date. While the works were in progress the Woolwich Borough Council strongly urged that the absence of lifts would be a serious inconvenience to persons using the tunnel. The council finally concurred in this view, and agreed to follow the course adopted at the Greenwich footway tunnel, and to provide lift accommodation at both ends of the tunnel. The additional cost of this amounted to £5,000. The work was entrusted to the contractors, who were allowed to sub-let it to the Easton Lift Company, Limited.



Woolwich Footway Tunnel. Cross-section, Looking North.

The tunnel was designed by, and the work executed under the supervision of, the council's chief engineer, Sir Maurice Fitzmaurice, C.M.G., M.INST.C.E., who has supplied the following description of the undertaking:—

In design this work closely resembles the Greenwich Tunnel, constructed by the council and opened to the public in 1902. It consists of a cast-iron tube

of 12 ft. 8 in. outside diameter, connecting two vertical shafts of 25 ft. inside diameter and about 60 ft. deep. The length between the shafts is 1,635 ft., or nearly ¼ mile. The thickness of the river bed between the top of the tunnel and the river is about 10 ft. at the deepest place.

The shafts consist of steel caissons formed of two skins of steel plating, the annular space between them being filled with concrete. Both shafts were sunk by excavating inside them under compressed air. They are lined with brickwork, and in each there is a spiral steel staircase giving access to the tunnel from the street above. In the well of each staircase there is an electric lift capable of carrying forty passengers. The electric motors, gearing, switchboards, &c., are installed upon an upper floor in the brick buildings which have been erected above each shaft. Electric current for power and lighting is supplied from the mains of the Woolwich Borough Council.

The tunnel was constructed by the shield method under compressed air. The ground passed through was almost entirely chalk with numerous fissures which were in free communication with the river. The air pressure required to keep the working face dry varied from 18 lb. to 28 lb. per square inch, according to the state of the tide and other conditions. A fair day's progress in tunnelling was 8 ft. 6 in.

The cast-iron rings composing the lining are 1 ft. 8 in. long and each ring is made up of nine plates. The thickness of the metal is 1⅛ in., and about 2,000 tons were required in all. After the tunnel was completed from shaft to shaft it was lined throughout with concrete, upon which white-glazed tiles are fixed. The footway is paved with York stone flags, and underneath are water pipes and electric cables for the tunnel service, and also a steel water main 20 in. in diameter, and high-tension electric power cables which have been laid by the Metropolitan Water Board and the Woolwich Borough Council respectively.

The construction of the north shaft was begun on May 1st, and it was sunk to its final level in September, 1910. Actual tunnelling was started on December 1st, 1910, and finished in October, 1911. The resident engineer was Mr. E. H. Tabor.

TESTS OF PAVING MATERIALS IN PARIS.

The Paris municipal laboratory for the testing of paving materials has recently been improved by the alteration of some of the old apparatus and the installation of new machines.

Shaping Machine.—In order to shape the specimens for testing with perfectly flat and parallel faces a polishing machine with a carborundum tool is used, capable of being run at a speed of 1,400 revolutions per minute.

Impact Tests.—For tests of paving-sett materials a tup weighing 6 kilogs. and dropped from a height of 1 metre is used, the apparatus permitting of a range of drop between 5 cm. and 1 metre (2 in. and 39 in., say). The specimen is contained within a box which is bolted to the anvil, and it is held in the middle of the box by four springs, one on each side. The specimen stands 1 cm. above the box, and the blow is transmitted through a round-topped steel cap with a flat base.

Attrition Tests.—The blocks are tested by means of a cast-iron drum 60 cm. in diameter, turning on a horizontal axis. The blocks are placed in pivoted boxes sliding in vertical guides. The first part of the tests consists in imparting the curvature of the drum to the side of the block. Sand (crushed sandstone) and water are delivered by funnels in front of each specimen. The specimens are spaced apart by gaps of their own width, and after every 1,000 revolutions the drum is shifted exactly this distance on its axis to prevent the formation of grooves in the shell of the drum.

Tendency to take a Polish.—At present there is no apparatus for testing the tendency of the stone to be rubbed smooth, but owing to the importance of this matter in the case of materials used for paving streets, it is now under investigation with a view to the devising of suitable apparatus.

Fire at Tytherington Quarry.—A fire occurred in the Tytherington Main Quarry on the evening of the 24th ult., a gas plant and engine-house being destroyed. The damage done is estimated at £500, but the Tytherington Stone Company state that the fire will not seriously affect the working of the quarry, and that business will be carried on as usual.

BIRMINGHAM TOWN PLANNING SCHEME.

LOCAL GOVERNMENT BOARD INQUIRY.

Major C. E. Norton and Mr. Thomas Adams, on behalf of the Local Government Board, last week presided at an inquiry into an application by the Birmingham City Council for approval of their town planning scheme for East Birmingham, the preparation of which was sanctioned in March, 1911. It was explained by the town clerk, Mr. E. V. Riley, that the area to which the scheme applied embraced 1,443 acres, and that in the middle it was an excluded portion, almost entirely built up, measuring 98½ acres. Situated on the east side of Birmingham, the district was in part of four wards and in two Parliamentary divisions, and was drained in the northern part by the river Tame, and in the Southern part by the river Cole. The one distinguishing feature of the district was that, while there were plenty of means of communication from almost any part of the centre of Birmingham, there was no communication from north to south of the district itself, for the railway line formed an almost impossible barrier, except at two places. The scheme submitted, however, provided for the remedying of this defect by the construction of several new roads, and for up-to-date and proper means of communication from east to west. Those roads numbered twenty-one. Provision was also made for the limitation of the number of houses to the acre. The area was divided into zones, and the building density on these parts was fixed at eighteen, fifteen or twelve houses to the acre, with a stipulation that not more than twenty houses should be erected on any one acre. The area adjoined a manufacturing and industrial district, and the council had thought it desirable to set apart certain spaces for factory sites, while other spaces had been set apart for allotments. It was also the intention of the council to provide works for the improvement of the river Cole and the relief of flooding.

The city surveyor, Mr. H. E. Stilgoe, M.INST.C.E., gave details of the proposed new roads, and was cross-examined by Mr. H. H. Joy on behalf of a number of property owners who are affected by the scheme. With respect to the proposed limitation of the number of houses per acre, Mr. Stilgoe said he was not aware that another large city entering upon a town planning scheme were prepared to allow twenty-four houses to the acre. Whatever might have been decided on elsewhere, he added, he was certain that twenty-four houses to the acre in this case would not be in the best interest of the district.

ROAD BOARD GRANTS.

CORPORATION'S CIRCULAR TO LOCAL AUTHORITIES.

At a meeting of the Thames Valley Councils' Association held on Wednesday of last week a letter from the clerk to the Reigate Corporation on the above subject was read. It appeared that representations had been made to the Surrey County Council as to the manner in which the Road Board had treated local authorities as to grants, and the reply was that the Highways and Bridges Committee, before taking any action, thought it would be advisable for Reigate to circularise the local authorities to ascertain how many were aggrieved at the Road Board's action. The Reigate Corporation were of opinion that the Road Board were not carrying out the intentions of Parliament, as when the Road Board was constituted it was clearly laid down that a large portion of the grants made to it should be appropriated for road surface improvements, road widenings, objectionable corners, and so forth. It was manifest that these conditions were not being complied with, and not a little dissatisfaction had arisen owing to the manner in which applications were met by the Road Board. The association's views were therefore asked upon this important question.

It was stated by a delegate from Barnes that his authority thought the contributions given by the Surrey County Council were totally inadequate, and it was decided that the association should reply to Reigate in similar terms.

Institution of Electrical Engineers.—The opening meeting of this body is fixed for Thursday, November 14th, at 8 p.m., when the president, Mr. W. Duddell, F.R.S., will deliver his inaugural address.

Royal Sanitary Institute.

PROVINCIAL SESSIONAL MEETING AT ALTON.

A largely attended provincial sessional meeting of the Royal Sanitary Institute was held on Saturday morning last at Alton, Hants. The subject of housing problems in county areas was introduced in a paper submitted by Dr. Robert A. Lyster, medical officer of health, county of Southampton. A paper dealing with the municipal work of the district was afterwards presented by the surveyor to the urban council, Mr. G. Bertram Hartfree, F.S.I., M.S.E., and, together with the first-named contribution, will be found elsewhere in this issue. Those attending the meeting included, in addition to Mr. H. Percy Boulnois, chairman of the council of the institute, who presided, Mr. A. J. Martin, president of the Institute of Sanitary Engineers, Dr. Samuel Rideal, Mr. W. V. Anderson, city surveyor of Winchester, Mr. R. W. Cass, surveyor to the Farnham Urban District Council, Mr. F. R. Phipps, borough surveyor of Basingstoke, Mr. C. G. Mason, borough engineer of Guildford, Mr. J. A. Manning, divisional surveyor to the Hampshire County Council, and Mr. F. C. Uren, surveyor to the Aldershot Urban District Council.

A cordial welcome to the town was given by Mr. Gerald Hall, chairman of the urban district council.

Mr. H. Percy Boulnois, M.INST.C.E., chairman of council of the institute, in thanking the district council for giving facilities for the meeting, observed that these gatherings did an enormous amount of good wherever they were held. Papers on sanitary questions were discussed and brought home to the people of the different localities the need for sanitation. Legislation would, of course, go a long way towards helping sanitation, but unless some attempt were made to educate people legislative measures would remain comparatively ineffective. It was impossible to make a people religious by legislation, or to make them even temperate by legislation; it was the education of the masses of the people that brought about the necessary reforms, and the Royal Sanitary Institute was spreading knowledge all over the country, and evoking that interest in the subject that was necessary to progress.

DISCUSSION OF PAPERS.

It was agreed that the discussions on the two papers should be taken together, and the debate was opened by Dr. J. F. Briscoe (Alton), who remarked that the town was to be congratulated on having such an energetic and practical man as Mr. Hartfree fulfilling the duties of surveyor. The probable appointment of a Minister of Public Health in the near future was commented upon by the speaker, who, in the course of further remarks, put forward the suggestion that local authorities might be well advised in dealing with housing matters to insist on the minimum requirements in county areas.

Mr. C. G. Mason, borough engineer of Guildford, spoke of the lead which his town had taken in the housing problem in Surrey. He agreed entirely as to the desirability of ample garden space in cottages. His corporation had recently carried out two schemes, one in 1906 and the other during the present year [see THE SURVEYOR, May 3, 1912, and 22nd]. They might say that these were paying concerns. In all country towns the question of the demolition of cottages arose frequently. Property owners naturally retained cottages when they were long past occupation, and his council experienced great difficulty before they could put the Housing Act into operation in the town. But, as he had said, they had carried out these two schemes, and he was pleased to say they were giving general satisfaction. The cottages were never empty, and the yearly balance-sheets enabled the council to see that no loss was incurred. The cheapest of the dwellings were let at a rent of 5s. 6d. per week, inclusive of rates, though, of course, a cottage which they were able to provide at that figure was only fit for a young married couple. The aspect, however, was very pleasant, and there had been thirty applicants for the last cottages which they had erected. The selection of a site was an all-important matter, and one could not do better than choose one in which the roads ran east and west, so that there was plenty of sunlight on both the front and rear of the dwellings. In connection with the last scheme he was not in any way fettered by the engagement of an independent architect to prepare plans for one-half of the cottages put up, the result being that the dwellings were not all of a single design but of differing designs, which, fortunately, harmonised.

Dr. Francis E. Fremantle (London) followed with a reference to the misleading character of vital statistics, which were brought forward to show the need for rehousing in different localities. Nothing could be gained by exaggeration. Even the most carefully prepared statistics, particularly some of the Local Government Board with regard to back-to-back houses, were absolutely useless. They might talk as much as they pleased about back-to-back houses, and assert that people in them died more quickly than those in other types of houses, but they could not say that they started with the proper population to begin with, and the Local Government Board did not point out the essential difference. It was the poor and less intelligent people who would inevitably inhabit the least desirable houses. They might erect better houses in place of these, but they would not be solving the problem unless they were able to house the people who were displaced without increasing the burden on the tenants, because additional rental only meant reduced food supply and clothing. What was the natural life history of a house? An ordinary house was put up at an economic rental. It gradually became old and rapidly declined in price. A new house must inevitably have a great deal of extra value attached to it simply because it was new, but when they were trying to supply houses to the very poorest people they could not expect them to pay the extra amount which was due simply to the newness of the structure. From a sanitary point of view they must admit that an old house, say fifteen or twenty years old, could be made every bit as good as a new house. That was the basis of the position dealt with briefly by Dr. Lyster at the end of his paper on the proposal for a State grant. There were many objections against a State grant. One was that the Housing Act of 1909 had not been in operation sufficiently long for its full effect to be known. It would increase in usefulness, but they were acquainted with it sufficiently to know that it would not solve the problem entirely. The second objection was that it would lessen the responsibility of district councils, but that was an objection for which the time had gone by. Then it was contended that it was unfair to the tenants of other houses. He quite agreed, however, that the grant should be given only to the extent which represented the extra expense of a new house compared with an older one which the Act had provided. On the point that it was inadvisable to finance an industry, he would only point out that the grant would come out of the whole wealth of the nation, and that it was in the national interest that all interests should contribute fairly to a national charge. The question was of such urgency at the present time that the most careful consideration should be given to it, and attention given to the advisability of dealing with the problem in rural areas by applying for a State grant which could be properly distributed by the Local Government Board, with the assistance of county and district councils.

Mr. F. C. Uren, surveyor to the Aldershot Urban District Council, suggested that it would have been easier to appreciate the value of the sewage works at Alton if Mr. Hartfree had given in his statement as to the population they served. There was no information either with regard to the dry or wet weather flow, with the result that one was unable to ascertain whether the arrangements complied with recognised practice and were in accordance with the standards of the Local Government Board. He would like to know whether the filters with earth walls which were described in the paper were used as streaming filters only or as contact beds; if the latter, how were they filled with such porous material as earth, and why did Mr. Hartfree depart from the very general practice of using clinker? Mr. Hartfree admitted that clinker was the best, and surely the best was always the cheapest in the end. He presumed there had been no complaints with regard to the removal of house refuse, but to mix it with sewage sludge, as was done, seemed to him to be only aggravating the nuisance from it without enhancing its manurial value. Mr. Uren added that a little further information in regard to the sinking of the [illegible] and the method of using [illegible]

have been interesting for comparative purposes. Concluding, the speaker said that the council deserved to be congratulated upon the success of its water undertaking. The low rates charged reflected credit alike upon the council's policy and the management and energy of the surveyor. Altogether Mr. Hartfree deserved the warmest thanks of the meeting for his interesting and well-prepared paper. He (Mr. Uren) knew Alton before Mr. Hartfree took up his present position there, and he had visited it many times since, and, handicapped as Mr. Hartfree had undoubtedly been in the matter of funds, his work and paper gave evidence of zeal and ability which were quite exemplary. The analysis of costs in connection with his road works should considerably enhance the value of the Transactions of the institute.

Mr. W. V. Anderson, city surveyor of Winchester, observed that much of the difficulty experienced in the past in connection with the provision of cottages for the working classes was due to the great stringency of the by-laws, and they were all pleased to see the new set of model by-laws of the Local Government Board, which would give them a great deal of latitude in that connection. He was in total agreement with the "reasonable essentials" of Dr. Lyster, and if they made their specifications agree with those headings he did not think they would go far wrong. Mr. Anderson added that he disagreed with Mr. Uren on the point as to the mixture of house refuse and sludge.

Mr. R. W. Cass, surveyor to the Farnham Urban District Council, said he maintained that this matter of housing was every bit as important as any other section of the public service, and the matter of cost should be a secondary consideration altogether as compared with the health and comfort of the people.

Dr. Bevan (Alton) expressed the view that a great deal of the ill-health among people was attributable to the bad foundations of houses on made soil which was full of organic impurities. He was in favour of compromise in the carrying out of the law on the subject, and considered it would be helpful, not only to the people themselves, but to the sanitation of a town, if the local authority could assist poor owners of property to carry out necessary repairs to houses.

Mr. F. Ayles (Stockbridge) said that, after an extended study of means for effecting economies in cottage building, he had come to the conclusion that until the various materials were standardised nothing could be done. He had purchased 50 acres of land near Romsey, and he proposed to build on that a number of houses for letting at a rent of 5s. per week each, with an additional 9d. for rates. The houses would accommodate six or eight persons. Others would be a trifle more costly, and would be let to people who occupied houses which were not good enough for them, and who were in surroundings that were not to their taste. If he could provide houses at that rent public authorities ought to be able to do it also, because they were in a position to get money cheaper than he could; but if private bodies were going to get a State grant it would not be fair to the private builder.

Mr. C. Phillips (Hursley) said he was in favour of less stringent by-laws, adding that he knew of wooden structures built on brick foundations which were in every way healthy. In his opinion every house ought to have at least three bed-rooms.

Mr. A. J. Martin (Westminster) commented upon the excellent arrangement and interest of Mr. Hartfree's paper. It might be a fact that there were many undesirable features in the public works of Alton, but he was sure that would not have been the case had Mr. Hartfree started with a clean slate. Like many other surveyors, however, he had had to contend with great difficulties, and he (the speaker) could find nothing in the paper which went to show that either the council or their surveyor had not done the best in the circumstances. Proceeding to deal with Dr. Lyster's paper, Mr. Martin agreed that there was no earthly use in putting up the best kind of houses for the purpose they had in view and expecting them to remain sanitary. It seemed to him a most perverse and wrong-headed proceeding all round to attempt to deal with the problem by putting down the houses to begin with. Dr. Lyster had suggested that the local authorities should be more liberal in their by-laws, but many authorities would hesitate to do that, and many owners would not like to be deprived of their property. Where property was not fit for habitation, and the owner could not put it into proper repair, the local authority might undertake the necessary work and collect the rent until the amount paid for repairs was refunded.

Mr. T. Paterson (Farnham) agreed that the whole thing was a matter of the education of the individual, and that unless something of that kind was attempted the slums would remain.

The Chairman (Mr. H. Percy Boulnois), in closing the discussion, said the question of housing was, of course, an extremely difficult one. The point was this: If a local authority were to find houses for the people—State-aided houses, that was to say—where were they to draw the line? Why should Smith live in a State-aided house and pay a rent which did not pay the local authority, while Brown lived in a house on which the owner had to charge a remunerative rent? They must consider the ratepayers, who were not all wealthy. He perfectly agreed that the working man experienced difficulty in finding a house suited to his means. When he was city engineer of Liverpool he endeavoured to build working-class dwellings on the basis of 1s. per room per week, and to bring in 4½ per cent on the outlay, the land costing 12s. 6d. per square yard. In the construction of those houses he exercised the greatest economy in the matter of materials. There was no plaster on the walls, the floors were of concrete made out of clinker, and old tramway rails were used as girders, while the panes of glass in the windows were so small that if broken they would cost only 3½d. each to replace. The plumbing, however, was thoroughly well done, and separate water-closets—so important in the interests of cleanliness—were provided for each tenant. He was sorry to say he did not quite succeed in getting down to the basis of 1s. per room per week, but he did the work for 1s. 3d., and brought in the 4½ per cent he had aimed at. He tried and, as he had since found, succeeded in providing for the lowest class of people, and it was his opinion that that was what local authorities should try to accomplish, leaving the better class to private individuals to find houses for them.

Dr. Lyster and Mr. Hartfree replied shortly to the points raised by the various speakers. The latter, replying to Mr. Uren, stated that the population of Alton was 5,000, and that the dry-weather flow of sewage was 180,000 gallons per day. In the Bagshot sands, as at Aldershot and Frimley, it would be impossible to make bacteria beds with earth walls, but in that district it was different. They were able to make perfectly watertight walls, and he considered it was well worth the saving effected. On the question of the use of clinker, in a district like theirs they had to cut their coat according to their cloth. They would have liked to use clinker, but the cost prohibited it. In regard to the question as to house refuse, on the face of it it would appear that the nuisance from that material would be intensified by the addition of sludge, but their experience in the matter had been otherwise. Calcium chloride and Akonia were employed as dust palliatives.

The members of the institute were afterwards the guests of the urban district council at luncheon, the hospitality being appropriately acknowledged by Mr. H. Percy Boulnois, the chairman of the council of the institute in proposing the toast of the local authority.

FOUR BOOKS FOR MUNICIPAL ENGINEERS. **There is a field for enterprising local authorities to lead the way by providing municipal crematoria. Mr Albert C. Freeman's book—"Crematoria in Great Britain and Abroad," with 70 illustrative plans and designs, price 5s (post-free 5s. 4d.)—is the standard work on the subject. Mr. Freeman is also the author of "The Planning of Poor-Law Buildings and Mortuaries," price 7s. 6d. (post-free 7s. 10d.), a companion work in which the illustrations are again a valuable feature. "Roofs and Floors of New Buildings: their Structure and Stability," by Ernest H. Essex, Assoc.M.Inst.C.E., price 2s. 6d. (post-free 2s. 8d.), embodies in a most concise manner the calculations necessary for the strengths of timbers in floors and roofs. "The Housing of the Labouring Classes and Back-to-Back Houses," by H. Percy Boulnois, M.Inst.C.E., price 1s. (post-free 1s. 1d.), contains 41 diagrams, and comprises, says "The Architect," "valuable information on one of the most embarrassing of social problems." The above four works are all published by the St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, London, E.C.**

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

The premium for October is awarded to

MR. FRANK NICHOLSON,
County Surveyor's Office,
Dornoch,

whose solution has been the opinion of the adjudicators, been the best received during the month.

QUESTIONS.

This week answers are invited to the following questions:—

276. Roof Design. It is [illegible] necessary, in designing the steel trusses [illegible] to adopt some system of wind bracing. Explain in detail how the [illegible] sectional area of the wind ties is determined. (H. F. W. *Tottenham.*)

281. Surveying. Upon what [illegible] does triangulation depend? Prove that the sides of a triangle are proportional to the sines of the angles opposite to them.

282. Hydraulics. Explain simply what is meant by the "hydraulic gradient" in a pipe, and how this may be obtained in any given case. ("Pupil.")

283. Strength of Materials.—What is meant by the following terms:—Modulus of elasticity, limit of elasticity, permanent set, plastic elongation, ultimate resistance, and resilience of a bar? (Inquirer.)

284. Wood Paving.—What are the comparative advantages and disadvantages of soft and hard wood for wood paving? ("Suburban.")

REPLIES TO QUESTIONS.

278. Mechanics.—Give an expression for the tension of the bucket rod in a piston-rod in a common suction pump. The barrel of the pump is 8 in. diameter, and the stroke of the bucket or piston is 10 in. Find the work done per stroke in ft.-lb. when the spout is 16 ft. above the surface of the water in the well. (A.M.I.C.E., October, 1901.)

(*a*) Let A = area of bucket in square feet
S = length of stroke in feet
H = height from water surface in well to delivery spout, in feet.
F = force in lb. required to raise bucket on the up-stroke
= 62·3 lb. = weight of 1 cub. ft. of water

Neglecting friction and weight of bucket and rod we have: Weight of water raised by one up-stroke
= volume swept out by bucket × 62·3
= 62·3 × A × S

Work done during up-stroke = 62·3 × A × S × H ft.-lb., because the weight (A × S) of water moved is raised through a height (H) equal to the total head.

Or work done = force × distance = F × S ft.-lb.
F × S = 62·3 × A × S × H
∴ F = 62·3 × A × H lb.

i.e., F lb., the tension in the rod, is equal to the weight of a column of water of cross-section equal to that of the bucket, and height equal to the total head. The actual tension in practice will be greater than F lb. by the weight of bucket and rod, and the resistance due to friction.

(*b*) As above:—

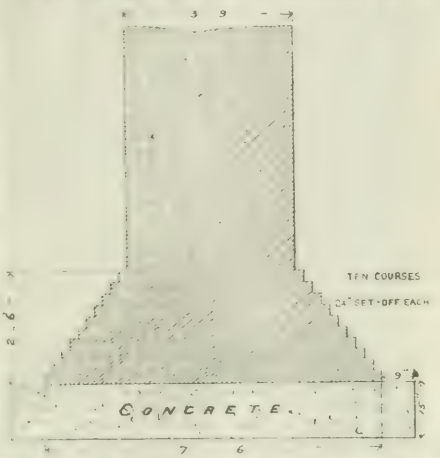
Work done = $62{\cdot}3 \cdot A \cdot S \cdot H$ ft.-lb.
$= 62{\cdot}3 \cdot \frac{\pi}{4} \cdot \left(\frac{8}{12}\right)^2 \times \frac{10}{12} \times 16$ ft.-lb.
$= 62{\cdot}3 \times {\cdot}7854 \times \frac{64}{144} \times \frac{10}{12} \times 16$ ft.-lb.
= 290 ft.-lb. = Answer.

(H. V. O., *West Bromwich.*)

280. Building Construction.—The walls at the base of a high brick tower are 3 ft. 9 in. thick. Describe, with drawing, what footings should be provided, the thickness of concrete, and the distance below the surface. (T. R.)

The number of courses should be equal to the number of half-bricks in the wall, and should be laid in regular set-offs of 2¼-in. projection on each side; the base of the footings should be twice the width of the base of the wall. As many brackets as necessary should be laid in the footings, so as to form a good tie between the back and front of the wall, and to render less likely a disturbance in the case of the soil moving.

The [illegible] should not be less than 9 in. in depth, and should project at least 6 in. on each side. (J. O. N., *Pontefract.*)



[M. E. N., Dublin, points out in his reply that a good practical rule for obtaining the depth of the concrete is to draw a line at an angle of 60° with the horizontal from the outer edge of the footings, when the intersection of this line with the edge of the concrete will give the required depth.—Ed.]

NOTES.

A [illegible] to Question 273 (Cast-Iron Stanchion) in the issue of October 4, 1912:—

In the Rankine formula as given the constant a is [illegible] for the expression $\frac{f}{\pi^2 E}$ (E being Young's modulus for the material), considering a strut with both ends free.

Using the value of f given [illegible] 80,000 lb. and assuming E as 6,000 tons per square inch, this gives a value of

$$a = \frac{80{,}000}{9{\cdot}87 \times 6{,}000 \times 2{,}240} = \frac{1}{1{,}650} \text{ approx.}$$

If both ends are perfectly fixed, the constant is $\frac{a}{4}$ *i.e.*, $\frac{1}{6{,}400}$, and if one end is fixed and the other free the constant may be taken as $\frac{a}{2}$ *i.e.*, $\frac{1}{3{,}200}$. The ends of the strut are obviously not free, but it cannot be assumed that they are perfectly fixed, so that an assumed value of the constant $= \frac{1}{3{,}200}$ is reasonable, any error being on the safe side.

The value of the moment of inertia, and consequently the radius of gyration, as worked out, is the maximum for the section, whereas the minimum should be used.

The minimum moment of inertia of the suggested section is 50·8, and the corresponding radius of gyration is 1·63 in. Using these values with the constants given,

$$P = \frac{8{,}000 \cdot 19}{1 + \frac{1}{3{,}200} \times \left(\frac{144}{1{\cdot}63}\right)} = 142{,}000 \text{ lb.}$$

and with the factor of safety of 5·55

the safe load $= \frac{442{,}000}{5{\cdot}55}$ lb. = 35·5 tons.

A similar section, 7·5 in. × 7·5 in. × 1·3 in., area 25·9 sq. in., and minimum radius of gyration 1·89 in., would carry a safe load of 59 tons, calculated in the above manner. (H. E. I., *Hastings.*)

Correspondence.

"Be calm in arguing; for fierceness makes
Error a fault and truth discourtesie."
GEO. HERBERT, *"The Temple."*

MIXING CEMENT WITH "BITUMEN."

To the Editor of THE SURVEYOR.

SIR,—My faith in Mr. Nathan's claim to be regarded as an expert in bitumen gets rather a shock by his confession that he does not know what is meant by "liquid 'bitumen' (*i.e.*, British)." To me, whose knowledge, on Mr. Nathan's view, is not equal to "the veriest tyro in bitumen manufacture," its meaning is "quite an elementary question;" in fact, the term has been commonplace throughout my experience of some forty years past as an engineer employing such materials.

As this gentleman now confesses that, though quite able to do so, he had no intention—indeed, "it was farthest from his thoughts"—to throw any light upon the practical point embodied in my query as to the safety of mixing cement and "bitumen" his concern being, he says, for your space (surely a matter for your solicitude rather than his)—one may be pardoned for wondering why he took up your space at all by entering into this correspondence. If it was merely to apply to my comparisons of pavings the term "invidious," an objectionable imputation for which he has no justification, he might, I hope, have been more worthily employed. Would he regard it as justifiable for such an obnoxious term to be applied to his own comparisons on p. 506 of your issue of October 11th?

As my comparison was made from the standpoint of purely technical interest, while his is from the point of view of a trader concerned in exploiting a rival mode of paving, there might be the more ground for attributing motives. The old adage about those who live in glass houses should not be forgotten.

When penning my first remarks (THE SURVEYOR, October 4th, p. 462) I little thought that the first object-lesson illustrative of one of the points my query was designed to elucidate would come from one who is engaged in bitumen manufacture: his remarks may therefore be fairly judged from a strictly technical and practical standpoint.

Now, my queries were:—

(*a*) "The exact composition of the bitumen?" (used in one of the systems of paving).

(*b*) "Was it a good thing to mix 'bitumen' and cement?" To which I added, "I prefer it (the cement) uncontaminated by any tarry mixture" (in one of the systems of paving then under consideration forty to sixty volumes of cement were mixed with five volumes of liquefied tar).

Mr. Nathan now renders my (*b*) query thus: "Why a percentage of cement is employed in the manufacture of asphaltic paving mixtures?" This misquotation of words is either due to carelessness, intention, or a belief that the meaning is synonymous; assuming the latter to be the case, we have the significant fact, to which special attention is called—that even an expert and manufacturer terms a mixture of "bitumen" and cement an asphaltic paving mixture. He even goes further, for the same term is applied to the mixture of tar (only) and cement before referred to (this word being on p. 577, "comparison between asphaltic paving mixtures").

It was the indiscriminate and unscientific use of these several terms, for which, I believe, we have the Americans mainly to thank, and the consequent confusion that arises—as the remarks of your correspondent "Natural" appositely show that led to my query on.

It is to be hoped that the Road Materials Standardisation Committee will include within the scope of its duties the proper classification and definition of [illegible]. A complete glossary on the subject is badly wanted.

With regard to my query (*b*), it will, I have been observed, that "bitumen" was written in inverted commas, intended thereby to convey that the article [illegible] "British bitumen" was meant. Having some experience with Pratford's wood mixed with this material, and not myself recognising the utility of this process, I thought it was time to raise the question in the hope of eliciting the views of some of your readers. Unfortunately, the correspondence has so far not been very informing on the point. Perhaps some of your readers will come forward and make it [illegible].—Yours, &c.,

W. J. HOWARD-SMITH.

October 29, 1912.

NON-SLIPPERY WHINSTONE.

To the Editor of THE SURVEYOR.

SIR,—Mr. Howard-Smith observes that the exact value of my testimony with regard to the slipperiness of whinstone cannot be estimated in the absence of more definite data, and presumably this will equally apply to his own remarks.

Contrary to Mr. Howard-Smith's supposition, I have had official responsibility for the condition of whinstone-paved streets over a long period of years, and in streets subjected to heavy as well as light traffic. Local authorities in Scotland at least, when they have declined to approve of the use of whinstone setts when proposed to be used by companies about to construct tramways in their districts, have done so, not on account of the slipperiness of the whinstone, but because it has not the lasting qualities of granite. From repeated trials over long periods I am quite satisfied that the best Scottish granite has twice the life of the best whinstone. The fact that Mr. Howard-Smith has not discovered a non-slippery whinstone is no proof that such does not exist, as there are many quarries which produce such stones.

It is absurd to give an opinion on whinstone setts without knowing the particular quarry from which they are produced. Large quantities of Scotch whinstone are yearly sent to England, and it is quite apparent that the buyers do not have much knowledge of the qualities of the respective quarries, as they accept setts from quarries which would not be approved of locally as being of best quality.

It would undoubtedly be of advantage to surveyors who are purchasing material from a district with which they have no personal acquaintance first to ascertain the opinion of a fellow-surveyor in the district, as they would thereby obtain the best class of stone, which is sold at practically the same price as the inferior ones.—Yours, &c.,

"SCOTCH WHINSTONE."

October 28, 1912.

TOWN PLANNING: WHOSE WORK?

To the Editor of THE SURVEYOR.

SIR,—The contention of the secretary to the Garden City and Town Planning Association that because the shareholders in the garden city companies are limited to 5 per cent interest on their investments, and as many of the companies do not build houses, they cannot be said to be building speculators, is one that I cannot accept.

At a time when corporations can practically get all the money they require at 3½ per cent, and the speculative builder can borrow at 4 per cent, the 5 per cent obtained by the shareholders shows clearly that the companies are of a speculative character.

The promotion of garden city schemes under the alluring disguise of philanthropy and housing reform does not make them non-speculative transactions, though the fact that investors are always attracted by high-sounding titles of a moral or social character may make them a greater commercial success, and therefore somewhat less speculative.

As the value of the property of one of the companies mentioned by Mr. Culpin as being a building company, the Co-partnership Tenants, Limited, which builds for and buys from its tenants, had property at the end of 1909 valued at £56,560, I fail to see why he should, or how he can, object to the term "building speculation" being applied to the shareholders in such companies.

Mr. Culpin's cheap sneer at my "acquaintance" with the garden city movement does not disturb me unduly. I have been a fairly regular and industrious student of garden city and town planning literature for several years, have visited a number of garden cities, and have had the advantage of listening to Mr. Raymond Unwin, Mr. Thompson, and other leaders of this movement; and the outstanding feature of the discussions and literature is the statement that if you are to get a less number of houses to the acre you must reduce the cost of your road making.

When the reduction of the cost of road making is obtained by reducing the width of the road and lowering the quality of the materials for road making below the standard accepted by any self-respecting road authority, I cannot say that I feel called upon

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
Accommodation Subways	589
Appointments Vacant	624
Assistants' and Students' Section	611
A Suggested New Form of Arbitration Clause	623
Birmingham Town Planning Scheme	608
Continental Municipal Engineers Visit	614
Correspondence	612
Disposal of Sewage Sludge	602
Horse-shoes and the Road Crusts	597
Housing Problems in County Areas	599, 601
Institution of Municipal and County Engineers	605, 624
Institution of Municipal Engineers, Notices	624
Local Government Board Inquiries	615
London County Council Engineership	598
London Western Approach Road Scheme	614
Mixing Cement with Bitumen	612
Motor Traffic and Highway Maintenance	620
Municipal Competitions Open	624
Municipal Contracts Open	625
Municipal Engineers in Canada	590
Municipal Waterworks Association	598, 603
Municipal Work at Acton	599, 621
Municipal Work in Progress and Projected	617
Non-Slippery Whinstone	612
Percolating Filters	598
Personal	618
Rapid Methods of Construction	597, 620
Recent Publications	619
Road Board Grants	608
Road Grating	614
Road Materials in Some European Countries	600
Royal Sanitary Institute:—	
Notices	624
Provincial Sessional Meeting at Afton	609
Sewage Distribution at Ilkeston	613
Tenders for Municipal Works and Supplies	626
Testing Materials in Paris	608
Town Planning: Whose Work?	612
Two Appointments	613
Woolwich Tramway Tunnel Opened	606

to suggest in such a case as this. It is true that [illegible] attempts at cheapening costs [illegible] the scrapping of a [illegible] and [illegible] and the gross bungle which took place [illegible] such as [illegible] composed [illegible] but the main points on which they rely to reduce costs is undoubtedly in [illegible]

I am glad to see that Mr. Dawbarn is to be on the planning of the Federal Capital of Australia, and if Mr. Culpin selects his other lectures as wisely, and [illegible] I shall probably find myself [illegible] Yours, &c.,

A. J. PRICE.

Leyton.
October 29, 1912.

To the Editor of THE SURVEYOR.

SIR,—Mr. [illegible] in the letter on p. 575 of THE SURVEYOR, [illegible] of my letter, and a side opinion from [illegible] cases he omits the important comma after *planning*, [illegible] Such [illegible]

In the report of the proceedings of a certain quixotic institution, on p. 589 of your journal, Mr. Carr states [illegible] that [illegible] should [illegible] proposed for the Redhill-Norwood [illegible] There is bound to be the "tremendous lot of trouble" [illegible] based on no proper engineering foundation.—Yours, &c.,

J. E. WILKES.

Bruchaven.
October 26, 1912.

[We quite [illegible] Ed. SURVEYOR.]

SEWAGE DISTRIBUTION AT ILKESTON.

To the Editor of THE SURVEYOR.

SIR,—In your issue of October 18th we note a letter from Mr. E. Witton Booth stating that considerable interest was taken in the Ilkeston sewage distributors, and that municipal engineers would be interested also to see the results of these distributors after several years' working. These distributors are generally known as the Hanley distributors. The first of these distributors were specially designed and constructed by the principal of our firm for Messrs. Wilcox & Rookes, the engineers to the Hanley sewage scheme. The method of coupling these distributors by a haulage rope so contrived that one distributing arm balances another against the effect of wind pressure was for the first time brought into operation in 1905 on these distributors. Distributors covering nine acres have been in operation during the last five or six years at Hanley, and these have proved so successful that a number of other towns have also adopted them, Ilkeston being the most recent installation. In every case the perfect time intervals and evenness of dosing have produced what may be said to be a most perfect effluent. Engineers from all parts of the world have visited Hanley to see these distributors and the opinion they have invariably expressed has been in the highest terms of praise. Certainly in efficiency of operation and control during the best or the stormiest weather, also for evenness of the distribution, and their great range of dealing with large or small volumes of sewage, there is no other sewage distributor on the market that will bear comparison with the Hanley sewage distributors. The power-driven rectangular distributor will be without doubt more extensively used as its merits become more widely known to the municipal engineers.—Yours, &c.,

HARTLEY, CAUSTON & RICHMOND, LIMITED.
(J. W. Hartley, Managing Director.)

Regent Engineering Works,
Stoke-on-Trent.
October 22, 1912.

TWO APPOINTMENTS.

To the Editor of THE SURVEYOR.

SIR,—May I draw the attention of your readers to the two following advertisements which appeared in THE SURVEYOR of September 27th?—*viz.*:—

"Chief Engineer and County Surveyor." London County Council. £2,000 per annum.

"Deputy City Engineer." Manchester. £500 per annum.

In the issue of the 25th inst. you publish the short list of selected candidates for the first-named appointment, and, strange to say, two of the gentlemen selected for the honour are not eligible, according to the terms of the advertisement, to compete for the latter appointment, which offers only one-fourth of the salary of the first-named. Comment is useless, as [illegible] must be kept there.—Yours, &c.,

A.M.I.C.E.

October 26, 1912.

[We publish our correspondent's letter, but with the note that the conditions of the Manchester appointment are under reconsideration.—Ed. THE SURVEYOR.]

ROAD CRITTING.

To the Editor of THE SURVEYOR.

SIR,—It would be interesting to have the remarks of surveyors on this subject.

My experience is that so long as asphalt or tar dressed roads are clean there is no slipping; the dirt brought from the water-bound roads causes slipping and skidding on the better pavements. I find that the horses I use myself slip more on pitched crossings than on any other form of pavement.

It is true that horses are not so liable to slip on macadam as on the better form of road surface, as their shoes are driven through the mud and dirt on the surface of such macadam, but as this mud can support pneumatic tyres, such tyres skid more readily on macadam, especially on limestone macadam, than on the better forms of road surfaces.—Yours, &c.,

C. H. COOPER, M.INST.C.E.,
Borough Engineer.

Wimbledon.
October 26, 1912.

Meldrum Brothers, Limited.—We are informed that the works and assets of this firm at Timperley, together with the goodwill, have been transferred to a new company, formed for the purpose, which will continue the business under the style of Meldrums, Limited, of which company Mr. John W. Meldrum, who has been manager during the liquidation, will be the managing director.

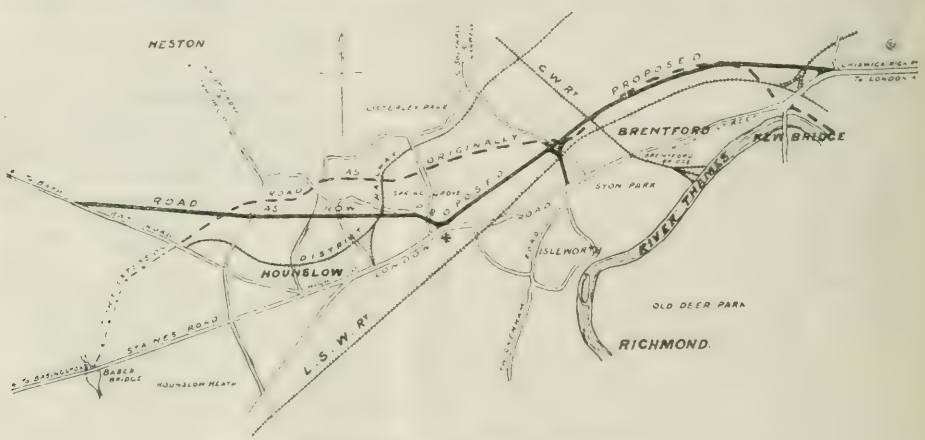
THE LONDON WESTERN APPROACH ROAD SCHEME.

An improved scheme has been evolved for the Brentford section of the Road Board's Great West Road proposal, and it is hoped that this will settle the chief difference now existing between the various authorities interested in a broad western exit from London. The improved scheme, the principle of which was approved by the Council of the Roads Improvement Association at its last meeting, provides that the new road when approaching Brentford shall not swerve upwards at the Brentford Waterworks to pass in a north-westerly direction to the Bath-road near Hounslow Barracks Station, with a possible extension across country to the Staines-road at Bedfont, but shall start at Chiswick High-road at the foot of Gunnersbury-lane, near St. James' Church. It will then pass straight across the railway lines, avoiding the tangle of tramway sidings at Kew Bridge, and then run parallel with the London and South-Western Railway until a junction is made with the existing road at Pears' Fountain. From this point the new road will go due west across country until the Bath-road is reached in the neighbourhood of "The Traveller's Friend" at Hounslow.

A consideration of the local circumstances and objections will, the Roads Improvement Association contend, quickly show the outstanding advantages of the revised proposal. The new scheme is really a development of principle of the Road Board's proposal. In addition to the advantages mentioned, it is pointed out that when the new road is constructed very little difficulty will occur when repairs are in progress, as traffic can be diverted to either the old or the new sections temporarily. The angles at which the roads will join are claimed to be almost perfect.

Only three local authorities will be concerned in the scheme—the Brentford Urban District Council, the Heston and Isleworth Urban District Council and the Middlesex County Council. The Heston and Isleworth Urban District Council, whose chairman was mainly responsible for the creation of the revised scheme, has agreed to the new proposal, and the Road Board have also approved it. It now remains for the principle to be adopted by the Middlesex County Council and the Brentford Urban District Council.

The cost of the scheme is estimated at about £250,000, a relatively small figure when the cost of the whole Road Board proposal—£1,750,000—is borne in mind.



New Western Road: Proposed Deviation.

(Junction of proposed road with main road through Hounslow and Brentford.)

"Tarco." We learn that Messrs. R. S. Carr & Co., Limited, of Liverpool, the patentees and proprietors of "Tarco," the well known road-surface compound, will in future deal themselves with all business connected with the manufacture and sale of this article for use in the United Kingdom, as well as the export trade, and are asked to state that all enquiries should be addressed to their head office at Liverpool. The arrangements with their licensees for the United Kingdom have just expired.

CONTINENTAL MUNICIPAL ENGINEERS' VISIT.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS' WELCOME.

Over fifty members of the Association Générale des Hygiénistes et des Techniciens Municipaux paid a visit to England last week. On the morning of the 21st inst. the party assembled at the St. Ermin's Hotel, Westminster, where Mr. Thomas Cole, secretary of the Institution of Municipal and County Engineers, addressing the party in French, offered them a very hearty welcome to London on behalf of the institution. Mr. Cole explained that the programme that had been prepared for them for the three days of their visit would enable them to see examples of waterworks, sewage disposal works, electricity and gas works, and a garden city. The party, including ladies, then drove to the Mansion House where they were presented to the Lord Mayor and Lady Mayoress by Mr. W. B. Bryan, the chief engineer of the Metropolitan Water Board, who referred to the great work in which the members of the association were engaged in the improvement of sanitation and the amelioration of the conditions of life in the cities and towns of France, Belgium and other countries. A visit was then paid to the Guildhall. Later in the day, as we have already reported, an inspection was made of the pumping machinery and the roof-gardens at Hampton, under the guidance of Mr. Bryan. The party then proceeded to the sewage works, where they were greatly interested in the processes there adopted. Mr. S. H. Chambers, engineer to the Hampton Urban District Council, acted as guide. The members were hospitably received by the chairman of the district council at the Manor House.

On the following day visits were paid to the Letchworth Garden City, and to the sewage disposal works at Saltley, Birmingham, which were described and explained by Mr. J. D. Watson, engineer to the Drainage Board. The party were afterwards entertained to luncheon by the board.

The next day's programme included an inspection of the electricity works of the London County Council at Greenwich, Mr. Fell, the tramways engineer, being present to receive the visitors. At the gasworks at East Greenwich the South Metropolitan Gas Company entertained the party to luncheon. In the absence of the chairman, Mr. Bywater presided, and welcomed the party. The works were inspected with the greatest interest, and were described by Mr. Bywater, engineer to the company, and his assistants.

At a reception held in the course of the week, Mr. Cole, the secretary of the Institution of Municipal and County Engineers, was elected an hon. member of the association.

Bridlington Waterworks Extension.—The Mayor of Bridlington last week formally opened extensions at the new waterworks, which have been carried out at a cost of £12,500 and which have provided a water supply that is likely to be ample for many years. The waterworks are run at a large profit to the town.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Belfast R.D.C. (October 18th. Mr. P. C. Cowan).—£800 for the Glengormley and Whitehouse sewerage system. The money, it was stated, was required for the provision of a caretaker's house at the sewage works, for fencing, making a road, and extending the sewerage.

Cardiff T.C. (October 22nd. Mr. H. R. Hooper).—£63 713 for waterworks (including the purchase of land), wood paving, and the provision of a live-stock market. With respect to the proposed expenditure of £36,533 on repaving with wood blocks, the city engineer, Mr. W. Harpur, stated that it was intended to relay certain streets with Jarrah wood. The old paving had given a fifteen years' life, and they had it for a ten years' loan. As to the purchase of land for waterworks purposes, it was admitted that the price to be paid was high, but that, having regard to the value of the adjoining land, the council could not do better.

Chester-le-Street R.D.C. (October 15th. Mr. A. A. G. Malet).—£1,385 for a water supply for Great and Little Lumley.—It was stated that the colliery industry had developed very greatly; plans for nearly 600 houses in Little Lumley had been approved, and over 150 were already built. The proposal included the construction of a reservoir, and it would be possible to collect sufficient water during the night time in the reservoir to supply the whole of the new houses, also the existing houses, and give both parishes a good supply.

Doncaster T.C. (October 18th. Major J. Stewart).—£1,215 for laying granite setts, and £3,802 for the provision of a destructor. It is proposed to lay the granite setts in St. Sepulchre-gate. With respect to the destructor, it was stated that the proposal is to erect one of the Horsfall type, for which the tender of Messrs. Holloway Brothers, of London, has been accepted. Before agreeing to the tender the sub-committee visited several works in other towns. The maximum period of repayment was asked for with respect to each loan. The inspector complimented the borough surveyor, Mr. F. O. Kirby, on the care with which the scheme had been prepared.

Driffield R.D.C. (October 11th. Major C. E. Norton). £550 for the Nafferton waterworks scheme, which was opened in May last. The first loan was for £3,600. Mr. C. E. Fairbank, of York, for the council, explained that since the scheme was commenced the price of material and labour had gone up. This and other things caused a difference in cash over and above his estimate of £269. The extension of the services to outlying farms caused additional outlay. There was no opposition.

Hertfordshire C.C. (October 8th. Mr. A. G. Drury). £665 in respect of the erection of a new bridge over the River Stort Navigation at South Mill. It was stated that the proposed bridge would have a waterway of 25 ft., and a headway of 7 ft. 6 in., and that it was proposed to give a roadway (including a footpath of 5 ft. on the west side) of 25 ft.

Horwich U.D.C. (October 17th. Mr. F. H. Tulloch). £4,000 for a sanitary conversion scheme. The surveyor, Mr. T. Green, stated that the scheme provided for the conversion of 978 privy and 430 pail closets, making a total of 1,408 conversions, this being a complete abolition of all privy and pail closets in the district.

Hyde T.C. (October 23rd. Mr. M. K. Knott).—£6,000 for an extension of the baths.—It is proposed to build the extension on land adjoining the present baths, to provide a larger plunge bath for boys and men, and to use the present men's plunge bath for girls and women.

Ilkeston T.C. (October 16th. Mr. Edgar Dudley).—£2,667 for the improvement of Burns-street and Heanor-road, and £569 for the purchase of Car-close depot.—The town clerk gave the usual details of population, assessable value, and so forth, and mentioned that the total indebtedness of the town was £229 000. The proposed improvement and widening of Heanor-road and Burns-street were explained, land having been given by the Duke of Rutland for the widening of the first-named road on certain conditions.

Keighley T.C. (October 17th. Major J. Stewart).—£7,500 for the extension of the public baths in Albert-street, and £7,900 for Devonshire Park extension, and improvements at Lund Park, Victoria Park, Hainworth Wood-road Recreation Ground and the Lynum-street Recreation Ground.—It was stated that the proposed new bath would be 100 ft. by 30 ft., and that the area would be about three times that of the present first-class swimming bath. The tenders which had been provisionally accepted, subject to the approval of the Local Government Board, amounted to £7,246. The work to be done in connection with the improvements in the parks includes the construction of boundary walls, street works, laying out an old English garden, conservatory and shelter, at a cost of £3,233, in Devonshire Park, providing a bowling green and macadamising roads, at a cost of £687, in Lund Park; making the boundary walls, improving Bradford-road, and providing an aviary, for £2,165, in Victoria Park; carrying out works, chiefly in making boundary walls, at the Hainworth-road Recreation Ground, at a cost of £826, and at Lynum-street for £389.

Kirbymoorside R.D.C. (October 10th. Major C. E. Norton).—£6,049, £815 and £736 for works of water supply for the townships of Farndale Low Quarter, Bransdale East Side, and Farndale West Side.—The clerk, Mr. R. Jennings, stated that the council had found it necessary to extend their works at Kirby so as to get an additional supply of water for Kirby, and to extend the works to Kirby Mills and Keldholme and several outlying farms. Certain springs were awarded to the parishes, and these would yield an abundant supply.

Lees (Lancs) U.D.C. (October 10th. Mr. Courtenay Clifton).—£480 for the purpose of widening Stamford-street, leading to the Market-place and Thomas-street. —It was stated that during the last thirty or forty years various improvements had been carried out, and the present proposal was one part and parcel of the general intention of the council to improve the well-being of the village and the comfort of the inhabitants. It was requested that the period for repayment of the loan should be sixty years, but the inspector doubted very much whether such a term would be granted.

Maesteg U.D.C. (October 22nd. Mr. W. H. Collin). £2,100 for the purchase of the town hall freehold, and £3,410 for alterations and extensions to the existing town hall and market.—There was no opposition to the application.

Maldens and Coombe U.D.C. (October 18th. Mr. Edgar Dudley).—£3,600 for the purchase, for an open space, of land adjacent to Wimbledon Common and situated partly in the council's district and partly in the borough of Wimbledon.—Mr. J. W. Johnson, clerk to the council, appeared in support of the application, and Mr. Leslie Vigers, the well-known surveyor, and Mr. R. H. Jeffes, surveyor to the council, were among those who took part in the proceedings.

Plympton R.D.C. (October 22nd. Mr. W. O. E. Meade-King). £806 for works of water supply to the village of Crabtree and Longbridge, Egg Buckland. The council also applied for sanction to the purchase of water mains belonging to the corporation of Plymouth.—It was stated that the present supply of water to the two hamlets was unsatisfactory, depending, as it did, upon wells which were dirty and springs which failed in the summer. The hamlets were in the area of Plymouth's water supply, and three houses were already supplied from the Plymouth mains, and an agreement was projected—subject to the sanction of the Local Government Board—under which the rural council would take a supply for the whole of the villages in bulk from the Plymouth mains at 6d. per 1,000 gallons, and purchase the mains, communication pipes and fittings which were already in the ground. When the estimates were made in February it was thought that £750 would cover the cost, but in consequence of the increase in the price of iron pipes from £6 to £7 12s. per ton, it was necessary to increase the proposed loan to £802.

Twickenham U.D.C. (October 29th. Mr. W. O. E. Meade-King).—£1,850 for the purchase of Long Croft and Briar Cottage, Mereway-road, and White House, Colne-road, for purposes of allotments, depot and stables, bathing accommodation, school site and street improvements; and £675 for the construction of an embankment along the river side at Radnor Island.—Mr. F. W. Pearce, surveyor to the council, submitted evidence in support of the opening statements of the

clerk, Mr. H. Jason Saunders, and explained the second part of the application.

Wallsend T.C. (October 17th. Mr. A. A. G. Malet).—£750 for the provision of an underground convenience in Sycamore-street, and adjoining High-street, and £4,000 for the provision of a wharf adjoining Stephenson-street, Willington Quay, and for the purchase of a hopper barge for sending refuse out to sea.—With regard to the second application it was stated that it was proposed to lease, for sixty-six years, 6,106 sq. yds. of land from the Northern Corporation.

Wincanton R.D.C. (September 26th. Mr. F. O. Stanford).—£525 for the purchase of water rights at Penselwood, in connection with the extended water supply for the parish of Wincanton.—Mr. E. N. Martin, clerk, stated that the District and Parish Councils of Wincanton had agreed to purchase from Lord Ilchester certain rights at Penselwood for the sum of £500 for the extension of the Wincanton water supply, these having recently come into the market by the disposal of his lordship's estate at Redlynch Park. The additional sum of £25 was for legal expenses and other contingencies. There were at present two reservoirs at Penselwood, whence the whole of the Wincanton water supply was obtained. The loans for the previous water undertaking had been paid off, and with the additional storage from the recently acquired springs at Penselwood it was estimated there would be a daily supply of 64,000 gallons, or 30 gallons per day per head of the population, which was considered to be very satisfactory for the requirements of the town.

Wokingham T.C. (September 20th. Mr. M. K. North).—£2,500 for sewerage and surface-water drainage.—The town clerk, Mr. James May, stated that the application arose partly in consequence of a notice from the Thames Conservancy requiring the discontinuance of the alleged pollution of the Emm brook by effluent from Union Sewage Farm. In consequence of building operations in Oxford-road, an extension of the sewerage system was necessary, and as this increased flow to Union Farm would enlarge the difficulty of satisfying the Thames Conservancy, it was decided to discontinue that farm and divert the sewage, by means of ejectors, to Bucks Copse, where there was adequate means of dealing with the flow. It was stated that owing to building operations in Oxford-road a part of the extension of the sewer had already been carried out, at a cost of £62. The borough engineer, Mr. C. W. Marks, explained the scheme in detail. There was no opposition.

Woolwich B.C. (October 1st. Mr. A. A. G. Malet).—£1,050 for the provision of an underground convenience for women in Beresford-square, Woolwich, and £350 in respect of a sanitary convenience for both sexes in the Royal Victoria Gardens, North Woolwich.—Detailed plans were submitted by the borough engineer, Mr. J. Rush Dixon, who stated that the Beresford-square convenience would consist of six water-closets and a lavatory. With reference to the North Woolwich structure, it was stated that the East Ham Town Council had agreed to contribute one-third of the cost of construction and one-third of the cost of maintenance. The estimated cost was £500, and the £350 loan applied for represented the Woolwich Borough Council's proportion of the cost.

APPLICATIONS FOR LOANS.

Ashton-under-Lyne T.C. £365 for a [illegible] at a public school.

Bognor U.D.C.—£11,000 for extending the sewage outfall.

Congleton T.C.—£1,125 for two Lancashire boilers and [illegible] to Forge [illegible].

Easington R.D.C. £[illegible] [illegible] hospital.

Epsom R.D.C.—£1,000 for the purchase of land for the Cobham outfall works.

Erith U.D.C. £1,100 [illegible].

Freebridge R.D.C. £500 for workmen's [illegible].

Cillingham T.C.—£2,500 for the provision of pleasure [illegible] and street works.

Heage (Derbyshire) U.D.C. £900 [illegible].

Hinckley U.D.C. £3,320 for eight [illegible].

Larne U.D.C. £5,000 for the [illegible] new street.

Leicester T.C.—£118,916 for a sewage disposal and other schemes.

Mexborough U.D.C.—£7,370 for the enlargement of the sewage disposal works.

Moira R.D.C.—£16,400 for sixty-eight labourers' cottages.

Tilbury U.D.C.—£600 for street lighting purposes.

Tiverton T.C.—Supplemental loan of £1,950 for council school and caretaker's house.

LOANS SANCTIONED.

Bridlington T.C.—£4,700 for workmen's dwellings.

Dundalk U.D.C.—£12,000 for a housing scheme.

Edmonton U.D.C.—£6,775 for private street works.

New Forest R.D.C.—£800 for a road improvement scheme.

St. Helens (Isle of Wight) U.D.C.—£1,848 for a sewerage scheme.

Chorley R.D.C.—£367 for water supply schemes.

Southend T.C.—£4,892 for making up several roads and £3,542 for a new administrative block at the sanatorium.

Surrey C.C.—£1,050 for the purchase of a playground at Egham.

Swanwick U.D.C.—£1,400 for the purchase of land for road improvements.

FORTHCOMING INQUIRIES.

NOVEMBER.

	£
4.—**Bath.** For destructor and street purposes (Mr. R. H. Bicknell)	5,650
4.—**Beckenham.** For private street works (Mr. F. H. Tulloch)	2,960
4.—**Hendon.** For street improvement works (Mr. M. K. North)	3,799
5.—**Croydon.** For sewerage purposes (Mr. M. K. North)...	1,050
5.—**Haworth.** For water supply purposes (Mr. W. O. E. Meade-King)	1,350
5.—**Kingswood.** For works of sewerage (Mr. R. H. Bicknell)	750
5.—**Ossett.** For fire brigade and street purposes (Mr. E. Leonard)	1,922
5.—**Pontefract.** For the provision of public baths (Mr. Courtenay Clifton)	5,600
5.—**Wombwell.** For gasworks extensions (Mr. H. R. Hooper)	7,000
6.—**Clayton.** For paving and water supply purposes (Mr. H. R. Hooper)	1,206
6.—**Morley.** For works of planting and fencing (Mr. W. O. E. Meade-King)	3,300
6.—**Penistone.** For the erection of public offices (Mr. E. Leonard)	3,500
6.—**Rawtenstall.** For the erection of workmen's dwellings (Mr. Edward Leonard)...	8,598
6.—**Wood Green.** For street and town hall purposes (Mr. M. K. North)	7,850
7.—**Coole.** For the provision of a pleasure ground (Mr. W. O. E. Meade-King) ...	1,550
7.—**Lytham.** For the provision of carbonising plant (Mr. H. R. Hooper)	8,939
7.—**Rishton.** For the erection of workmen's dwellings (Mr. Edward Leonard)	4,200
7.—**Street.** For the purposes of a water supply (Mr. A. W. Brightmore)	9,650
8.—**Basford.** For water supply works (Mr. W. O. E. Meade-King)	1,301
8.—**Stepney.** For the provision of public conveniences (Mr. A. G. Drury)	3,600
8.—**Worsborough.** For street improvement purposes (Mr. Courtenay Clifton) ...	1,550

Correction.—In our last week's report of Mr. H. Percy Boulnois' remarks in the discussion on the subject of the intercepting trap at the recent annual meeting of the Institution of Municipal Engineers, the word "flushes" appeared as "brushes" in one instance, the name of Mr. Patten Barber, whose experiments were commented upon by the speaker, being also misspelt.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Bath £10,000, East Riding £10,674, Paddington £20,000, Plymouth; housing and town planning—Spalding £5,176; roads and materials—Blackpool £48,000, Warrington £2,762; sewerage and sewage disposal—Brampton, Eccles £56,554, Leicester, Nantwich £12,500, Windsor £73,688; water, gas and electricity—Merthyr.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

ADMINISTRATION.

Bradford T.C.—Authority is to be sought in a Parliamentary Bill to give optional powers to the council to establish a superannuation fund for corporation officers and servants.

BUILDINGS.

Bangor (co. Down) U.D.C.—New baths and public conveniences are to be provided at an estimated cost of £3,000.

Bath T.C. The Education Committee propose to build a secondary school at an estimated cost of £10,000.

Cardiff T.C.—The city engineer, Mr. W. Harpur, has received instructions to prepare estimates for a large public bath to be erected at Llandaff Fields.

Carlton U.D.C.—The tender of Mr. G. T. Tegerdine, at £799, has been accepted for pulling down five houses and erecting four new dwellings for firemen.

Deptford B.C.—For the erection of the central public library in Lewisham High-road the tender of Mr. H. L. Holloway, of Deptford, has been accepted. The various items were: Bath stone and deal joinery, £10,482; Portland stone and hardwood joinery, £1,528; sundries, £408.

Darwen T.C. It has been decided to build a fire station in Charles-street.

Dorset C.C.—The tender of Messrs. Jesty & Baker, of Portland, at £3,949, has been accepted for a new school at Portland Underhill.

East Riding C.C.—With regard to the reconstruction of Hull Bridge, near Beverley, the Road Board have increased their grant to £4,000. The estimated cost of the work is £10,674.

Festiniog U.D.C.—The Council Assembly Rooms are being ventilated by means of Shorland's patent exhaust roof ventilators and patent hygienic inlet ventilating panels, supplied by Messrs. E. H. Shorland & Brother, Limited, of Failsworth, Manchester.

Glasgow T.C.—With a view to effecting improvements at the Cross, it has been referred to a committee to consider the purchase of certain properties at the corner of the Trongate and High-street.

Keighley T.C.—A new school for 440 children, built at a cost of £5,548, was formally opened on Saturday last.

Matlock U.D.C.—A scheme for the erection of a pavilion in the park, at an estimated cost of £4,000, has been approved.

Paddington B.C. A sum of £20,000 has been provisionally agreed upon for the provision of public baths.

Plymouth T.C.—The Parks Committee have decided to recommend the council to purchase the West Hoe estate for the sum provisionally agreed upon—viz., £8,000. It is proposed by the committee to utilise the property—probably the quarry site—for the erection of swimming baths and the provision of winter gardens and a pavilion, but the details connected with such a scheme must be a matter for future consideration.

Roxburgh C.C.—The Jedbury District Committee are promoting a scheme for the reconstruction of three bridges on the Jedwater road, at an estimated cost of £3,300.

Warrington T.C.—The borough surveyor, Mr. T. Longdin, has received instructions to prepare plans for extensions to the police station.

Wood Green U.D.C.—The Local Government Board have returned an application by the council for a loan of £3,100 for the purchase [illegible] fire station. The site was only one-fifth of an acre in extent, and was partly occupied by five small houses. The cost would have been at the rate of £15,000 an acre.

HOUSING AND TOWN PLANNING.

Boston R.D.C.—Plans of labourers' double cottages at Benington have been prepared and forwarded to the Local Government Board.

Billericay R.D.C.—Six workmen's cottages are to be erected at Ramsden Bellhouse, at a cost of £990.

Bradford T.C.—A town planning scheme for the centre of the city is to be proceeded with. It is proposed to acquire the whole of the land and buildings fronting and within the following area: Commencing at the Market-street junction with Bridge-street, along Bridge-street to Hall Ings, along Hall Ings, Peel-place and Leeds-road to Well-street and Forster-square, along Market-street back to Bridge-street.

Spalding U.D.C.—A scheme has been adopted for the erection of thirty-six houses for the working classes, and the tender, at £5,176, of Mr. E. Clarke, of Melton Mowbray, has been accepted for carrying out the work.

Swaffham R.D.C. [illegible] to provide six labourers' cottages in the parish of Pickenham.

Twickenham U.D.C.—The council have approved the draft of a proposed agreement with regard to the land situate in the urban district of Ham, originally included in the Twickenham town planning scheme.

Wirral R.D.C.—Application is to be made for sanction to a town planning scheme.

REFUSE COLLECTION AND DISPOSAL.

Taunton T.C. A dust cart has been purchased from Messrs. G[illegible] & Son for £28.

ROADS AND MATERIALS.

Aberdeen C.C. A claim [illegible] with respect to the alleged damage by tar was supplied by a letter received by the Aberdeen District Committee making a claim for 10s. for damage to potatoes by fumes from a tar boiler in connection with road operations at Culter. The council instructed the clerk to forward the claim to the Century Insurance Company, and to intimate that in their opinion it should be repudiated.

Abergele U.D.C.—Improvements are to be carried out at the promenade, at an estimated cost of £1,500.

Blackpool T.C.— The borough engineer, Mr. J. S. Brodie, has prepared a scheme for the further extension of the Promenade, at an estimated cost of £48,000.

Castlereagh R.D.C.—The weekly pay of road surfacemen has been increased from 15s. to 16s.

Croydon R.D.C.—The tender of the Improved Wood Pavement Company, Limited, [illegible] accepted for works of wood paving.

Croydon R.D.C.—The tender of Mr. E. Iles, senr., of Croydon, at £2,945, has been accepted for making up three roads.

Deptford B.C.—It has been agreed to carry out road repairs, at an estimated cost of £914.

Donegal C.C.—The county surveyor, Mr. James H. Steadman, reported that with the chairman of the council he had had an interview with the Road Board, with the result that the board agreed to make a grant to County Donegal of £10,000, on condition that the county raised a ½d. rate, which was to be devoted to the improvements of existing maintenance contracts. The £10,000 grant was to be applied to the resurfacing of leading roads to be approved by the board; the specification of same and the execution of the work to be [illegible] The Road Board had further agreed to lend the county a sum of £5,000, free of interest, repayable within five years, to facilitate the improvement of leading roads with the same reservations *re* specifications and executions of work as were provided for under the £10,000 grant. The county surveyor and the chairman of the council have been formally thanked by the council for their services in the matter.

Edinburgh T.C.—The Streets Committee have adopted a proposal for the widening of a Musselburgh main road, at an estimated cost of £3,000.

Evesham R.D.C. The surveyor, Mr. J. Smith, has prepared schemes for repairing the road from Blackminster to Bretforton, and these have been forwarded to the county council for their observations.

Harrow U.D.C.—The tenders of Messrs. Willis & Powis, of Wembley, at £5,672 has been accepted for making up several roads.

Heston and Isleworth U.D.C.—It has been decided to repave the main road through Hounslow with wood blocks, and the remainder of the road to Brentford with an artificial granite paving.

Hitchin R.D.C. The tender of Messrs. S. Redhouse & Sons, of Stotfold, at £1,066 has been accepted for a scheme of road improvement.

Kanturk (co. Cork) R.D.C. A new road is to be made form Charleville to Dromcollogher at a cost of £300.

Knaresborough U.D.C.—The surveyor, Mr. R. E. Wilson, has been instructed to report on the cost of the upkeep and reconstruction of the High-street, which connects the York-road with the Leeds and Harrogate road, and afterwards to apply to the county council for a grant.

Louth T.C.—Upgate is to be widened, at an estimated cost of £3,385, and the council have asked the county council for a contribution towards the project.

Okehampton R.D.C.—A suggestion has been adopted that the county surveyor be invited to hold periodical consultations with the district council on the subject of the maintenance of main roads generally.

Southport T.C.—The plan of the borough surveyor, Mr. R. P. Hirst, has been approved for the paving of Nevill-street, the laying out the centre of the street opposite the Victoria Hotel as a small garden, and the placing of the Queen Victoria monument therein. The paving work is to be done by the Limmer Asphalte Paving Company from Lord-street to the Promenade, with Lithofalt blocks, 1½in. thick, at 6s. 9d. per square yard, and with block 1¼ in. thick at 7s. 6d. per square yard.

Warrington T.C.—Paving works are to be carried out at a cost of £2,762.

SEWERAGE AND SEWAGE DISPOSAL.

Brampton R.D.C. The council have now approved and accepted the scheme of sewerage and sewage disposal for Castle Carrock prepared by the engineers, Messrs. Taylor & Wallin (Mr. Harry W. Taylor, ASSOC.M.INST.C.E.), of Newcastle-upon-Tyne and Birmingham. The sewage will gravitate to the outfall, and be disposed of in modern bacterial works. Application for the necessary loan is to be made at once to the Local Government Board.

Eccles T.C.—Plans of a main sewerage scheme, estimated to cost £56,554 are under consideration.

Hunsworth (Yorks) U.D.C. A new scheme of sewage disposal has been prepared by Mr. N. A. Johnson for dealing with the whole of the sewage of the district. The estimated cost is £2,500, including a fee of £125 for the engineer.

Leicester T.C.—A scheme has been adopted to deal with the sewage in times of storm, including an increase of plant at the Abbey pumping station. The scheme is the outcome of a report prepared by the borough surveyor, Mr. E. G. Mawbey.

Linlithgow T.C. It has been decided to carry out improvements at the sewage disposal works.

Nantwich R.D.C.—A sewerage scheme costing £12,500 is being considered by the council.

Windsor R.D.C.—Amended plans for Sunninghill and Sunningdale sewerage have been submitted to the council. The estimated cost is £73,688, to be apportioned between the two parishes. The original estimate was £55,000, but additional requirements in connection with the scheme have been made since last year, and this accounts for the £18,000 difference. The scheme has been submitted to the Local Government Board.

WATER, GAS, AND ELECTRICITY.

Banbridge (co. Down) U.D.C.—Application is to be made to the Board of Works for a provisional order authorising the supply of electricity by the council within the urban district.

Bolton T.C.—The Finance Committee have passed a recommendation that application be made to the Local Government Board for sanction to borrow £130,000 for purposes in connection with the proposed new generating station at Back-o'-th'-Bank.

Cardigan T.C.—Proposals are being considered for the extension of the waterworks, at an estimated cost of £2,000.

Heage (Derbyshire) U.D.C.—Plans of a water supply scheme have been prepared by Messrs. Hunter & Woodhouse, of Belper, and they have been submitted to the Local Government Board. The estimated cost, with connections, is about £600.

Merthyr T.C.—The plans and specifications in connection with the new waterworks at Pontsticyll have been approved. The engineers are Sir Alexander Binnie, Mr. W. Binnie, and Mr. T. F. Harvey.

Leicester T.C.—It has been decided to seek for powers to extend the area of supply of electricity.

St. Thomas R.D.C. In connection with the Topsham water supply the council have decided to make application for leave to borrow £500 for experimental boring.

Withernsea U.D.C.—The council have instructed Messrs. Taylor & Wallin (Mr. Harry W. Taylor, ASSOC.M.INST.C.), Newcastle-upon-Tyne and Birmingham, to report as to whether a local source can be used for supplying the urban district. Hitherto it has been considered that a satisfactory supply could only be obtained from Hull, a distance of about 20 miles, which would involve very considerable expense. The engineers are now investigating this matter, and expect to report to the council very shortly.

MISCELLANEOUS.

Tilbury U.D.C.—The surveyor, Mr. S. A. Hill-Willis, has been instructed that only British manufactured goods are to be purchased when ordering materials, and that those tendering must pay the trade union rate of wages.

Twickenham U.D.C.—The tender of the Ham River Grit Company has been accepted for a barge-load of sand at 5s. 6d. per yard delivered.

PERSONAL.

Mr. D. Edwards, borough surveyor of Taunton, has had his salary increased by £25 per annum.

Mr. R. A. Shelton has been appointed surveyor and sanitary inspector to the Wilton Rural District Council.

Mr. D. D. Macleay, of Inverness, has been appointed burgh surveyor of Nairn, in succession to Mr. D. Munro.

Mr. J. S. Senior, surveyor to the Swanage Urban District Council, has tendered his resignation to that authority.

Mr. T. Gardner, surveyor to the Newmarket Rural District Council, has had his salary increased by £50 per annum.

Mr. W. S. Shell, surveyor to the Consett (Durham) Urban District Council, has died, we regret to state, at the age of sixty.

Mr. H. Blewitt, of Southwell, has been appointed district surveyor to the Mutford and Lothingland Rural District Council.

Mr. F. A. Adlard, assistant surveyor of Warwick, has been appointed assistant waterworks engineer to the Madras Municipality.

Mr. A. S. Whipp of Milnrow, has been appointed assistant to Mr. O. P. Abbott, surveyor to the Hindley (Lancs) Urban District Council.

Mr. Arthur J. Abbott, F.A.S.I., A.R.S.I., building surveyor and sanitary inspector to the East Barnet Valley Urban District Council, has been granted a motor cycle allowance of £25 per annum.

Mr. H. A. Cutler, city surveyor of Belfast, and Mr. Henry Seaver, architect, have been appointed joint assessors in connection with the proposed competitions for dwellings to be erected under the housing scheme.

Mr. R. W. Jones, surveyor for the western division of Carmarthenshire, has been voted £150 (including £44 out-of-pocket expenses) for services rendered in the Eastern Division while the office of surveyor was vacant.

SOME RECENT PUBLICATIONS.*

The Law and Practice of Rating. By Walter C. Ryde. Price £1 17s. 6d. London: Butterworth & Co., and Shaw & Sons.

This is the third edition of Mr. Ryde's masterly work on rating, a subject that is full of complexities and pitfalls to the layman. The contents have been thoroughly revised, and summaries prepared of all new cases, while due attention is paid to the more recent developments of the law. This latter feature is all the more necessary and important owing to the fact that upon questions of practice several far-reaching decisions have been given. These include the rating of railways and the rating of buildings containing machinery, both vexed questions in the strictest sense of that phrase. While seeking to set out in the body of the work what the law is, Mr. Hyde, in his preface, states quite candidly what he considers the law ought to be, and among the desiderata he enforces are the urgent need for codification, an amendment of the process of appeal from quarter sessions, and (as regards the Metropolis) a right of appeal against a provisional list. In addition to the appendices of statutes and of statutory orders which appeared in the second edition, the present revised edition contains an appendix showing the authorities who appoint the assessment committees in London. The work is, indeed, as complete in all respects as it is possible to make it, and it is provided with that valuable adjunct an excellently arranged index.

Estimating. Part I. By T. D. L. Piper. Price 3s. 6d. nett. Portsmouth: The Ubique Press, Limited.

This work consists substantially of a reprint of a series of articles which originally appeared in the *Southern Builder and Engineer*. These have, however, been thoroughly revised, and much new matter has been added. Full analyses showing how prices are arrived at are given wherever possible and the book has been prepared in a concise and simple style specially adapted to the requirements of students. Thus it commences with a preliminary chapter and one dealing with squaring and cubing. Subsequent chapters are concerned with labour, shoring and scaffolding, pulling down, excavating, drainage, concrete, brickwork, arches, damp-courses and steel. A study of Mr. Piper's book will go far to enable the student to qualify himself as an estimator, while the fully fledged builder's clerk will also find much useful information.

Where to Live Round London. (Northern Side.) Edited by Prescott Row and Arthur Henry Anderson. Price 1s. nett. London: The Homeland Association, Limited.

We have already commended most favourably this useful little work of reference, and the appearance of the edition before us, the fourth, justifies our high opinion of it. It has been revised to date and fresh sections added to it and it now includes a new feature, five pages of summary of the principal statistics of the more important places dealt with in the book. We again congratulate the editors and publishers on an excellent idea happily carried into practice.

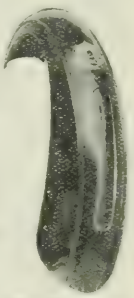
London County Council. In pursuance of their good work of indicating by memorial tablets the houses in London of historical interest the London County Council have just issued Part xxxviii. of their series of descriptive penny pamphlets (London: P. S. King & Son). This particular brochure gives notes of the associations of W. M. Thackeray with 36 Onslow-square, South Kensington, and of Charles James Fox with 9 Arlington-street, S.W.

Lectures on Illuminating Engineering. The first of a special series of lectures on illuminating engineering at the Polytechnic (Regent-street, W.) took place on Friday last. In this introductory lecture Mr. W. C. Clinton, of University College, gave a brief account of the fundamental laws of light and colour, and showed some interesting experiments illustrating the appearance of coloured objects illuminated by the arc lamp, the mercury-vapour lamp and the Neon tube. The next two lectures of the course, to-day and next Friday, will deal with electric lighting, and will be illustrated by lantern slides and exhibits of the latest types of lamps.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

A GENEROUS PROPOSAL.

If all members of the Institution of Municipal and County Engineers showed as great a practical interest in the Orphan Fund as that displayed by Mr. Walter Maughan, the sum at the disposal of the committee would soon be more adequate to meet the demands made upon it. Mr. Maughan has achieved no little distinction as an inventor, and among his patents is a mudguard for motor cyclists known as the Mon-Aero mudguard. The advantages of this device are many, and have been testified to by some of the leading exponents of motor cycling. Although the matter is not one which affects our readers professionally, we feel sure that there are many in the ranks of municipal engineers who are motor cyclists, and we are led to draw attention to the matter by reason of Mr. Maughan's generous offer to give 2s. 6d. to the Orphan Fund in respect of each guard (price 12s. 6d.) sold to or through a municipal engineer. The guards are to be obtained from the Coventry Auto-Aero Company, Limited, Priory-street, Coventry.



The Mon-Aero Mudguard.

The Esholt Sewage Tunnel.—At the meeting last week of the Bradford Corporation Alderman Johnson moved the adoption of the Sewage Committee minutes, with the exception that the tender of Messrs. Pethick & Dix (£113,975) be substituted for that of Messrs. Best & Sons, Limited (£112,312). He explained that there were twenty-three tenders, the amounts ranging up to £200,000. He had been advised by the town clerk that an item of £5,598 which had been omitted from Messrs. Best's tender must be included. The committee's minutes were approved.

Surveyors' Institution Examinations.—The Surveyors' Institution Students' Preliminary Examination will be held on January 15th and 16th next. It is proposed to examine candidates from the counties of Lancashire, Cheshire, Yorkshire, Staffordshire, Durham, Cumberland, Westmorland, Northumberland and North Wales at Manchester. Candidates from other counties in England and Wales will be examined in London, Irish candidates in Dublin, and Scottish candidates in Glasgow. The list of entries closed on September 30th. Examinations qualifying for the class of Professional Associate and Fellow will commence on March 31st next. English candidates for the professional examinations will be examined in London, Irish candidates in Dublin, and Scottish candidates in Glasgow. The list of entries closed on September 30th. The preliminary examinations are held once in three years. The next examination will be held on June 10th, 11th and 12th next.

FOR OTHER ADVERTISEMENTS

See End of Paper.

CLACTON URBAN DISTRICT COUNCIL.
SURVEYOR'S DEPARTMENT

The above Council invite applications for the appointment of Junior Assistant in the Surveyor's Department.

The applicant should be a fair draughtsman, able to take levels and make surveys.

Wages One Guinea per week.

Applications, stating age, qualifications, &c., accompanied by copies of three recent testimonials, to be delivered, under sealed cover, endorsed "Junior Assistant," at my office not later than Monday, November 11th, 1912.

GEO. T. LEWIS,
Clerk to the Council.

Town Hall Buildings,
Clacton-on-Sea.
October 30, 1912.

WANTED at once, an Assistant Surveyor in Town Surveyor's Office; neat Draughtsman, used to inspection of buildings, drainage under the by-laws, levelling, surveying, office routine; commencing salary Thirty Shillings per week.—Box 1,196, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

THE CONSTRUCTION OF THE HEMLOCKS DAM AT BRIDGEPORT, CONNECTICUT.

The *Engineering Record* of New York contains a description of the construction of a dam at Bridgeport, Connecticut, in the building of which supplies are being hauled seven miles by motor trucks and the concrete is being delivered by a cableway. The satisfactory progress of the work proves the advantages which may be secured by the use of improved methods.

The dam is 96ft. high above the lowest part in its foundation and will retain about 4,500,000 gallons of water. The body of the structure is formed of cyclopean masonry, that is to say, concrete in which large blocks of stone which weigh sometimes as much as 6 or 8 tons each are embedded. As the site of the work is seven miles from the city of Bridgeport, the transportation of plant and material to and from the work is a matter of considerable importance, and it was necessary at the outset to consider what was the most economical and rapid means of transport available. It appeared probable that motor trucks would be better than horse traction, and accordingly two 5-ton motor trucks were used. These carry cement, coal for the power plant, or other materials, and experience has proved that each truck will make 5 trips a day, carrying 100 bags of cement on each journey and covering about 70 miles in the day. Also by using a trailer with the trucks a large number of masts and booms 65ft. in length for derricks have been transported to the site.

In constructing the dam, two stationary towers, each 75ft. high, set on concrete foundations on the hillsides at each end of the work, were erected. These were securely guyed with cables fastened to anchorages, and a cableway was stretched between the towers along the course of the dam. This cableway has a span of 1,325ft., and the velocity of travel along it is 1,800ft. per minute. Along this cableway run 2-yard or 4-yard buckets or skips filled with material, which is thus carried very rapidly to the point required. A number of stiff-legged derricks have been erected along one side of the dam, and these are used to remove the excavated earth and rock to the side of the trench and also to deliver to the exact points required the concrete or stone delivered by the cableway. These derricks have 65ft. booms and are spaced 100ft. apart. About 500,000 cubic yards of masonry are to be placed in this manner. The concrete is mixed mechanically and is discharged into 2-yard buckets, which are then run along a trestle to the centre of the dam. These are then picked up by the cableway, which delivers them quickly to the place where the work is going on.

At first concrete was dumped from the cableway direct, but it was soon found that the sudden removal of weight from the bucket caused it to jump upwards, producing oscillations which occasioned considerable delay and danger to the workmen. The buckets are therefore first lowered on to the dam from the cableway, and are then picked up by the nearest derrick and emptied where needed. Four-yard skips are used for delivering the smaller sized blocks of stone, while the very large blocks are lifted and placed by the derricks. The concrete is laid in sections 60 ft. long and 4 ft. to 5 ft. high. There are transverse joints at intervals of 8 ft. across the dam, each section being jointed to the next by a groove and projection 12 in. deep by 18 in. wide. No joints extend through the dam. The use of large-sized buckets and skips has proved to be very satisfactory. The work is being done by day labour, and the methods adopted appear to produce very rapid and economical work and to assist the soundness of construction.

The Wrexham Meeting. Mr. John Edward [illegible], borough engineer and surveyor of Wrexham, writes, in reply to Mr. T. W. A. Hayward's comments [illegible] at the meeting of the North Wales District held [illegible] Institution of Municipal and County Engineers in that town, that the rate of 8s. 9d. includes 2s. 2d. for the repayment of principal and interest on loans and poor rate, including police and county rates. The rate of wages paid to labourers is 24s. per week. Mr. England at the same time corrects certain errors which occurred in his paper. Private street works cost, he states, should read 7s. 6d. per foot of frontage, and the size of the plunge bath should be 60ft. by 24½ ft.

MOTOR TRAFFIC AND HIGHWAY MAINTENANCE.

LIABILITY OF OMNIBUS COMPANIES: COUNSEL'S OPINION.

At a meeting of the Hornsey Town Council on Monday the Parliamentary Committee reported having had before them the opinion of counsel on the question of liability of the London General Omnibus Company in respect of the omnibus traffic along roads in the borough during the past six months, and particularly along three roads at Muswell-hill since the middle of July.

Counsel, in his opinion, stated: "I think there is a justification for the suggestion that in the case before me the motor-omnibus traffic over such a road as Fortis-green is extraordinary traffic within the meaning of the statute, and that the omnibus company may be made liable in respect of it, partly because it is of the character and description which is quite new through a road like Fortis-green, and partly because it is exceptional in the frequency of the journeys over the road."

The committee recommended that the company should be notified of the extraordinary expense which is about to be incurred by the council in repairing the roads in question on account of the extraordinary traffic thereon, and that they should be asked to make a contribution towards such expenses, and be informed that in the case of their not doing so they would be held liable for the expense.

The report was adopted, and a tender of over £3,000 was accepted for the repair of the three roads in question. It was further resolved that counsel's opinion should be communicated to certain selected authorities in the metropolitan police area, including the county council, and that inquiry should be made whether, in the event of the Hornsey Council taking the matter into court, they would be willing to make a contribution towards the cost. Finchley Urban District Council have already agreed to do so. It was decided to take a census of the traffic as regards the character and number on certain streets in the borough.

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The Metropolitan Boroughs Standing Joint Committee on Monday passed resolutions asking the Government to provide in next year's Budget for the handing over of the proceeds of the petrol tax to the local highway authorities; declaring that the Home Secretary should be given power to define motor-omnibus routes; and advocating legislation to require traction engines to be fitted with resilient tyres.

At the last meeting of the Executive Council of the Urban District Councils' Association the proposal of the Wood Green Council to convene a national conference of road authorities to discuss the question of the increasing burden thrown upon the ratepayers and the absence of proper powers to regulate this traffic was unanimously approved. The proposal has already received considerable support from a large number of road authorities, including some important county councils, county borough councils, and town and urban district councils, who have appointed delegates.

DEATH OF MR. F. W. RICHARDSON.

It is with much regret that we have to announce the death, which occurred on Wednesday of last week, at Sidmouth, Devonshire, of Mr. Frederic William Richardson, formerly surveyor of Aston Manor.

Mr. Richardson, who was only thirty-four years of age, was a brother of Mr. Harry Richardson, the hon. secretary of the Midland district of the Institution of Municipal and County Engineers, and served his articles with the latter at Aston, where he afterwards became assistant surveyor under Mr. Jack, whom he eventually succeeded. When Aston was absorbed by the city, Mr. Richardson was offered a post under the Birmingham Corporation, but, declining this offer, he accepted his pension in compensation of loss of office, and, going to London, set up in private practice. Here his health failed, and he was ordered to live in the South. The insidious disease from which he was suffering developed rapidly, and he died, as stated, at Sidmouth, where he had taken up his abode. His marriage a few weeks ago will be fresh in the minds of our readers, and the deepest sympathy will be extended to his widow in her bereavement.

The funeral took place on Monday last at Handsworth Old Church.

Municipal Work in Alton.*

By G. BERTRAM HARTFREE, F.S.I., Surveyor to the Urban District Council.

The area of the urban district of Alton is 3,945 acres, which includes the town, with surrounding land under development for building purposes; Beech area, principally bungalow residences; and agricultural land. The rateable value is £30,768, and the total rates for the present year, including water, amount to 6s. 6d. in the £. The geological formation is chalk: the three varieties (upper containing flints, middle without flints, and lower or chalk marl) occur in turn, covered to varying thicknesses on the hills by clay and in the valleys by gravel. . . .

SEWERAGE.

The earliest sewers were constructed in 1861, and consisted of stoneware socketed pipes, jointed with clay on the underside and left open at top. The best-known patent pipes, the special point of which was the facilities they afforded for inspection in case of stoppage, were used. The patent referred to movable caps placed over the junction of two pipes. No manholes were provided; but relying on subsoil water for sewer flushing was soon discovered to be without any advantage, and led to considerable difficulties. Under the advice of the late Mr. Lawson in 1865 close-jointed pipes were laid, iron being used in the valley; manholes were provided at all necessary points, the original sewer remaining in position as a spring-water drain. Further extensions were made in 1890, under the direction of the late Mr. Mansergh, M.INST.C.E.

Since 1905 short extensions have been made as building development required, and in August last an extension of 2,000 yds. was completed by direct labour. This consisted of 900 yds. of 9-in. and 220 yds. of 6-in. stoneware pipes, 600 yds. of 9-in. cast-iron pipes, and, for the purpose of improving the gradient of the new sewers, a length of 330 yds., formerly with a fall of 1 in 178, was relaid to a less gradient to allow a uniform inclination of 1 in 385 to 900 yds. of the new sewers, the remainder of which were laid at inclinations varying from 1 in 180 to 1 in 280. Lead wool was used for jointing the iron pipes, and proved invaluable, as many of the joints were made under water; all were tested internally to a pressure of 3½ lb. to the square inch before being covered over.

The work being close to the river Wey, rendering brick construction difficult, rock concrete manholes provided with iron spigots and sockets were used. Upon being lowered into position the connections were made sound with lead wool, and the ogee-shaped joints to each section of manhole ensured obtaining sound work. Those stoneware pipes laid to the 1 in 385 gradient were provided with bitumen joints to obtain a true invert. With the greater part of the stoneware construction much more water was met than was anticipated; in consequence, to minimise the risk of future inflow of water, in addition to tested cement joints, they were covered by a band of clay and encased in concrete, with the exception of 200 yds. laid with grouted composite joints; the latter section proved the most economical. Unfortunately the estimated cost (£1,500) was exceeded by £164, caused by the abnormal quantity of water met with and lack of experience on the part of the workmen, only three of whom had previously been engaged on similar work. It has been customary in the past to arrange that all work should, as far as possible, be carried out departmentally in the winter to reduce unemployment, and on smaller works this has been satisfactory from all points of view.

From earliest days great trouble has been experienced from the entry of spring and surface water in the sewers. In 1874, while the estimated dry-weather flow was 100,000 gallons, ten times that amount arrived at the works. This has been reduced considerably by laying iron sewers and separate surface-water drains. On the hilly districts deep stoneware gullies were provided in place of brick catchpits, and turning chambers were substituted by silt-arresting chambers; these were constructed as large catchpits, with bases 2 ft. or 3 ft. below outlet pipes, with brickwork brought to ground surface and covered by ventilating manhole covers. The quantity of silt arrested, and its absence in the pipes, has warranted the continuance of this practice. During the past year concrete built around wood drums has been used in chamber and gully construction, and while being stronger, it has been cheaper than brick or stoneware work.

SEWAGE DISPOSAL.

The sewage disposal works constructed in 1861 consisted of a small precipitation tank and filter made of wrought-iron framework filled with layers of flints and charcoal. With a view to improving the works, from 1874 to 1887 experiments were made with the following processes of purification: A B C, phosphate process, black-ash waste and lime, lime precipitation, and porous carbon. A scheme for lime precipitation was submitted to the Local Government Board in 1887, but was not approved, a final land treatment not being included. Three years after schemes for broad irrigation and intermittent downward filtration were contemplated, but opposition on the part of owners of adjoining lands prevented their execution, and subsequently experiments were made with herring brine, ferrozone and polarite filters. In 1890 an offer was accepted from a company who agreed to construct all buildings, appliances and filters, and purify the town sewage for the sum of £280 per annum, subject to the board purchasing the plant at a price previously agreed upon at the end of three years, in the event of a satisfactory effluent being continued. These works, constructed in 1891, included carboniser-house in which house refuse was burned for purposes of obtaining carbon; precipitation tanks and filters. The contract was terminated owing to complaint of smells and other difficulties. Endeavours were made to obtain suitable ground for land treatment outside the district, but, owing to strenuous opposition on the part of adjoining landowners, without success; as temporary measures, the Amines system of precipitation by brine and lime and aluminoferric treatment were tried.

Subsequently, upon the advice of Mr. R. F. Grantham, M.INST.C.E., a scheme for chemical precipitation with final land treatment was proposed; the precipitation was abandoned in favour of Mr. Dibdin's bacteria beds which had recently been installed at Sutton, and this met with the approval of the Local Government Board. The works included an egg-shaped tank sewer, 3 ft. by 2 ft., capable of holding 40,000 gallons, screening chamber and pump well, an engine-house (containing engine pump-room, workshop and store. Hornsby-Ackroyd oil engines, and three-throw pumps by Messrs. Waller, were provided in duplicate. From the pumping station the sewage is raised to the disposal works at the foot of Neatham Down.

Originally the screened sewage was discharged direct on the primary (coarse) beds, where after contact it flowed on the second (fine) series, the effluent passing on to land laid out in terraces; these were not underdrained, but, notwithstanding, absorbed the effluent for several years. Some eight or nine years ago the beds choked, and both series were refilled with coarse material; a small detritus tank was constructed at the same time. In 1906 two anaërobic tanks, together holding one-third of a day's flow, were constructed; the land has since been underdrained, and additional bacteria beds are in course of construction.

The size of tanks was limited, owing to the large proportion of brewery waste rendering longer contact inadvisable. Strictest economy had to be practised in their construction, and the chalk soil was excavated to its angle of repose, and lined with 9-in. brickwork, with 18-in. piers, 8 ft. apart, at the back. Land drains consist of field pipes butted, but with cement-jointed pipes at the end of each section taken above ground as air inlets. Inspection chambers are provided to each of fourteen sections of land, so that effluents can easily be examined. Gallenkamp's testing apparatus is used for this purpose.

The new beds for bacteria treatment are being constructed with earth walls; as filtering media, any hard, clean material that can be obtained is used. Eight beds, each capable of holding 12,000 gallons, have been commenced, four of which are now in use; two are filled with broken glass, one with clinker, and the fourth with flint. Although not giving as good results as clinker, the glass performs useful work, and results warrant further extension on the same lines,

* Extracts from a paper read on Saturday last at a Provincial Sessional meeting of the Royal Sanitary Institute at Alton.

as the cost of brick-built beds of similar size (£86 each) prevents their use, and purchased filtering media would average an additional £50. The present area of land, including buildings, beds and roads, is 14½ acres, but acquisition of more land is contemplated.

HOSPITAL ACCOMMODATION.

Previous to 1907, a building situate in the town was used as an isolation hospital. The present buildings are erected on a hill overlooking the Caker stream, with excellent views to the south-east, and include a large pavilion, containing two six-bed wards, water-closet, bath-rooms, and nurses' sitting and bed rooms, with kitchen and laundry block, with caretaker's room adjoining; a small pavilion, 40 ft. distant, contains one two-bed and a four-bed ward, with bath and nurses' room; a small discharge cabin, containing disrobing, bath and dressing rooms; there is also a mortuary on the site, which, fortunately, has been used but once. The buildings are constructed of timber framing, covered with galvanised iron outside and lined with matchboard inside; on the face of this uralite has been fixed, the joints of which are covered with strips of the same material finished to give a panelled appearance.

Drainage is to an anaërobic tank, the liquid from which discharges upon filters: No. 1 (open), containing 1-in. granite, and No. 2 (covered by perforated tiles) is filled with ¾-in. flint; the effluent is conveyed away in closely jointed pipes until the outcrop of the middle chalk formation is passed, and discharges on agricultural land with a marl subsoil. Water supply is from the council's waterworks; owing to the altitude of the hospital site a miniature high-level service had to be provided.

The total cost of land, buildings, sewage disposal, water supply and fencing was £1,340. An agreement was entered into with the Alton Rural District Council last year, by which the hospital is now controlled by a joint board, and by a further agreement made in August last the board has taken over the leasehold lands and buildings in the occupation of the rural district council situate at Medstead, to be retained as an emergency hospital.

REFUSE DISPOSAL.

House refuse is collected from town dwellings twice weekly; formerly it was deposited on hop lands, but the supply exceeding demand, complaints of accumulations were received, and some five years back the provision of a one-cell destructor was considered; but as utilising the power for sewage pumping required steam in place of the oil engines in use, and refuse cremation near the water reservoir appeared undesirable, the destructor scheme was abandoned in favour of the system in use at Farnham, and the refuse is mixed with sewage sludge, finding ready sale as manure.

WATER SUPPLY.

Provision of a public water supply received attention in 1871, four years after the works were constructed on Windmill Hill, under the direction of Messrs. Gotto and Beesley. These consist of an engine-house, containing engine-room, boiler-room and coal bunker, a dwelling-house for attendant, and a reservoir constructed with brick, arched and covered, having a capacity of 100,000 gallons. The well was sunk to a depth of 135 ft.; owing to the supply failing to meet increased demands, it was lowered a few feet in 1880, and the advisability of driving headings was considered, but ultimately boring operations were instituted to a depth of 480 ft., reaching the green-sand formation, since when no shortage of water has been experienced. Continual observations were made during the hot summer of 1911, and throughout the supply was in excess of the demand.

Considerable extensions and improvements have been made recently to the mains, and, owing to the development of building sites on the hills, further improvement at the works is under consideration. The draft scheme provides for increased storage, substituting gas or oil engines for those in use, preferably one of each to provide against shortage of any particular fuel, also a high-level supply, the principal power for which probably will be a wind motor capable of raising 50,000 gallons in twenty-four hours 50 ft.

The water charges are low, a special rate of 2s. each for cottages, while larger dwellings pay a rate of 3d in the £, no extras are made in respect to baths or additional water-closets. Trade and garden supplies are metered at a charge of 6d. per 1,000 gallons.

ROADS.

The mileage of roads in the district is 37. 7 of which are main roads. The local materials suitable for road metalling are picked flints and gravel; Guernsey granite was imported in 1903, and the use of hard material has since extended. Clee Hill basalt, Rowley rag, Moel-y-Gest and Scotch basalt have since been used on the level lengths, and Mountsorrel and Hartshill granites on the hillsides.

Dust palliatives were introduced in 1906, and the results warranted further use until 1909, when surface tarring was commenced. This work has been extended yearly, including machine and hand treatment with local tar, distilled tar, and Tarvia. The costs varied from ½d. to 1¾d. per yard super., according to the material and finish; the lowest price being for local tar covered with road dust, and the highest for Tarvia covered with limestone chippings. Recently lengths have been laid with tarviated granite on the Gladwell system, Rocmac sub-binder, and the following materials coated with tar previous to spreading: Slag, Clee Hill basalt, Mendip limestone, Bargate stone and flints.

All the foregoing trials have clearly demonstrated that water-binding methods are obsolete, and present-day traffic can only be combated by some form of tar or bituminous binder. Various materials consolidated to a full thickness of 3 in., allowing 1 ton to cover 6½ yds., have cost per yard: Gravel, 8½d.; flint, 1s.; Bargate rock (a Hampshire calcareous sandstone similar to Kentish rag), 1s. 6d.; Mendip granite, 1s. 7d.; Rowley rag, 2s. 6d.; Mountsorrel granite, 2s. 7½d.; Hartshill granite, 2s. 7½d.; Clee Hill basalt, 2s. 8d.; tarred Mendip stone, 2s. 8½d.; tarred slag, 3s.; Clee Hill basalt on Rocmac binder, 3s. 1½d., on Tarvia binder, 3s. 1½d., and the same material tarred to Road Board specification, 3s. 5½d.

The principal roads are scavenged twice daily, and others according to requirements. Private streets are repaired under the provisions of the Private Street Works Act. The costs, including kerbing, channelling and surface drainage, have ranged from 2s. 4d. to 5s. per foot frontage.

The formation of narrow roads and *culs-de-sac* in the past has drawn attention to the necessity of remedying as far as possible and in future preventing this evil, and a draft town planning scheme is in hand, showing suggested improvements to existing roads and lines of proposed thoroughfares. While local development does not warrant at the present time an application for Government confirmation, the plans will be taken as a general guide in case of alteration, additional building or other similar matters, with a view to obtaining a general conformity of new roads and widening to those existent at small expense to the rates.

MISCELLANEOUS.

Until September, 1907, the by-laws with respect to new buildings in force were those made under the provisions of the Public Health Act, 1848. Those now in use are the series known as the Intermediate Model By-laws, and contain a special clause for permitting the erection of galvanised-iron dwellings in the rural parts of the urban district.

In the public health department periodical house-to-house inspections have been made for many years. In addition to the ordinary registers, a separate record is kept of the type of closets, gullies, and water fittings at the various dwellings. The provision of flushing cisterns to water closets was enforced in 1908; since some 900 additional tanks have been provided. All new drains are subjected to a hydraulic or compressed air test, and wherever possible, in addition, a clearway test is applied to the interior of pipes to prove the existence or otherwise of obstructive joints. Whenever occasion arises, existing drainage is tested with smoke, chemicals, coloured water, or normal air pressure.

The question of provision of sufficient light and ventilation to existing cottages receives special attention. In cases of dampness, roof repairs, rendering walls with cement, and insertion of horizontal damp-proof courses are insisted on as the particular case may require. All the other matters in this department are of the usual routine character.

"THE SURVEYOR" BOOK DEPARTMENT.

In response to suggestions from numerous readers, resident in remote districts at home and abroad, who find it difficult to procure the books they require, we have decided to establish a department for the supply of technical and scientific books, a selected classified list of which will shortly be published in our advertisement pages.

A SUGGESTED NEW FORM OF ARBITRATION CLAUSE.

(By a Legal Contributor.)

There can be no doubt that certain recent decisions of the Courts have very seriously impaired the validity of the arbitration clause in that class of contract with which surveyors are most concerned. It is not too much to say that half the arbitrations which take place in relation to works agreements in this country are conducted by surveyors. They are eminently fitted for the work both by training and experience, and we have never yet heard of a surveyor "nominated by the president of the institution" having been rejected by one party to a dispute on the ground of alleged bias or incompetence. Nevertheless, it cannot be ignored that where a surveyor (who is in the employment of one party to a dispute) is called upon to sit as arbitrator objections may be taken to his so acting. These objections, which are most often taken when the surveyor is in the permanent employment of one of the parties, have been upheld by the Court of Appeal. In the result the arbitration clause in many contracts—particularly those contracts to which a local authority is a party—is sometimes rendered practically valueless to the parties.

It is proposed to summarise the cases which have led to this very awkward state of affairs, and then to consider various suggestions which have been made to obviate the difficulty.

It has long been settled law that the mere fact that a proposed arbitrator is in the permanent employment of one party to a contract does not disqualify him. But the cases go even further than this. They show that even where a man may possibly be biassed or has expressly declared himself on a matter he is not necessarily disqualified. In *Jackson* v. *Barry Railway Company* (1893, 1 Ch., 238) objection was taken to an engineer of a railway company acting in the capacity of arbitrator, because in a preliminary correspondence he had expressed a view adverse to the interests of the contractor. This fact did not induce the Court of Appeal to say that he was unfit to act. Lord Justice Bowen said: "To an adjudication in such a peculiar reference the engineer cannot be expected nor was it intended that he should come with a mind free from the human weakness of a preconceived opinion. The perfectly open judgment, the absence of all previously formed or pronounced views—which in an ordinary arbitrator are natural and to be looked for—neither party to the contract proposed to exact from the arbitrator of their choice. They knew well that he possibly or probably must be committed to the prior view of his own, and that he might not be impartial in the ordinary sense of the word. What they relied on was his professional honour, his practice, his intelligence, and the contractor certainly had a right to demand that whatever views the engineer might have formed he would be ready to listen to argument, and at the last moment to determine as fairly as he could, after all had been said and heard."

That was the law in 1893, and it states a principle which is said to be now accepted by the Courts. In a later case (*Ives* v. *Willans*, 1894, 2 Ch., 478) it appears to have been held that if there is no probability that the arbitrator, being in the employment of one party, will be biassed in favour of one party, the arbitration must proceed. In that case the Lord Justice said: "No doubt in a sense the engineer will be the judge of his own conduct, and no doubt that is a position which *primâ facie* raises some surprise in a judicial mind; but that is the contract of the parties. They have contracted that the servant of one of the parties to the contract shall be the arbitrator, and it appears to me that they have contracted that he shall be the arbitrator in cases which must necessarily involve the correctness of his own opinion, the competency of his own advice and opinion as engineer, and the regularity of his own proceedings. . . ."

Thus, in 1894 it was said, impliedly if not expressly, that in order to set aside a reference something more than a probability of bias must be shown. Let us summarise the cases in which, within the last two or three years, this onus has been discharged.

A reference will be set aside—(*a*) if there is an unseemly personal dispute raising a vindictive feeling between the surveyor and the contractor, and he has expressed an opinion so strongly as to amount to a prejudgment (*Nuttall* v. *Manchester Corporation*, 1893, 8 T.L.R., 515); (*b*) if the dispute be such that it cannot be properly determined without the cross-examination of the surveyor (*Freeman* v. *Chester Rural District Council*, 1911, 1 K.B., 783); (*c*) if the dispute be as to the existence and terms of an agreement made between the surveyor (acting for the building owner) and the contractor (*Aird* v. *Bristol Corporation*, 1912, 28 T.L.R., 278); (*d*) if the question is whether the surveyor did or did not act unreasonably—*e.g.*, by making alterations and amendments in drawings, by delaying the delivery of drawings and materials, and by rejecting suitable material (*Blackwell* v. *Derby Corporation*, 1909, 75 J.P., 129); (*e*) if, although acting honestly, the surveyor has lost his independence by conferring with and accepting advice from one party to the contract (*Roberts* v. *Hickman*, 2 H.B.C., 10).

This summary of recent decisions may appear—at least to the layman—to involve a serious departure from the principle enunciated in *Jackson* v. *Barry Railway Company* (*supra*). However that may be, it is clear that the arbitration clause in many existing contracts may cease to have any value.

Before considering the various methods by which the difficulty may be overcome, it is well to review the motives of those who insert an arbitration clause in a contract. They desire to avoid litigation, to have questions decided finally, promptly and at a minimum cost, and to secure the services of a man who has an intimate knowledge of technical matters, and who will be less trammelled by the forms of law than a judge or a legal arbitrator. In naming as arbitrator the man who has drawn the specifications, prepared the plans, and supervised the execution of the works, the parties clearly contemplate that when he undertakes the burden of a reference he will be possessed of a knowledge of the subject matter which an independent arbitrator could only acquire after much preliminary labour, or by hearing the evidence of numerous witnesses. For these reasons it is considered that (apart from the question of bias) the appointment of the surveyor is the most satisfactory and economical for all concerned.

So far as contracts now in existence are concerned, they must be governed, in the absence of a fresh agreement, by the principle laid down in the cases above quoted. But what course can be adopted in order to avoid the difficulty in future contracts? The following courses are open: (1) Omit all reference to arbitration; (2) name an independent arbitrator in the contract; (3) name two arbitrators in the contract and allow them to appoint an umpire; (4) submit to the arbitration of a person named by the president of the Institution of Civil Engineers or of Surveyors' Institution; (5) name a single arbitrator who may be the surveyor of one of the parties, and then provide, by a special clause, that if the court shall be of opinion that he is disqualified from acting, the dispute shall be decided by an independent person nominated by the president as above.

With reference to these suggestions it is obvious that all of them (except, in a certain event, the last) have the defect that they involve the decision of questions arising under the contract by a person who is wholly unfamiliar with the subject matter. This, as has already been shown, involves delay and additional expense. The last proposal, however, appears to be well calculated to obviate any difficulty. It may be said that it practically reduces the parties to the position they would have been in if their agreement contained no arbitration cause at all; but this is not so. Where a dispute arises between the builder and a building owner, and there is no arbitration clause, a writ is issued. If the dispute is likely to be long and technical it is sent by the judge to an official or special referee, who is an officer of the Court. It cannot be decided by arbitration. On the other hand, assuming the parties are bound by a clause similar to that adumbrated in paragraph (5) (*supra*), they secure the reference of disputes to the surveyor in a proper case. In any event they secure arbitration and avoid litigation. Whether the validity of such a clause would be affirmed by the Courts is an open question, although the present writer sees no objection to it. It does not tend to oust the jurisdiction of the Courts any more than an ordinary arbitration clause. It merely makes a decision by the named arbitrator, or, alternatively, by the arbitrator appointed in the manner agreed to by the parties, a condition precedent to the settlement of disputes by the ordinary legal tribunals of the land.

Competition Award.—Mr. Ernest Fetch, London, has been awarded the premium for his design for new public offices at Goole.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. Thomas, M.Inst.C.E., County Surveyor, Buckinghamshire.

SOUTH-EASTERN DISTRICT EXECUTIVE COMMITTEE MEETING.

A meeting of the Executive Committee of the South-Eastern District was held at the offices of the institution, 11 Victoria-street, Westminster, S.W., on Saturday last, those present being Messrs. A. Dryland (chairman), H. W. Bowen, J. H. Brierley, W. H. Grieves, F. Harris, H. W. Longdin, C. G. Mason, P. H. Palmer, A. E. Prescott, J. L. Redfern, and Mr. T. Cole (secretary of the institution). The hon. secretary (Mr. Frank Roberts) was unavoidably prevented from attending.

It was decided to hold an afternoon meeting of the members of the South-Eastern District in order to visit the Sidcup-road trial lengths on the afternoon of Wednesday, January 8th, if it could be conveniently arranged, the inspection to be followed by a dinner in London, at 6.30 p.m. The tickets for the dinner will be 5s. per head, exclusive of wines, and any members of the institution outside the South-Eastern District will be welcome if they will previously notify the secretary of their desire to attend. The musical part of the dinner arrangements has been left in the hands of Mr. Frank Harris and Mr. W. Hedley Grieves, who will be glad of offers of assistance from members.

Various matters of interest were discussed by the committee, and it is hoped to arrange for a meeting at one of the coast towns in the district in May next, and probably at another in September.

The committee are meeting again early in December to fill two vacancies among the representatives of the junior members, and to make further arrangements for the proposed meetings.

The committee are anxious to make the institution useful, particularly to the younger members, and will welcome suggestions to that end.

The council of the Institution of Municipal and County Engineers are offering premiums to members, associate members and students of the institution amounting to twenty-eight guineas for the best plans for laying out a seaside pleasure resort.

The drawings are to be delivered prior to the annual meeting in July next at a date to be fixed hereafter. Further particulars will be issued shortly.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

INSTITUTION OF MUNICIPAL ENGINEERS.

President Mr. Frank Latham, M.Inst.C.E.I., F.S.E., Borough Engineer and Surveyor, Penzance

NORTH-WESTERN DISTRICT.

It has been decided to hold a social evening at Manchester on Saturday, December 7th. The approximate expense per head will be 4s., and it is desirable that members should give notice, at the earliest possible moment, of their intention to attend. Full programme will be issued later.

"Brantwood," Jas. W. Gleave,
Coomassie-street, *Hon. District Secretary.*
Heywood.
October 12, 1912.

Subscriptions, 1912-13. Members and others are requested to note that annual subscriptions for 1912-13 are now due.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*

ROYAL SANITARY INSTITUTE.

LONDON MEETING.

At a meeting of the Royal Sanitary Institute, to be held at 90 Buckingham Palace-road, S.W., on Tuesday, November 12th, Mr. H. Percy Boulnois, M.Inst.C.E., chairman of council of the institute, will open a discussion on the recently issued report of the Departmental Committee on Intercepting Traps in House Drains.

The chair will be taken at 8 p.m. by Sir Maurice Fitzmaurice, C.M.G., M.Inst.C.E., chief engineer to the London Council Council.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1369 Holborn), subject to later confirmation by letter.*

ASSISTANT SANITARY INSPECTOR.—November 4th.—Coalville Urban District Council. £2 5s. per week.—Mr. T. E. Jesson, clerk.

CLERK OF WORKS.—November 4th.—Tipton Education Committee. £2 2s. per week.—Mr. E. Richards, secretary, Education Offices, Tipton.

INSPECTOR OF NUISANCES.—November 4th.—Whitby Urban District Council. £100 per annum.—Mr. W. S. Gray, clerk.

BUILDING INSPECTOR.—November 5th.—Corporation of Leeds. £120 per annum.—Mr. W. T. Lancashire, city engineer and building surveyor. Applications to be endorsed "Building Surveyor."

INSPECTOR OF NUISANCES.—November 5th.—Sheerness Urban District Council. £120—£150 per annum.—Mr. V. H. Stallon, clerk.

CLERK OF WORKS.—November 5th.—Bray Urban District Council. £2 5s. per week.—Mr. P. MacDonnell, clerk.

SURVEYING ASSISTANT.—November 5th. Corporation of Manchester. £3 3s. per week.—Mr. Thomas Hudson, town clerk.

INSPECTOR OF NUISANCES.—November 7th.—North Walsham Urban District Council. £120 per annum.—Mr. H. W. T. Empson, clerk.

ROAD FOREMAN.—November 11th.—Maidstone Rural District Council. £1 1s. a week.—Mr. R. Hoar, clerk.

TWO TEMPORARY ASSISTANTS.—November 11th.—Corporation of Swansea. £10 16s. 8d. per month.—The Town Clerk.

CLERK OF WORKS.—November 11th.—Lichfield Rural District Council. £3 13s. 6d. per week.—Mr. R. Green, 37 Waterloo-street, Birmingham. Applications to be endorsed "Clerk of Works."

CLERK OF WORKS.—November 12th. Stalybridge and Dukinfield Joint Sewerage Board. £3 3s. per week.—Mr. W. Moss, clerk, Market-place, Ashton-under-Lyne.

INSPECTOR OF NUISANCES.—November 12th. Southborough Urban District Council. £104 per annum.—Mr. Philip Hanmer, clerk.

MUNICIPAL ENGINEER.—November 21st.—Municipal Board of Cawnpore. 800—1,000 rupees per mensem.—Mr. C. E. Goument, C.S.I., M.Inst.C.E., c/o Messrs. Thos. Cook & Son, Ludgate-circus, London.

ARCHITECTURAL DRAUGHTSMAN.—Public Works Department, Kedah, Malay States. £350 per annum and free quarters.—Box No. 1,194, The Surveyor office.

ASSISTANT DRAINAGE ENGINEER. Corporation of Madras. Rs. 500—700 per mensem, and motor bicycle allowance. Age not to exceed thirty-five.—James Mansergh & Sons, agents to the corporation, 5 Victoria-street, Westminster. Envelopes to be endorsed "Drainage Assistant."

ENGINEER'S ASSISTANT. Municipal Commissioners of Singapore. $350 per month. Age under thirty-two.—Mr. C. C. Lindsay, M.Inst.C.E., 180 Hope-street, Glasgow.

MUNICIPAL COMPETITIONS OPEN.

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RHYL.—November 18th.—Plans, specifications and estimates for strengthening Rhyl pier, for the urban district council.—Mr. A. Rowlands, clerk.

ORSETT (Essex).—January 1st.—For the construction of a sewerage and sewage disposal scheme in the parish of South Ockendon, for the Orsett Rural District Council. Premiums of £50 and £25 are offered.—Mr. James Beck, clerk, 2 Orsett-road, Grays.

DURSLEY.—Competitive designs for thirty cottages, for the rural district council.—Mr. J. Collett, clerk to the Parochial Committee, Dursley.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but these responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1369 Holborn), subject to later confirmation by letter.*

Buildings.

BEDFORDSHIRE.—November 2nd—14th.—For the erection of a school, for the county council. Mr. W. W. Marks, clerk, Shire Hall, Bedford.

MAIDENHEAD.—November 2nd.—For additions to the electricity station, for the corporation.—Mr. H. E. Davies, town clerk.

LINDSEY (Lincs).—November 4th—21st.—For the erection of a public school, for the county council.—Mr. S. Maudson Grant, secretary, 286 High-street, Lincoln.

TREFECHAN.—November 4th.—For the erection of workmen's dwellings, for the corporation. Mr. R. Jones, borough surveyor, Smithfield-road, Aberystwyth.

BATH.—November 4th.—For constructional work in Orange-grove, for the corporation.—City Surveyor.

SLOUGH.—November 6th.—For the erection of buildings at the pumping station, for the urban district council.—Mr. G. H. Charsley, clerk.

HADHAM.—November 6th.—For the erection of six cottages, for the rural district council.—Mr. A. G. Gwynn, clerk.

DUNDEE.—November 6th.—For reinforced-concrete piling and foundation work, for the corporation.—Mr. H. Richardson, manager of the electricity department.

SHEFFIELD.—November 7th.—For alterations and extensions to a school, for the Education Committee.—City Architect.

WANSTEAD.—November 7th.—For the erection of a fire brigade station, for the urban district council.—Mr. C. H. Brassey, surveyor.

WEST RIDING.—November 8th.—For the erection of a new school and additions to a school, for the Education Committee.—Education Architect, County Hall, Wakefield.

CORNWALL.—November 9th.—For additions and alterations at a school, for the Education Committee.—Mr. F. R. Pascoe, secretary, Education Department, County Hall, Truro.

GLAMORGAN.—November 9th.—For the erection of two detached cottages and four pairs of semi-detached cottages, and the construction of accommodation road, for the county council.—Mr. T. Mansel Franklin, clerk, County Hall, Cardiff.

MARGATE.—November 11th.—For repairs to the water tower, for the corporation.—Mr. Edward Brooke, town clerk.

BIRMINGHAM.—November 11th.—For the erection of stabling, for the corporation.—Mr. William Holt, superintendent and engineer, Refuse Disposal Department.

CAMBRIDGE.—November 11th.—For the erection of cottages, for the corporation.—Mr. J. E. L. Whitehead, town clerk.

PETERHEAD.—November 11th.—For the construction of a storage reservoir, for the corporation.—Messrs. Walker & Duncan, engineers, 3 Golden-square, Aberdeen.

RICHMOND (Surrey).—November 11th.—For extensions to the public baths, for the corporation.—Mr. Henry Sagar, town clerk.

CLEETHORPES.—November 11th.—For the erection of a bandstand, for the urban district council.—Mr. C. H. Waithman, engineer and surveyor.

YORK.—November 12th.—For the erection of thirty cottages, for the corporation.—Mr. F. W. Spurr, city engineer.

STOCKPORT.—November 12th.—For the erection of a shelter, bowl house and tennis pavilion, for the corporation.—Mr. J. Atkinson, borough surveyor.

WOOLWICH.—November 13th.—For the erection of sanitary conveniences in Royal Victoria Gardens, for the borough council.—Mr. Arthur B. Bryceson, town clerk.

RUGBY.—November 14th.—For the erection of a discharge block at hospital, for the Joint Hospital Board. Mr. T. W. Willard, architect, Market-place, Rugby.

EASTBOURNE.—November 14th.—For the construction of a coal bunker retaining wall, for the corporation.—Borough Electrical Engineer.

BIRMINGHAM.—November 18th.—For the erection of a school, for the Education Committee.—Mr. J. Arthur Palmer, secretary, Council House.

PORTSMOUTH.—November 19th.—For the erection of stores, for the corporation.—Borough Engineer.

HACKNEY.—November 21st.—For the erection of a branch library, for the borough council.—Mr. W. A. Williams, town clerk.

BEBINGTON.—November 21st.—For the erection of a school, for the Administrative Sub-Committee.—Mr. J. Harding, clerk, Library Cottage, Bebington, near Birkenhead.

NORWICH.—November 22nd.—For the erection of a shelter at the cemetery, for the corporation.—Mr. A. E. Collins, city engineer.

Iron and Steel.

MALDON.—November 4th.—For laying 370 yds. of 6-in. water main, for the corporation.—Mr. F. H. Bright, town clerk.

EALING.—November 5th.—For the supply of iron fencing, for the corporation.—Mr. Geo. E. Brydges, town clerk.

SWANSEA.—November 5th.—For the extension of water mains, for the rural district council.—Mr. Edward Harris, clerk.

CARLISLE.—November 8th.—For laying water main, for the rural district council.—Mr. F. Barker, waterworks manager, 7 Victoria-place, Carlisle.

KEIGHLEY.—November 9th.—For laying line of water pipes and other works, for the corporation.—Mr. W. Bagshaw, town clerk.

MANCHESTER.—November 9th.—For the erection of a 96-tube fuel economiser, for the corporation.—Mr. Thomas Hudson, town clerk.

EGREMONT.—November 18th.—For the supply of materials for and construction of water supply, for the urban district council.—Mr. John Nelson, clerk.

NEWMARKET.—November 25th.—For carting, excavating for and laying 5 miles of 3-in. cast-iron pipes, including fixing valves and hydrants, and erection of brick water tower, for the rural district council.—Mr. S. J. Ennion, solicitor.

NEWMARKET.—November 25th.—Supply of 163 tons of 3-in. cast-iron pipes and specials, the erection of cast-iron tank and other works, for the rural district council.—Mr. S. J. Ennion, solicitor.

KNOTTINGLEY.—(No date.)—For the supply of 10-in. and 6-in. cast-iron rising main and specials, for the urban district council.—Mr. W. Swaine, clerk.

COCKERMOUTH.—(No date.)—For scraping 16 miles of water mains and fixing hatch boxes, valves, covers, pipes and other fittings, for the rural district council.—Mr. J. H. Musgrave, clerk.

Roads.

HAMPTON WICK.—November 2nd.—For the supply of 200 yds. of broken granite, for the urban district council.—Mr. H. Fawssett, clerk.

ENNISKILLEN.—November 4th.—For the supply of road metal, for the urban district council.—Mr. A. W. G. Ritchie, town clerk.

MONK BRETTON.—November 4th.—For the execution of private street works, for the urban district council.—Mr. James Gibson, clerk.

WALTHAM.—November 4th.—For laying wood-block paving, for the urban district council.—Mr. W. C. Holloway, engineer and surveyor.

GELLIGAER.—November 4th.—For constructional road work, for the urban district council.—Mr. Frank T. James, clerk, Council Offices, Hengoed, *viâ* Cardiff.

WEALDSTONE.—November 5th.—For the supply of granite chippings, for the urban district council.—Mr. H. Walker, surveyor.

TOTTENHAM.—November 5th.—For making up South-grove, for the urban district council.—Mr. Edward Crowne, clerk.

EALING.—November 5th.—For making up Haslemere-avenue and York-road, for the corporation.—Mr. Geo. E. Brydges, town clerk.

BARKING.—November 6th.—For carrying out private street works, for the urban district council.—Mr. C. F. Dawson, surveyor.

CLACTON.—November 6th.—For the supply of flints and granite, for the urban district council.—Mr. D. J. Bowe, surveyor.

HAILSHAM.—November 6th.—For work of road widening, for the rural district council. The Chairman.

WANSTEAD.—November 7th.—For making up certain streets, for the urban district council.—Mr. Bruce Blewitt, clerk.

MIDDLETON.—November 8th.—For private street works, for the corporation.—Mr. W. Welburn, borough surveyor.

HASTINGS.—November 9th.—For the supply of 1,200 yds. of best unbroken blue stone, for the rural district council.—Mr. A. R. Inskipp, clerk, 11 Wellington-square, Hastings.

WILLINGTON.—November 9th.—For work of making up, for the urban district council.—Mr. J. H. Gardner, clerk.

WALSALL.—November 9th.—For making up Charles-street, for the corporation.—Mr. J. R. Cooper, town clerk.

NORTHUMBERLAND.—November 9th.—For supplying, breaking and carting stones, for the county council.—County Surveyor, Moot Hall, Newcastle-upon-Tyne.

SKIPTON.—November 11th.—For work of making up, for the urban district council.—Mr. Richard Wilson, clerk.

WANDSWORTH.—November 11th.—For making up and paving part of Southerolt-road, for the borough council.—Mr. D. A. Nicholl, town clerk.

BEDLINGTONSHIRE.—November 11th.—For work of making up, for the urban district council.—Mr. Charles D. Forster, joint clerk, 24 Grainger-street West, Newcastle-upon-Tyne.

MANCHESTER.—November 11th.—For making up certain thoroughfares, for the corporation.—Mr. Thomas Hudson, clerk.

BIRMINGHAM.—November 11th.—For the supply of stores, for the Water Department.—Mr. E. Antony Lees, secretary, 44 Broad-street.

SALTASH.—November 12th.—For making up certain streets, for the urban district council.—Borough Surveyor.

PENYBONT.—November 12th.—For making up nine streets, for the rural district council.—Mr. R. Harmer Cox, clerk, Union Offices, Bridgend.

LONDON.—November 12th.—For the supply of Jarrah and creosoted deal paving blocks, for the county council.—Sir Laurence Gomme, clerk.

EDMONTON.—November 12th.—For making up certain private streets, for the urban district council.—Mr. W. Francis Payne, clerk.

RAWTENSTALL.—November 13th.—For work of paving and sewering, for the corporation.—Mr. J. Johnson, borough surveyor.

BARNSTAPLE.—November 14th.—For the hire of steam roller, for the corporation.—Mr. E. Y. Saunders, borough surveyor.

METHLEY.—November 16th.—For works of flagging and kerbing, for the urban district council.—Mr. T. Thompson, surveyor.

EAST SUSSEX.—November 22nd.—For the supply of materials, cartage and team labour, for the county council.—Mr. F. J. Wood, county surveyor.

Sanitary.

EAST PRESTON.—November 4th.—For laying a stoneware drain, for the rural district council.—Mr. C. W. Leney, surveyor.

WHITLEY.—November 4th.—For the construction of a sewer, for the urban district council.—Mr. Augustus Whitehorn, clerk, 60 Saville-street, North Shields.

FELTHAM.—November 5th.—For the construction of a stoneware sewer, storm-water drain and manholes, for the urban district council.—Mr. G. Stevens, clerk.

HAVANT.—November 6th.—For laying concrete tubes and manholes, for the rural district council.—Mr. W. L. Hibberd, surveyor.

HOO.—November 6th.—For work of scavenging, for the rural district council.—Mr. R. P. Smyth, clerk.

COCKERMOUTH.—November 9th.—For works of sewerage, for the rural district council.—Mr. J. H. Musgrave, clerk.

TADCASTER.—November 9th.—For the construction of manholes, for the rural district council.—Mr. G. A. Bromet, clerk.

THORNE.—November 12th.—For the removal of town refuse, for the rural district council.—Mr. Harold Plewes, surveyor.

HALIFAX.—November 16th.—For the construction of earthenware pipe sewers, for the corporation.—Mr. J. Lord, borough engineer.

BELFAST.—November 19th.—For the construction of an outlet sewer, for the corporation.—Mr. R. Meyer, town clerk.

LEWES.—November 19th.—For the construction of sewage disposal works, including screen chambers buildings, settlement and storm tanks, tidal storage tanks, and sludge drying beds, for the corporation.—Mr. Montague S. Blaker, town clerk.

LEWES.—November 19th.—For the construction of the low-level pumping station and contingent works, for the corporation.—Mr. Montague S. Blaker, town clerk.

GLOUCESTER.—November 26th.—For the construction of a main outfall sewer, for the corporation.—Town Clerk.

ARDSLEY.—(No date.)—For the construction of small sewerage works, for the urban district council.—Mr. C. McNaughton, clerk.

Stores.

WOKING.—November 16th.—For the supply of oil, sludge press cloth, gulley frames and gratings, brooms, shovels, mud scrapers, pickshafts, fagging hooks, pennant kerb, tar paving, dust skips, coke, coal, lamp standards and lanterns, Izal disinfecting fluid, Izal empty pint tins, Izal soft soap, Izal sulphur candles, Sanitas No. 2. hard soap, gummed rolls for disinfecting, disinfecting powder, lime and oats, for the urban district council.—Mr. Robert Mossop, clerk.

Miscellaneous.

NEW SOUTH WALES.—November 4th.—For the supply of 180,000 casks of Portland cement, for the Government of New South Wales, Australia.—Agent-General for New South Wales, 123 and 125 Cannon-street, London, E.C.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BIDEFORD.—For the supply of broken and unbroken granite and chippings, for the corporation:—

Baker & Son, Bideford.—Broken granite, 8s. 11d. per ton; unbroken, 7s. 1d. per ton; chippings, 6s. 6d. per ton.

BIRKENHEAD.—Accepted for the construction of a gallery in the swimming bath, for the corporation.—Mr. J. Fearnley, town clerk:—

T. Spencer, Liverpool, £111.

BIRKENHEAD.—Accepted for private street works in Powell-street, for the corporation.—Mr. C. Brownridge, borough engineer and surveyor:—

W. Bramwell, Birkenhead, £300.

BRAINTREE.—For the supply of 500 tons of 1½-in. granite, 100 tons of 3-in. slag, and hire of steam roller for about 80 days, for the rural district council.—Mr. C. V. Bright, surveyor of highways:—

Granite.—Ellis & Everard, Bardon Hill—250 tons, average price per ton, 13s. 3d.; C. Abell, Limited, Hartshill—250 tons, average price per ton, 12s. 5d.

Slag.—Lavender & Bateman, Sutton Bridge—100 tons, 10s. per ton.

Hire of Steam Roller for about 80 days—Pamphin Brothers, Cambridge—21s. per day inclusive.

CARLTON.—For the erection of four cottages, for the urban district council.—Mr. J. C. Haller, surveyor:—

J. A. Betts, Nottingham	£935
J. Powell & Son, Nottingham	896
W. Maule & Co., Nottingham	850
T. H. Harper, Nottingham	840
J. Quinn, Nottingham	830
J. Lewin, Nottingham	828
J. & G. Rouison, Nottingham	810
W. D. Tuck, Nottingham	800
G. T. Tyerdine, Nottingham*	799

CHICHESTER.—For the supply of granite, for the corporation:—

Rowe & Mitchell.—Guernsey granite at 12s. 8d. per ton.

CHINGFORD.—For making-up work, for the urban district council.—Mr. J. T. Griffin, surveyor:—

T. Adams, Wood Green, N.	£1,219
W. & C. French, Buckhurst Hill*	1,215

COCKERMOUTH.—For widening a roadway, for the rural district council:—

W. Weightman, Keswick, £79

HAYES.—For the construction of percolating filters, sludge beds, and humus tank, and alterations at existing works, for the urban district council.—Mr. D. C. Fidler, engineer, Grange-road, Hayes:—

Langley & Johnson, Slough	£1,905
H. M. Blaker, Leatherhead	1,264
G. Rayner, Wallington	1,223
A. Winch, Harlington*	1,134

Surveyor's estimate, £1,210.

HUNSLET.—For making-up work, for the rural district council:—

D. Speight & Son, Leeds	£150
H. C. Pullar, Halifax	138
G. L. Briggs & Son, Leeds	128
J. Robinson, Wakefield*	120

LEISTON-CUM-SIZEWELL.—Accepted for the construction of grit chamber and septic tank, with manhole, for the urban district council.—Mr. J. Baldry, surveyor:—

G. Partridge, Leiston, £130.

MAIDSTONE.—For the supply of disinfectants, for the corporation:

F. J. Oliver, Maidstone, £226.

STOCKPORT.—For taking down one of the bays of the covered market and other work, for the corporation.—Mr. J. Atkinson, borough surveyor:—

H. Bardsley, Stockport, £187.

WANDSWORTH.—For repairing parts of two roads in Southfields for the urban district council.—Mr. P. Dodd, borough engineer:—

Wimbledon-park-road.—H. Woodham & Sons, £255 and 15 per cent above schedule prices for extras or omissions.

Viewfield-road.—H. Woodham & Sons, £227 and 15 per cent above schedule prices for extras or omissions.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

NOVEMBER.

2.—Lower Thames Valley District Surveyors' Association: Meeting at Town Hall, Twickenham. 6.30 p.m.

4.—Royal Institute of British Architects: Mr. Reginald Blomfield, R.A., delivers his presidential address. 8.30 p.m.

8.—Institution of Civil Engineers: Mr. R. Elliott-Cooper, President, delivers his inaugural address: presentation of medals: Institution of Mechanical Engineers, Storey's Gate, S.W. 8 p.m.

11.—Surveyors' Institution: First Ordinary General Meeting of the Session: The Hon. Edward Gerald Strutt delivers his opening address: Presentation of Gold Medal. 8 p.m.

12.—Royal Sanitary Institute: Discussion on Report of Departmental Committee on Intercepting Traps in House Drains, 90, Buckingham Palace-road, S.W. 8 p.m.

14.—Concrete Institute: Mr. E. P. Wells delivers his presidential address. 7.30 p.m.

28.—Concrete Institute: Mr. John M. Theobold, F.S.I., on "Bills of Quantities for Reinforced Concrete Work." 7.30 p.m.

DECEMBER.

12.—Concrete Institute: Messrs. R. Cathcart and Laurence Gadd, F.S.I., on "The Effects on Concrete of Acids, Oils and Fats." 7.30 p.m.

APPOINTMENTS OPEN.

GOVERNMENT OF KEDAH.

MALAY STATES.

ARCHITECTURAL DRAUGHTSMAN.

1. Applications are invited for the appointment of Chief Draughtsman, Public Works Department, Kedah, Malay States.

2. Candidates should be under 30 years of age, unmarried, and expert draughtsmen, experienced in the Design and Construction of Public Buildings, able to prepare Plans, Working Drawings, Details and Specifications, and to control generally the work of the State Engineer's Drawing Office.

3. Evidence of training and experience in Architects' Offices must be given.

4. Engagement for three years, with salary at the rate of $250 per mensem (£350 per annum; the dollar equivalent is 2s. 4d.), and free furnished quarters; free second-class passage out and home again on satisfactory termination of agreement; half salary from date of embarkation, and full salary from date of arrival in Kedah.

5. In the case of the successful candidate a Medical Examination will be necessary.

6. Application by letter (no special form required), giving particulars of experience, accompanied by copies of recent testimonials, should be sent to Box 1,194, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C., not later than November 7th.

7. The selected candidate will be required to leave for Kedah as soon as possible.

MADRAS CORPORATION, INDIA.

WANTED: ASSISTANT DRAINAGE ENGINEER.

The President, Corporation of Madras, invites applications for the appointment of Drainage Assistant to the Special Engineer, J. W. Madeley, M.A., M.I.C.E., M.AM.SOC.C.E., &c.

The duties will be to assist the Special Engineer in the design, construction and maintenance of works of drainage for the City of Madras.

The salary will be Rs. 500 (£33 6s. 8d.) per mensem, rising by annual increments of Rs. 20 per mensem to a maximum of Rs. 700 per mensem. An allowance of Rs. 30 (£2) per mensem will be paid to the officer appointed so long as he maintains and uses on the work a first-class motor bicycle in good running order. No other allowance of any kind will be made.

Before sailing for Madras, the successful candidate will be required to sign a three-years' agreement to be prepared by the Corporation. By mutual consent the appointment may be extended for a further period.

The Corporation reserves the right to determine the appointment at any time by three months' notice in writing or by payment of one month's salary.

The officer appointed will be allowed ordinary first-class railway fares and second-class steamship passage to Madras, *viâ* Marseilles and Bombay, by P. & O. steamer. A like class return free passage will be granted on the termination of the appointment, subject to the satisfactory service according to the conditions of the agreement. Half-pay will be granted on the voyage out from the date of leaving England.

Leave will be granted on full pay to the extent of one month for every eleven months of active service, but not for more than three months at a time.

The applicant must not be more than 35 years old, and copies of certificates of age, testimonials and medical certificate of fitness for service in India must be enclosed with the application, which must reach the undersigned not later than Thursday, November 14th. They will be sent out to Madras, where the final selection will be made by the President of the Corporation.

The President reserves the right of rejection all applications without giving reasons.

The officer appointed will be required to commence his duties in Madras not later than eight weeks after he has received notification of the acceptance of his application.

Applications must be in writing, and should be sent to the undersigned in envelopes superscribed "Drainage Assistant."

JAMES MANSERGH & SONS,
Agents to the Corporation of Madras.

5 Victoria-street,
Westminster,
London, S.W.
October 23, 1912.

CITY OF LEEDS.

CITY ENGINEER AND BUILDING SURVEYOR'S DEPARTMENT.

Applications are invited for the position of Building Inspector. Candidate must be thoroughly conversant with all branches of the Building Trade, must hold the certificate of the Royal Sanitary Institute, and must not be more than forty years of age. Salary £120 per annum.

Applications (endorsed "Building Inspector"), together with copies of three recent testimonials, to be sent to the undersigned not later than Tuesday, November 5th, 1912.

Forms of application and lists of duties may be obtained at the office of the City Engineer and Building Surveyor.

W. T. LANCASHIRE,
City Engineer and Building Surveyor.

Municipal Buildings,
Leeds.

LICHFIELD RURAL DISTRICT COUNCIL.

STREETLY SEWERAGE AND SEWAGE PURIFICATION WORKS.

CLERK OF WORKS.

Applications are invited for the appointment of Clerk of Works in connection with the above works, at a salary of £3 13s. 6d. per week. The person appointed will be required to devote the whole of his time to the duties of the office, to work under the instructions of the Council's Engineer, and to commence in December.

It is necessary that applicants should be accurate in the use of the dumpy level and the theodolite, and in the setting out and measuring up of works.

Applications, in the candidate's own handwriting, stating age, qualifications and experience of similar work (including sewers in tunnel), together with copies of not more than four recent testimonials, and endorsed "Clerk of Works," must be sent to Mr. Robert Green, M.INST.C.E., 37 Waterloo-street, Birmingham, not later than Monday, the 11th November, 1912. Probable duration of engagement fifteen months.

Canvassing Members of the Council will be considered a disqualification.

THOMAS MOSELEY,
Clerk to the Rural District Council.

Lichfield.
October 25, 1912.

SINGAPORE, STRAITS SETTLEMENTS.
MUNICIPAL ENGINEER'S DEPARTMENT.

The Municipal Commissioners of the Town of Singapore require an Assistant, under 32 years of age and of sound constitution, chiefly for their new Sewage Scheme. He must have received a good technical education, a regular training as a Civil Engineer, and including a practical knowledge of Surveying, Levelling and Estimating. He must also have had special experience in designing and constructing sewerage and sewage disposal works and waterworks, and their maintenance. Preference will be given, other things being equal, to applicants who have passed the Examination of the Institution of Civil Engineers—Associate Members—or that of the Institution of Municipal and County Engineers. The engagement will be for three years, and each applicant is to state the earliest date upon which he could be free to leave for Singapore. The selected candidate must pass a medical examination. A second-class passage will be provided by mail steamer, or a first-class passage by other steamer, with half-pay during the voyage out.

The salary will be 350 dollars per month, paid monthly in dollars, the currency of the Colony, the value of the dollar being two shillings and fourpence sterling. Such local transport allowance as may from time to time be sanctioned by the Commissioners will be paid. Applications, stating age and place of birth, and giving details of education, training, and experience generally, and referring to the above requirements seriatim, accompanied by copies (only) of testimonials, and also personal references, are to be lodged with C. C. Lindsay, Esq., M.INST.C.E., 180 Hope-street, Glasgow (who will give further particulars if requested), not later than Tuesday, 5th November, 1912.

COUNTY BOROUGH OF SWANSEA.

The Corporation require Two Temporary Assistants in the Borough Surveyor's Office for Private Street Works for a period of 12 months.

Candidates must have a thorough knowledge of the Private Street Works Acts. Salary £10 16s. 8d. per month.

Applications, stating age and qualifications, together with three recent testimonials, to be sent to Mr. George Bell, Borough Surveyor, not later than Monday, the 11th November next.

Guildhall, Swansea.
October, 1912.

SURVEYOR (South of England) has vacancy for Pupil; important sewerage works.—Box 1,180, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

APPOINTMENTS WANTED.

ASPHALTE.—Gentleman, 39, wide experience in all branches of trade, is open to manage or represent good firm; moderate salary.—Box 1,190, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

SURVEYOR'S ASSISTANT, disengaged; 5 years' experience building, land, chain and theodolite surveys, levels; good draughtsman; certificates for Building Construction.—Kemp, 18 Bristol-gardens, Maida Hill, W.

PUBLICATIONS FOR SALE.

COPIES of THE SURVEYOR, unbound, 1901, 1907—8, 9, 10 and 11 complete, and 1902, 3, 4 and 6, with only fifteen numbers missing, to dispose of for reasonable offer. Offers to Box 1,195, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

TENDERS WANTED.

EAST SUSSEX COUNTY COUNCIL.

MAIN ROADS.

TENDERS FOR ROAD MATERIALS, CARTAGE AND TEAM LABOUR.

The Roads and Bridges Committee invite Tenders for the Supply of Materials, Cartage and Team Labour for the Maintenance of the Main Roads in the West, South, Central and East Districts of the County, for the year ending 31st March, 1914—*viz.*:—

1. Stone, Granite and other approved Material delivered in cargoes to the Council's Wharf in Newhaven Harbour.
2. Flints, Stone, Granite and other approved Material delivered to various Railway Stations and Wharves.
3. Flints, Local Stone and other approved Material delivered on the Sides of the Main Roads.
4. The Cartage of Materials from Railway Stations and Wharves to the Sides of the Main Roads.
5. General Team Labour.

Further particulars, Conditions of Contract and Forms of Tender can be obtained on and after 8th November on application to the undersigned.

Tenders to be delivered at the County Surveyor's Office, County Hall, Lewes, on or before Friday, 22nd day of November, 1912.

The lowest or any Tender will not necessarily be accepted.

F. J. WOOD, ASSOC.M.INST.C.E.,
County Surveyor.

County Hall, Lewes.
October 26, 1912.

COCKERMOUTH RURAL DISTRICT COUNCIL.

To let by Tender, the Scraping of about Sixteen Miles of Water Mains (three inches to nine inches in diameter). Also the Providing and fixing of all hatch-boxes, valves, covers, pipes and other Fittings necessary.

Forms of Tender and all other information may be obtained on application to Mr. J. B. Wilson, A.M.I.C.E., Water Engineer, Grecian Villa, Cockermouth.

The lowest or any Tender will not necessarily be accepted.

(By order)
J. H. MUSGRAVE,
Clerk.

Grecian Villa,
Cockermouth.
October 28, 1912.

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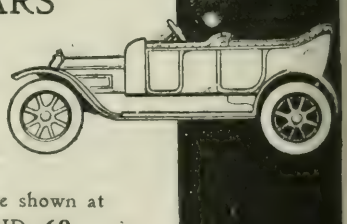

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The Surveyor

And Municipal and County Engineer.

Vol. XLII. NOVEMBER 8, 1912. No. 1,086.

Minutes of Proceedings.

Concrete and Moisture.

Concrete as usually made is not waterproof, except in the limited sense that it does not allow water to ooze through it quickly. A concrete wall, with water under pressure behind it, will allow water to pass through it at a rate which depends upon its thickness and upon the water pressure. This rate is probably increased somewhat if the face of the wall be at a temperature considerably below that of the water or wet earth behind it, but not below freezing point. The apparent percolation depends upon the state of the atmosphere and the temperature of the face of the wall. If the water is oozing through slowly on a dry day, it may be so quickly evaporated by warmth and wind that the appearance of the wall is hardly altered by it. A rate of percolation which produces a dark appearance on a dry day will on a damp day produce beads of moisture, or the face of the wall may be streaming with wet. It is important in such cases to distinguish between the rate of percolation and the rate of deposition from the atmosphere, more especially in climates like that of the British Isles. The rate at which water will come through a wall or floor in any ordinary case is very small compared with the rate at which warm, damp air will deposit water upon the surface of cold concrete. It will be remembered that not many years ago a recently built sewer in Dublin was supposed to be leaking badly (reverse leaking), but the consulting engineer called in to settle the point found that most of the flow along the sewer was due to the condensation of moisture from the air upon its cold walls. Such an error is far from uncommon, and it is especially important to guard against it in the case of concrete, because the high specific heat per unit volume of the material and its high coefficient of heat conductivity, compared with some common building materials, leads to very rapid deposition of moisture when the temperature rises quickly and the air is damp. Compared with stone, the ease with which it can be finished smooth frequently leads to concrete being left without a protecting coat of plaster when a stone wall, such as those used for Welsh houses, would be well plastered on the inside. For the walls of dwelling-houses and buildings for the storage of goods easily injured by damp, it is, indeed, of very great importance that if the walls are of thick masonry which will "hold the cold," they shall be effectively protected from the deposition of moisture, at any considerable speed, by an internal coating of a light material with a low heat capacity and a low heat conductivity, such as that valuable material common plaster. The more dense the material of the wall itself, and the higher its heat capacity and conductivity, the thicker should be the coat of plaster.

It is no safeguard to make the walls hollow, for, although in a few cases this may keep the inner part at a higher temperature than it would otherwise have when it is cold outside, it does not guard against changes in the temperature of the inside of the house, and the part of the wall which is next to the covering rapidly draws from the surface the heat set free by the condensation of each drop of moisture, keeping the surface cool enough to go on condensing moisture from the air for a considerable time. It is probably the case, too, that an empty space left behind the wall covering is, besides an inconvenience, less effective as a non-conductor of heat than is a coat of porous material. It is clear, then, that a good brick wall, well plastered, offers advantages that must not be lightly thrown aside, although in some parts of these islands it is found necessary at times to coat the southern and western walls of dwelling-houses with paint, or to dress them with boiled linseed oil, in order to prevent the wet from coming through during long spells of driving rain. Again, in a continental climate a relatively thin wall of concrete may be much less effective in keeping out the cold of winter or in keeping a closed house cool during the hot hours of a tropical day than is a thick wall of cheap brick and mud. Where the seasons are consistent in character, however, dry, cold or wet as the case may be, the changes that tend to make vapour condensers of houses will be absent; and the objections to the use of concrete are still less in equable oceanic climates where houses are seldom shut up against cold or required to perform the service of equalising the temperature of the day and night. The matter is mainly one of the frequency of weather changes as far as the deposition of moisture is concerned, and depends, further, upon the rapidity with which changes of temperature occur and the extent to which the higher temperatures are accompanied by humidity of the air. What makes the condenser effect so important in this country is the fact that the cold of winter is often broken into by wet cyclonic disturbances of high temperature, the walls and roofs of houses, as well as the furniture and fittings, being often much colder than the air when such a change takes place.

Space does not permit of any reference here to those structural considerations which make concrete and ferro-concrete such valuable materials in their proper place, and when used in a suitable manner, but it must not be assumed that those advantages have been overlooked.

* * *

Waterproof Concrete.

We pass on to a consideration of the means that may be taken to make concrete waterproof, so that it may be used for the walls and floors of dwellings where water has to be kept out, may provide a suitable material for the building of tanks and aqueducts, and may prevent the rusting of the steel in reinforced concrete work immersed

in water. For some of these purposes, or, rather, in some cases, ordinary concrete will provide the degree of watertightness that is required, while for moderate pressures, at any rate, ordinary concrete, or concrete which is otherwise ordinary, can be made waterproof without the addition of any material beyond the usual ingredients. Such concrete must, however, be mixed in suitable proportions, and made in the proper manner. The exact proportions will depend upon the ratios of voids to solid in the different materials used, but with materials that do not vary much a given proportioning may cover a large number of cases. At the engineering conference of the Institution of Civil Engineers held in 1907 Mr. J. W. Sandeman said: "I make it an invariable rule for all sea work to have absolutely watertight concrete, which will stand perfectly, by making it of one part cement to two of sand and three of aggregates, and no doubt if concrete piles are made of that proportion they will be impervious to water." As regards the method of mixing, the directions given by the engineer vary according to the nature of the materials used, but we believe that the concrete is nearly always, after all the materials have been added, beaten to a jelly. There is no mistaking the feel of the mass under light blows when it has reached the proper condition, and if it appeared dry up to that moment it is probably all right, another sign being the appearance of frothy moisture on the surface. Without attempting to compare the efficiency of proportioning and method with the results obtained by the addition of waterproofing substances, attention may be drawn to the chief of these. Water gets through concrete because it is not quite solid, but contains minute pores. By the addition of a suitable fine material in the mixing, these pores may be filled, or, rather, the spaces will be occupied by solid matter. Such a material may, possibly, be one which will join in the process of crystallisation, but it seems more reasonable to aim merely at the filling of the pores by some inert material, which will not disturb the ordinary routine of setting. This part is played, it may be assumed, by clay, wax or heavy oil, when any of these substances is used with the object of making the concrete waterproof, though alum, which is also used, possibly acts in a different way. It is claimed for waxy materials that they provide repellent surfaces in such capillary spaces as may exist, and this factor may be worth considering, though it is more important as regards the treatment of existing concrete.

The properties of mortar and concrete made with heavy oil, in proportions up to 10 per cent by weight of the cement, are briefly described in another part of the present issue, the information being derived from a valuable report issued by the United States Office of Public Roads. The experiments seem to have been very successful, and fully to have established the particular oil used as a material which may be employed in order to make concrete waterproof. The addition of the oil considerably reduces the strength of the concrete, and its grip upon plain reinforcing bars, but in many cases the reduction of strength is not an important matter. In other cases, however, it points to the need for considering the possible advantage of employing a bituminous material in a layer by itself, especially where the concrete is likely to crack. The addition of a small proportion of clay to concrete has for some time been employed as a means of making it waterproof, and has been found to reduce the strength very little, or even to increase it. Alum, on the other hand, reduces the strength, possibly because it enters into inconvenient competition with the other materials in the matter of crystallisation. In conclusion, it may be pointed out that the extent to which waterproofness may be obtained by the use of mortars other than Portland cement mortars is often overlooked.

Concrete Foundations for Roads and Streets.

The excellent results which, in roads of some classes, follow the use of Portland cement concrete as a material for the sub-crust or foundation of the road-crust proper have from time to time within recent years led to the Portland cement concrete foundation being put forward as a type which ought to be adopted, if not on country roads generally, at least on the main highways. The argument from the particular to the general is often one which is beset with pitfalls, and this case is no exception to the general rule. Probably the ideal situation for a Portland cement foundation is a residential road or street in which all pipes and cables are under the footways, so that the carriageway itself is not subjected to those disturbances which so greatly militate against the value of the services performed by the concrete foundation. Other favourable factors are that in these streets heavy vehicles usually proceed at a slow speed, and the very heaviest axle-loads are seldom carried on them. In noting the success of a tar macadam upper crust in conjunction with the concrete foundation, it must be borne in mind that a large proportion of residential roads are, to some extent at least, shaded by trees and do not suffer the worst effects of hot sunshine and severe frost. As regards the use of concrete foundations for busy streets, it must be noticed that it has already been found economically desirable in many cases to make the concrete nine inches thick, or 50 per cent. thicker than has usually been regarded as sufficient up to the present. The significance of this fact must not be lost when we consider the extension of this method of making the foundation to main roads in the country; on which roads the actual crust-temperatures reached are higher in summer and lower in winter, taking unfavourable places, than is the case as a rule in city streets.

There are quite a number of other considerations which have so far prevented county surveyors from adopting the concrete foundation to any considerable extent, but the subject is one into which we are not able at the moment to enter for lack of the space which it is desirable to give to the subject if it is to be discussed at all. We have been led to these remarks by a careful perusal of the communication, to be found on another page of this issue, in which a reference is made to the paper read last May before the Institution of Municipal and County Engineers by Mr. J. W. Liversedge, Assoc.M.Inst.C.E., engineer and surveyor to the Leigh-on-Sea Urban District Council. The article certainly provides evidence that the problem of street foundation is being grappled with energetically at Leigh-on-Sea, and we may even go a little further—as far in fact as to admit that there are numerous places where concrete foundations might be provided with advantage for country roads, if the cost could be met. It is quite another matter, however, to contemplate the provision of concrete foundations, as an economy, over the main roads of the country generally. We should be interested to learn that any county surveyor is prepared to provide his roads generally with concrete foundations as a matter of economy in road maintenance, and assuming the matter of first cost to present no difficulty.

* * *

The Training of Sanitary Engineers.

The day of the "rule of thumb" engineer is now happily past, and his place has been taken by a body of highly trained professional men who are able to bring to bear on their work all the advantages which accrue from systematic study of their business from both the practical and the theoretical sides. There is still considerable difference of opinion, however, as to what is precisely the best educational training for an engineer—and particularly for one who is destined to become what is rather vaguely termed a "sanitary engineer." The

latter expression is a very comprehensive one, and is made to include a great variety of meanings. This has been very clearly pointed out by Mr. George C. Whipple, the Professor of Sanitary Engineering in Harvard University. The problems which the sanitary engineer is called upon to face are so varied that an exceptionally broad education is necessary to fit him for his duties. Thus he needs a certain acquaintance with sanitary science and the work of the sanitary specialist, and he must also be familiar with much which comes within the special sphere of the medical officer of health. Only in this way can he hope to co-ordinate his own work—which is primarily of a constructive or engineering character—with that of others who are engaged in the same warfare against disease as himself. The work of the sanitary engineer and the health officer in this connection is primarily of a preventive character, and involves the use of mathematics for statistical purposes, engineering to secure cleanliness, chemistry to detect adulteration, bacteriology to prevent infection, law to secure the remedy of nuisances, and education to instruct the people in hygiene and healthful living. In the great campaign against disease specialists are needed, but they should remember that, although they have to know everything about something, they must also know something about everything in the whole range of sanitary knowledge.

* * *

"The Surveyor" Special Issues.

The first issue of The Surveyor is dated January 21st, 1892. The number of the current issue indicates that since then over one thousand and eighty weeks have passed, and it is a matter for grateful thanks that over the long intervening period of time indicated it has been possible to produce The Surveyor with at least unfailing regularity, and with, it is believed, a never-relaxing care for the character of its literary contents. In January of next year it will "come of age," and we propose to mark the occasion by making the issue for the 17th of that month a special one, a prominent feature of it being comparisons of the practice in the chief branches of municipal engineering then and now—twenty-one years ago and to-day. It should be an interesting record of advance in every direction. The issue of January 10th will include the half-yearly index, in this case for Vol. XLII.; and the usual Annual Special Issue, with its forecast of works projected for 1913 and its reviews of the main fields of municipal engineering during 1912, will be published on January 31st. As usual, the claims of The Surveyor Municipal-Engineering Exhibition at Olympia, to be held next year from April 12th to April 26th, will necessitate two or three big numbers; and further special issues will be devoted to the International Road Congress and Exhibition of June next, which will be as fully reported as is practicable in view of the voluminous considerations that will arise out of it. It is to be noted that annual subscribers to The Surveyor will receive, without additional charge, all these contemplated special issues.

* * *

Traders and the Road Congress and Exhibition.

With regard to the above-mentioned International Road Congress and Exhibition we hope soon to be in a position to give interesting details as to the progress of the elaborate arrangements which are being made to ensure its success; but at the moment we only permit ourselves a preliminary assurance that these arrangements promise to be as comprehensive and satisfactory as forethought and patriotism can make them. One of the influential committees which have the matter in hand is the "Traders' Committee," of which the president is the Right Hon. Lord St. Davids; and the vice-presidents Lord Cowdray, Sir R. A. Hadfield, Sir Alfred Hickman, and Sir Herbert Praed, the last-named taking an active part in the proceedings as chairman of the committee. It is obvious that any benefits the "traders" may justifiably hope to reap from the publicity of the exhibition will be attained by their expenditure in that direction; we have therefore used the word "patriotism" because we understand that they have already contributed donations to the Congress Fund on a most generous scale, and with the sole idea of providing for beyond-sea visitors a programme worthy of the nation's resources and hospitality. We would add that the joint hon. secretaries of the committee are Mr. Herbert Beadle, of the Road Maintenance Company, Limited, Gravesend, and Mr. H. L. Wettern, of the London Granite Company, Limited, 16 Water-lane, Great Tower-street, E.C.

* * *

The R.I.B.A. Registration and Education.

In another column will be found a report of the very practical address which was delivered by Mr. Reginald Blomfield, A.R.A., on the occasion of his inauguration as president of the Royal Institute of British Architects. Having reviewed the present position of the institute and the architectural profession, Mr. Blomfield had something to say about the important question of registration. In this connection he made it clear that the object of registration is not to create a monopoly regardless of the professional competence of those who are enrolled. On the contrary, the primary reason for the adoption of a system of registration is to put a stop to incompetence, and to establish and maintain a reasonable level of accomplishment, and to see that that level is reached by those who undertake the very responsible work of an architect. If registration is to be confined strictly to those who are professionally competent, it is evident that the question of education assumes a fresh importance, and the new president directed attention to the educational work which the institute has accomplished during the past few years through its Board of Architectural Education. The syllabus of training for students has been thoroughly revised, and the examinations of the institute are an effective and intelligent test of capacity. The principle of registration certainly commends itself, and we hope that Mr. Blomfield's aspirations may be realised in due time.

* * *

The Institution of Civil Engineers.

Among the many presidential addresses which are delivered in the course of a year before the various professional societies there are few which command a wider audience than that of the president of the Institution of Civil Engineers. Mr. Robert Elliott-Cooper, the new president of that body, in the course of his address on Tuesday evening dealt with a variety of topics, including the improvement of the conditions under which young men are enabled to obtain their first practical experience of professional work. There is always a certain danger that a young man in his "improver" stage may be kept too closely over the drawing-board. The importance of good draughtsmanship cannot, of course, be exaggerated, but it must not be forgotten that a young man needs more than this. He must avail himself of every opportunity of seeing and doing practical work, and these opportunities ought to be given as freely as possible by his employer. Mr. Elliott-Cooper also called attention to the work of the Civil Engineers' Appointments Boards, which has proved of mutual value to employers and assistants. In a reference to the new premises which are in course of erection, the president expressed the hope that the work would be completed in time to ensure that the official opening would take place during the coming summer.

The Design and Construction of Masonry Dams.*

By H. J. F. GOURLEY, B.ENG., STUD.INST.C.E.

The selection of site is an important question, and one which calls for the most careful investigation. Its solution may mean all the difference between failure and success, and in any case will largely affect the total cost of the work. An examination of many dams indicates that the cost of the work below ground is usually a very substantial, if not the major, portion of the ultimate cost. Therefore when this question is under consideration every effort should be made not only to secure a suitable site, but the best site within the area of possible deviation. Briefly, the main requirements of the dam site are that there shall be rock strong enough to bear the stresses transmitted from the dam, and so compact and free from fissures as to be relatively watertight at a reasonable depth below the surface, and, of course, an ample supply of stone for facing blocks, displacers and concrete in the neighbourhood. It sometimes happens that rock is reached of sufficient strength, but not of a watertight character; in this case a heel or tongue trench is usually carried down until an impermeable bed is reached.

Where there is difficulty in getting watertight ends to the trench, or where there are pervious beds in the trench which outcrop in the reservoir, wing trenches filled with concrete may be used. These trenches, which may be 5 ft. or 6 ft. wide, tie into the ends of the main trench, and run up valley until the pervious outcrop is reached. Should the outcrop take place on one or both sides of the valley above the bottom, but below top-water level, the pervious bed may be cut off in a similar manner. Sometimes a heading is driven into the hillside in the line of the main trench until watertight material is encountered, or to such a distance as will give the water so far to travel as to prevent serious percolation. In some instances the outcrop may be covered with a layer of cement concrete or of clay puddle protected by pitching.

In this country no engineer would dream of founding a masonry dam on superficial deposits, though this had been done in the United States. Even with an earthen embankment there is grave risk of leakage through pockets of gravel or porous material which may sooner or later undermine the bank. The harder rocks also have their failings. Weathering, faulting, folding and surface movements generally render them pervious and insecure. The opening up of the rock caused by weathering decreases with the depth, and the depth at which sound rock may be found varies considerably in different materials. Faults, primarily caused by crustal movements, may give trouble if the material filling the fracture is of a porous nature. This would be the case if the rock on either side of the fault were very hard. If, on the other hand, the country rock is shaley, the fault rock might be entirely watertight. Much depends also on the position of the fault relative to the dam trench. The effect of folding, which may be due to widespread crustal movements or to relative motion between alternating beds of shale and rock, is again to open up the rocks. The opening up may gradually die out in a small distance from the surface, or it may extend to a considerable depth.

For efficient location it is essential that the valley should be geologically surveyed for some distance, depending on the inclination of the strata, above and below the tentative site of the dam. The results should be plotted on a map, from which it will usually be possible to form a general idea of the arrangement of the bed, and their character, the presence of large faults or other dislocations within the area may also be detected. Before the

FINAL POSITION OF THE DAM

can be settled more detailed information is necessary, and this is best obtained by sinking trial shafts, not less than 8 ft. square, which, in the superficial deposits, should be well timbered from the top. The positions of the shafts are fixed after a careful consideration of the information already obtained, and should be such as will yield most information and clear up any points which would otherwise remain in doubt. It is well to carry one or two of the shafts down to and for some distance into the watertight rock.

Possibly there may be an occasional case in which trial shafts or borings are considered unnecessary, but as most valleys are covered with some alluvial or glacial deposit, or have suffered more or less serious crustal disturbance, something beyond mere surface examination is required. Boreholes are sometimes used, but do not give much idea of the actual state of the various beds passed through, and trial shafts, which make it possible to study a comparatively large exposure in detail, are preferable. If boring is carried out cores should always be obtained. Referring to the diamond drill exploration of the strata made when locating the New Croton Dam, it was said that "in a general way the rock was found to be more broken up and traversed by seams, fissures and soft streaks than might have been expected from the general surface conditions and from the boreholes themselves." From the information now available, the best site for the dam and the necessity or otherwise for heel and wing trenches can be decided upon, and a reliable estimate made of the probable ultimate cost.

DESIGN OF DAM.

In Messrs. Pearson & Atcherley's Memoir, published in 1904, it was urged that engineers, by treating horizontal sections as the critical sections, entirely overlooked the fact that serious tensile stresses existed on vertical planes near the tail of the dam. Messrs. Wilson & Gore's experiments on indiarubber models, however, indicated that the middle third rule for horizontal sections, which implied the trapezium law of distribution of stress, could be safely used in design; that there is a rather considerable amount of tension in the vicinity of the upstream toe, which may be reduced by making the upstream face vertical, or by a general increase in the dimensions of the dam, and that the rather high stresses found at the downstream toe may be reduced by rounding off the re-entrant angle there. The two conditions usually observed in practical design are (*a*) that the maximum compressive stress found on planes perpendicular to the downstream face should not exceed 10 tons to 14 tons per square foot, and (*b*) that the line of resultant thrust, reservoir full or empty, should never fall outside the middle third of horizontal sections. The second condition ensures the absence of tension, due to loading, throughout the dam, except near the base, and in general implies that there is no excessive shear stress.

Before commencing the actual design, the flood-water level must be settled. The extent of the drainage area and its character being known, a figure based upon experience and ranging from 1,000 cub. ft. per second per 1,000 acres for a few hundred acres to 250 per 1,000 acres for 15,000 acres, is assumed for the maximum rate of flood discharge. Frequently the dam itself is made to act as the spillway, either for its whole length or part of it, but occasionally the floods may be discharged down a by-wash channel quite independent of the dam. In any case, the height of the flow-over can be estimated. This height varies in practice from 3 ft. to 5 ft.

Following the design given in "Waterworks Engineering," * if

p = specific gravity of material of dam (assumed uniform);
w = weight of a cubic foot of water in tons;
s = maximum compressive stress allowed in tons per square foot;
h = depth of any plane below flood level in feet;
b = breadth at same level;

we have the following relations—

$$b = \frac{1}{\sqrt{\rho}} h, \text{ which holds until } h = \frac{s}{w(p+1)} = h_1$$

Below this level the point at which the resultant (reservoir full) cuts the base must be brought gradu-

* Paper read at a students' meeting of the Institution of Civil Engineers. References to recent papers dealing further with the subject:—"The Principles of Engineering Geology": H. Lapworth, "Proceedings" Institution of Civil Engineers, vol. clxvii., 1906. "Geology of Dam Trenches": H. Lapworth, "Transactions" Association Water Engineers, vol. xv., 1910. "The Foundations of the New Croton Dam": C. S. Gowen, "Transactions" American Society Civil Engineers, vol. xlvii., 1902. "Stresses in Dams" (and subsequent general discussion on Masonry Dams): J. S. Wilson and W. Gore, "Proceedings" Institution Civil Engineers, clxxii., 1908.

* Tudsbery and Brightmore. Third Edition. Page 213.

ally nearer the mid-point of the section as the depth increases, so as to keep the maximum stress within the limit s; the limiting height is that at which the maximum stress equals s. A formula, giving the widths below h_1, is $= b_1 - \sqrt{\frac{w h^3}{s}\left(1 + \frac{w^2 h^2}{4 W^2}\right)}$, in which W, the weight of the dam above the horizontal plane at depth h, is arrived at by approximation.

If $\rho = 2{\cdot}25$, then the base of the elementary triangle will be $\frac{2}{3}$ of the height. For $s = 12$ tons, h_1 works out at 130 ft.

The section obtained by calculation should always be checked by graphic statics.

If any further modifications of the section are considered necessary they will always increase the dimensions of the dam. By making the upstream face vertical the line of pressure, reservoir empty, will fall a little outside the middle third in the lower parts of the dam, owing to the extra thickness added at the top for wave resistance, and possibly for carrying a road over the dam; and for the full reservoir the resultant will cut the base a little nearer the centre, the increased compression at the inner toe helping to neutralise the tension previously referred to.

Messrs. Wilson & Gore's experiments (slide) show that from the upstream toe downwards through the base of the model the plane across which there is tension approaches the vertical and the tension vanishes.* In the actual dam the tension might cause a separation between the upstream face and the rock, though if the tail of the dam abuts on fairly sound rock downstream this is not a serious matter. In many masonry dams, and in practically all constructed in England, the downstream face finishes in a smooth curve so as to reduce the erosive action of the overflowing water on the rock below the dam, and this incidentally reduces the stresses at the toe. As a further precaution against erosion a pool is sometimes formed by a subsidiary dam placed a short distance from the toe.

CRACKS.

There is hardly a straight masonry dam free from cracks; usually these are widest at the top and sometimes extend in more or less vertical lines almost to the base. It is not known whether in massive dams these cracks extend far from the face, though in one or two cases it seems as if this has occurred. That they are partly due to variations of temperature is beyond doubt. It has been stated that in this country the temperature of that portion of the dam within 10 ft. of the face varies from 70 deg. Fahr. to 40 deg. Fahr., and the corresponding longitudinal compressive and tensile stresses exceed 20 tons per square foot.† It is not surprising, therefore, that cracks from this cause do appear. The fact that much of the building takes place during the fine and warm weather and little throughout the winter aggravates the trouble. Some of the failures in this respect have also been attributed to shear stress caused by unequal settlement in rather narrow steep-sided valleys. It is considered by some that such cracks may be prevented, or rather so distributed as to be hardly noticeable, by the use of steel reinforcement, but this method has been employed in but a few cases, and with indifferent success. Certain low dams have been constructed with vertical asphalt joints at intervals in their length, and these appear to have prevented serious cracks, though the idea has not been carried into practice in high dams.

What appears to be the true solution of the problem is to curve the dam in plan. By so doing the longitudinal compression induced by arch action will close up any cracks formed by contraction. The principle can be applied in most cases, and has such advantages that, although widely adopted in the past, it will probably be more extensively used in the future. Among the exceptions may be noted cases where (1) the dam is very long, (2) the curvature would throw the dam on to unsound material, and (3) where the hillsides are not strong enough, though by increasing the area receiving the thrust the pressure may be reduced to suit almost any material. In a curved dam the stresses on what might be termed the gravity section are reduced as the moment of inertia of the various horizontal sections about their axis of figure in plan is increased. This reduction is usually treated as a rather indefinite increase in the factor of safety, and not as a reason for reducing the section.

Leakage under a dam may, in the absence of adequate drainage of the foundation, lead to such an uplift on its base as would reduce its stability to a dangerously low value, especially where the rocks are shaley and level bedded. If this should occur in a straight dam the structure or parts of it might be swept downstream before the water in the reservoir could be drawn off, whereas no such thing could happen with a curved dam unless the material of the dam absolutely crushed or the solid hillside yielded.

It is very desirable to prevent water from entering the dam. In this country and in America reliance is generally placed on carefully caulked face joints, while on the Continent one finds that the upstream face is rendered with asphalt or trass cement mortar. This rendering is usually protected from weathering by a screen wall leaning against the battered face. In addition, vertical drains, connected with horizontal longitudinal tunnels, are sometimes formed at intervals near the vertical face. Further modification in the section will probably be required to take account of the character of the foundation rock and the proportion which the length of maximum section bears to the total length of the dam.

SETTING OUT AND CONSTRUCTION.

It will be assumed that a straight dam is to be constructed. The setting out of a curved dam is not quite so simple, but presents no particular difficulty. One of the first things to be done is to construct two observatories, one on each side of the valley, at 100 ft. or 150 ft. above the top of the dam. These observatories will be of brick or concrete, about 15 sq. in. or 18 sq. in., standing on a good foundation, on top of which are iron plates in which a good "centre dot" has been made so as to be in the vertical plane containing the "centre line" of the dam, and having three lead spots to receive the three screws of the upper plate of the theodolite. The "centre line" may be the line of the crest or any other convenient parallel line. On the valley faces of the observatories black arrows with finely drawn-out points are painted on a white ground, so that the points are in the previously mentioned vertical plane. It is sometimes thought that greater accuracy is obtained by wide vertical black lines instead of the arrows. Supplementary stations, distant multiples of 20 ft. away from the principal stations, are a convenience; they may be defined by a nail in a stout peg behind which a plumb ranging rod has been erected, the whole being surrounded by a fence to prevent disturbance by sheep. An arbitrary point, usually not on the dam itself, is then chosen as the zero from which distances are measured along the centre line of the dam. For convenience of setting out and periodical measurement, cross-sections are taken every 20 ft. or 25 ft.

If the dam is situated some distance from a railway station, as is generally the case, some means of transport to the works must be provided. Traction haulage may meet the case. Frequently, however, a railway and sidings is considered necessary, and its construction is put in hand as soon as the dam has been decided upon. At the same time the temporary works are started, and the various mechanical arrangements installed. These would include accommodation for the workmen, cement storing and aërating sheds, stone-breaking and grading machines, domestic water supply, a small reservoir for a high-pressure water supply, masons' sheds, wagon roads, and, frequently, if sufficient head room can be obtained, one, or preferably two, overhead cableways capable of lifting about 6 tons, together with locomotives and other cranes. The main function of the cableways is to remove the excavated material from the trenches, and later to carry the concrete in tip skips from the mixers placed on the hillside near the end of the dam, or from some point in the valley bottom to which the skips are brought in wagons. They are particularly useful when the various cranes, travelling or otherwise, scattered about the dam are to be moved.

The widths of the main trench at various cross-sections being taken from the plans, the limits of the excavation can be defined, and this portion of the work put in hand. Perhaps it should be stated that the maximum width of the trench at any point is the width of the dam section corresponding to the top of the rock at the point. Below this level the sides of the excavation are vertical, or as nearly so as is possible without timbering. A timber trough capable of discharging the maximum flood is constructed across the main trench some distance from the stream, and at such a level as will give a sufficient fall in a channel to be cut from the trench to a point at which the stream may be conveniently

* Water Supply. "Encyclopædia Britannica": 11th Edition.
† E. Sandeman. Presidential Address, Association of Water Engineers, 1911.

diverted. This course is followed when it is desired to proceed with the excavation under the existing stream bed as soon as possible. In other cases the river is not diverted until a tunnel, left to convey it through the dam, is ready.

As the main trench is completed the heel trench is put in hand. The usual width is 5 ft. or 6 ft., and it is carried down some little distance into watertight rock. For convenience of working it is generally kept a little distance back from the upper toe of the dam, and to minimise movement of the rocks on which the dam will ultimately rest, particular care is taken with the timbering. While the main trench may be carried 40 ft. or 50 ft. below the ground, the heel trench may have 50 ft. or 60 ft. greater depth. It is generally possible, and always advisable to fill up the heel trench with 4 or 5 to 1 concrete, free from displacers, as soon as it is bottomed. Prior to putting in the concrete the rock surface is well cleaned by a pressure water jet and wire brushes, any small cracks being grouted up and plastered with cement mortar or coated with grout.

Sump holes are sunk and pumps divided, so that the trench may at all times be kept fairly dry during the excavation and refilling. Any springs encountered as the concreting proceeds, and which would interfere with the proper setting of the concrete, are led into pipes which are carried up with the concrete; when the water ceases to rise, the pipes are filled with grout under pressure or simply sealed with a screwed plug. Great care is taken, both here and elsewhere, that all old concrete is picked over, washed and plastered before resuming the concreting, and that no through joints, vertical or horizontal, are left.

When the heel trench has been completed, and before a start is made with the dam proper, a system of 6-in. stoneware

DRAINS

is arranged to afford ample opportunity of escape for any water which may exert upward pressure on the base of the dam behind the heel trench. These drains lead to larger vertical pipes placed at intervals along the toe of the dam, and with their outlets at such a level as will ensure a free discharge at all times, or they may be led into the drainage culvert of the dam.

After all loose rock has been removed, and with the rock bed rough, jagged, and inclining downwards towards the upstream face, a bed of mortar is spread over the foundation, and a layer of concrete about 2 ft. thick spread over this forms the first course of the dam. Above this the concrete may contain displacers or plums. These stones, which must be of sound, hard rock, are of large size, running up to 1 or 2 tons, and prior to being dropped on a good bed of concrete they are well washed, scrubbed with wire brushes, and coated while damp with cement grout. They are so placed in the work that no air cavities can exist beneath them, and adjacent blocks are seldom less than some 6 in. apart. The bed of concrete into which the plum is beaten with wooden mawls is always of such a thickness that there is no risk of the block "riding" upon a lower one. The displacers are rarely surrounded by concrete in one day, and, projecting as they do up and from the work 1 ft. or 2 ft., form excellent keys and serve to break joints. As additional safeguards, vertical V-shaped grooves, some 9 in. deep, are sometimes made at vertical joints, and longitudinal grooves about the same depth and 18 in. wide on any flat surfaces.

As the ground surface is reached an arched opening is formed to convey the water through the dam. Two methods of dealing with it will be described. The top, sides and bottom of this tunnel have large toothings or indents formed at intervals throughout its length, and the exposed surfaces are well picked over. When the tunnel is complete, the river is diverted to flow through it. As the superstructure is nearing completion, and at a dry season when possible, a cofferdam or earthen bank is formed about the entrance to the tunnel, and forthwith the closing up of the masonry facing at both ends of the tunnel is commenced. Concreting then proceeds, working inwards from either end, and using 4 to 1 concrete and plenty of mortar between the old and the new work. In the dam a vertical shaft 3 ft. in diameter has been formed rising from the crown of the tunnel to a longitudinal tunnel connecting the valve towers. It is through this shaft that the concrete is passed, and this in its turn is made up with concrete. A wrought-iron pipe with screwed joints is embedded in the concrete with its lower end near to the up-stream [illegible] and its upper end [illegible] with a grouting pan worked in the longitudinal tunnel. When the concrete has had time to set, grout is forced down the pipe with a view to filling up any interstices left by the concretor.

In the second method not only are grooves left in the sides of the tunnel, but a reduction in size is also made towards its lower end by three or four offsets. Through the cofferdam the scouring-out pipe (or pipes) is laid, and is continued through to the other end of the tunnel. The water is allowed to flow through this pipe until the tunnel has been filled in. To provide against floods the upstream face is at once built up and made practically watertight. The remainder of the concreting is then completed. The arrangements made for grouting in this case take the form of a pipe leading through the dam to the top of the arch from a convenient point on its downstream side. When it is considered that all crevices not previously filled by the concrete are sealed, the pipe is left full of grout and plugged. While the

PROPORTIONS OF THE CONCRETE

—5 or 6 to 1—vary but little in this country, the practice with regard to the quantity of water used in mixing it varies considerably. Some prefer such mixtures as will show the least trace of water on the surface after vigorous ramming; others use an almost sloppy mixture. Dry concrete is the more costly, though if the ramming is uniform throughout this concrete will be more compact and therefore less pervious. On the other hand, a wetter concrete is more easily handled, less dependent on the workmen for its uniformity, and, considered in bulk, very little, if at all, inferior to the more expensive mixing. It has been suggested that by using "dry" concrete shrinkage cracks may be avoided. This appears to be reasonable, though there hardly seems to be enough evidence to warrant a definite conclusion.

The proportions of sand and stone to cement are arrived at by experiment, and are such as will give a mixture of maximum density. Once the proportion of sand and stone is fixed, it should be strictly maintained, the two materials being gauged separately for each banker. One sometimes finds that stone and sand are allowed to be tipped, probably in the correct proportion, to form one large heap on the stage. From this heap a quantity equal to the total bulk of sand and stone is gauged with the necessary cement, with the result that there is considerable variation in the proportions of sand and stone in the bankers. As regards the

FACING OF THE DAM,

it is a general rule that the blocks should be massive and the face impervious to water. Courses of squared rubble, varying between 18 in. and 30 in. in depth, and not less than 18 in. wide, with headers not less than 3 ft. to 4 ft. long, and occupying at least 25 per cent of the face area, represents average practice. The length of the stretchers ranges from 3 ft. to 8 ft., and their average weight would be about 2 tons. Though in most cases the beds and joints of all facing stones are left fairly rough, but true, in some instances V or other grooves have been added. The top and bottom beds are parallel, and always perpendicular to the face of the dam; curved faces necessitate slight variations in the thickness of the bed joints.

It is an advantage to get as high an average specific gravity as possible in the dam, and since the stone used has, in general, a higher specific gravity than the concrete, the greater the percentage of stone within the limits mentioned, the better. The ratio of the weights of stone and concrete in dams ranges from 30 and 70 to 45 and 55.

The face stones on the downstream face are set in 2 to 1 cement mortar, both bed and vertical joints being ¼ in. to ¾ in. thick. Some little time after the facing has been backed up with concrete the joints are raked out to a depth of 3 in. and caulked with almost dry 1 to 1 cement mortar. On the upstream face the caulking is done with neat cement, and the setting in 1 to 1 mortar. In this case there is no particular restriction as to displacers, except that the distance between them and the face stones should somewhat exceed 6 in. In other cases no caulking of face joints has been done, but then no displacers have been allowed within 10 ft. of the water face, and the 3 to 1 concrete backing has been made of stone broken to pass a 14-in ring instead of the more usual 2-in. ring.

For handling the stones and other materials travelling cranes, capable of lifting 5 tons at a radius of 25 ft., may be employed. Piers of concrete are raised, to 15 ft. or 20 ft. above the work at some point, and 300 ft. to 400 ft. apart. On these are placed girder beds,

upon which rest longitudinal girders carrying sleepers and rails. The sides of the piers are deeply indented and well picked over, so as to provide the requisite key for the concrete which will eventually surround them. As the work is levelled up at this point fresh piers are constructed at some distance away. Another set of girders and rails is then fixed in position, and the crane is raised on to its new track.

Derrick cranes having 50-ft. or 60-ft. jibs may be used. They may be supported on wood or steel towers placed quite clear of the dam or resting on the downstream face, or temporary piers may be raised from the existing work to carry girders or baulks on which are longitudinal rails. The ends of the sills of the crane rest on trucks running on the one set of rails, while the king post rests on another truck running on the other parallel rails.

The crest of the dam is faced or formed of radiating ashlar blocks, often set in 1 to 1 cement mortar, and the coping stones have joggled joints. If a road crosses the dam, it is generally carried on arches springing from piers rising from the crest, and as this work is always visible some attempt is made to give it a pleasing appearance.

Space will not permit of a description of the outlet works, though we may remark that, whereas in many earthen embankments it is inadvisable to make a culvert through the bank, in a masonry dam this is the usual procedure.

A POINT TO BE WATCHED

during construction is that at its various sections the dam is true to the drawings. For both straight and curved faces straight profiles 10 ft. or 12 ft. long, made of floor boards, meet the case. These are supported by iron brackets fixed into the bed joints, or into holes drilled for the purpose in the facing-stones, and are placed a definite distance measured horizontally out from the dam in every case. The brackets are so made as to permit of a movement of several inches to and from the wall. For a straight face the arrangement is exact, but a curve becomes a series of chords, the difference between the arc and its chord is inappreciable, particularly when it is remembered that the work is quarry-faced and the pitching lines are not too well defined.

The dam is drawn out to a large scale, and a table is compiled giving the distance of the two faces from the centre line for various levels at vertical intervals of 5 ft. or 6 ft., allowing, of course, for the constant projection, say 12 in., of the profile outside the work. From these distances the batter of the faces lying between pairs of levels is worked out and tabulated. Batter plum rules are made to correspond with the tabulated batters. It is now a comparatively simple matter to fix a profile at any particular point. A theodolite can be set up at the most convenient of the hillside stations and, taking the usual steps to ensure accuracy, a mark can be made on the dam which will be so many feet back from the centre line. From the facing already completed and using the batter plum rule, the profile is set at approximately its true position. After ascertaining the level at which the next widths have been tabulated this level can be marked on the profile, and the distance of the profile from the mark on the dam should agree with the tabulated figure. If it does not, the profile is moved slightly, the level is marked on afresh, and the distance again checked.

Address Wanted. A firm of engineers require the address of the Watkins Heat Recorder Company. Please address "H. N." c/o THE EDITOR.

Housing in Ireland.—The Lord-Lieutenant of Ireland lately received a deputation composed of gentlemen representing thirty-five towns in Ireland, whose object was to ask him to use his influence with the Government in order that the facilities obtained by rural councils for providing suitable dwellings for the working classes should also be extended to urban councils.

Paving Tramways with Nidged Setts.—The Glasgow Corporation Streets Committee, having adopted as a principle the employment of nidged setts—*i.e.*, setts with a finely dressed surfaces in paving the principal thoroughfares in that city, largely with a view to minimising noise, have represented to the Tramways Committee the desirability of paving the tramway tracks with a similar class of sett. The Tramways Committee have requested the general manager to prepare a report upon the subject.

MUNICIPAL WORK AT GODALMING.

REPORT OF BOROUGH SURVEYOR AND WATER ENGINEER.

Statistics in regard to the borough of Godalming, which appear in the last-issued report of Mr. J. H. Norris, the surveyor and water engineer, show that the population of that town—which has an area of 812 acres—has increased since the year 1892 from 8,117 to 8,847. The death-rate stands at the very low figure of 10·96 per 1,000, as compared with a birth-rate of 17·52 per 1,000.

In regard to sewerage the report mentions that there are leakages of sub-soil water at several points, and that the question of stopping these must be considered in the near future, as they seriously swell the quantity of sewage to be lifted at the outfall works. A similar remark applies to much roof and surface water which finds admission to the sewers.

Some difficulty exists in eliminating the colour of certain trade wastes discharged into the sewers, and there appears evidence of inadequate sedimentation in some of the liquors. These matters are being inquired into.

The indicated quantity of sewage pumped during the year was 248,832,000 gallons, but this must be diminished by deductions for slip in pumps, amounting, perhaps, to 10 per cent. It also includes trade wastes, leaks, storm water and flushing water; but after allowing for all these factors the flow must be considered a very large one for the population connected.

Building activity in the borough has again slackened, and it is noteworthy that the erection of fourteen new dwelling houses, for which plans were submitted during the year, involved the demolition of eight old ones.

The number of loads of dust removed from houses within the borough during the year was 1,844 against 1,716 loads for the previous year. Mr. Norris states that the work continues to be very well organised and efficiently carried out by a foreman and a staff of five men.

Dealing with highway matters, the borough surveyor mentions that the town is now feeling the benefit of tarring operations on roads with light traffic. It has been found that the tar coating lasts throughout the year, and that little wear of the road surfaces has occurred during recent seasons.

No change has been made in the organisation of the scavenging work, which is arranged on the basis of each man responsible for a particular district. Experiments were conducted to prove whether a change of system would be advantageous, when it appeared that with horses and carts and sweepers, working in gangs, the work could be done much more expeditiously, though perhaps not more economically.

The total quantity of water pumped to the town's reservoirs, as indicated by the pumps, was 194,422,631 gallons, or an average of 632,665 gallons per diem; 15,500,000 gallons of the total was lifted from new works at Ockford.

The estimated population supplied is 14,500, and the quantity per head is therefore 36½ gallons. This figure, however, must be diminished by the quantities used for trade purposes, gardens, street watering, sewer flushing, and by an allowance for main leakages and slips in pumps. These will probably amount to at least 120,000 gallons per day, making the daily consumption per head 29 gallons for domestic purposes.

Stoke-on-Trent New Municipal Buildings.—New municipal buildings at Stoke-on-Trent were formally opened last week. The mayor (Alderman F. Green, J.P.), in the course of the proceedings, expressed deep gratitude to the officials who had helped with the scheme, adding, "I specially desire to mention the name of the borough surveyor, Mr. A. Burton. The architects have done their duty, and have done it well, But in Mr. Burton we have had a man we could trust, whose whole life has been one devoted to his duty and to his employers. I give utterance to this expression because I can, with the committee, say without hesitation that we are deeply indebted to him." The whole of the buildings, decoration and fittings, including electric light fittings, have been designed and detailed by the joint architects, Messrs. James A. Bowden, of 6 Duke-street, Adelphi, Strand, and Thomas Wallis, of Queen Anne's Chambers, Westminster. The contractors for the building were Messrs. Wilcock & Co., of Wolverhampton.

INSTITUTION OF CIVIL ENGINEERS.

PRESIDENTIAL ADDRESS.

In his presidential address to the members of the Institution of Civil Engineers on Tuesday evening, Mr. Robert Elliott-Cooper said the improvement of the conditions under which young men were enabled to obtain their first practical experience of professional work—during the early years of which they must necessarily be more or less in the position of learners—was one of the most important questions that the institution has ever had before it. It could avail little to lay down standards of knowledge suited to form the basis of engineering training, and to devote the most careful attention to the means of testing the possession of such knowledge, unless at the same time the needs of those who had proved their fitness in this respect were recognised and provided for in the matter of opportunities of obtaining practical training. In the past quarter of a century the facilities for acquiring a knowledge of engineering science had been vastly extended and improved, and it might be said generally that the technical institutions fully recognised the desirability of sending out young men fitted to enter engineers' offices and works, and able to render some useful service in return for the opportunities they sought of obtaining a working knowledge of the profession.

It was for engineers—members of the institution—to realise more widely the desirability of extending a helping hand to young men at this stage; for it was clear that the future of the profession must depend very much upon the extent to which the engineers of the present day were disposed to take active interest in the question of the training of their successors, to facilitate the acquisition of practical training, and also to insist upon complete qualifications on the part of those engaged by them as assistants. He pleaded in favour of all possible facilities being afforded by masters to their pupils and younger assistants for participation in the visits to engineering works which were regularly arranged for by the institution. Such inspections were of advantage to those who made them, and must thereby benefit, too, the employers themselves.

EMPLOYMENT.

While it formed no part of the objects of the institution to find employment for its members, it is obvious that developments which had taken place pointed to a wider and growing recognition of the professional qualification afforded by the institution diploma. The members had been made aware of views entertained for several years past by the council as to the national importance of engineers engaged in public services and works being possessed of such qualifications as would be accepted by the engineering profession as proof of competence to exercise it. The council had already indicated that they believed it to be their duty to urge the adoption of that principle, and were doing their best to secure it. The Civil Engineers' Appointments Board, while in no sense part of or associated officially with the institution, was formed with the full sympathy of the council, and had already proved of considerable usefulness both to engineering employers and to many of our younger members and students. He was informed that it was apparent that the Appointments Board's operations would be largely increased, with corresponding benefit to young engineers, if many of the latter were able to show more practical qualifications for general engineering work, such as draughtsmanship, surveying work in its various branches, and acquaintance with the simpler kinds of constructional work, than unduly specialised training was calculated to secure. He commended that to the consideration of students, and those under whose guidance they might come.

ENGINEERING WORK ABROAD.

Speaking of the labours of the civil engineer in distant parts of the world, the president remarked that there was one main difference between the methods of construction of public works at home and abroad which affected materially the qualifications of the engineer in charge of them. In the country it was to a great extent customary for the carrying out of the works to be placed in the hands of an experienced contractor, according to the designs and under the supervision of the engineer, but in Australia South Africa and the Crown Colonies the work of construction was generally carried out "departmentally"—that was, without the intervention of a contractor. In Canada, however, the plan of carrying out the work through a contractor was more generally adopted, where, in the case of bridge construction, contractors often submitted designs for the work which they tendered for, in that respect following the United States' practice.

There were many advocates for each of these methods, even to the extent of the rival systems becoming planks of political parties. In many cases, however, there was no choice when contractors possessing the requisite skill and capital were not available, and it often became necessary for the Government to provide these essentials, including plant and material. The engineer, therefore, in direct charge of works, who at home would be called on to exercise the ordinary functions of a scientific and practical designing and inspecting civil engineer, had, in the case of similar work abroad, to add to them the business aptitude, the commercial ability, and the qualifications of a successful organiser of labour, which were required by the contractor's agent. Moreover, vigorous health also must generally be his, to meet not only, in some cases, bad climates, but in nearly all the various hardships inseparable from undeveloped regions.

The remoteness of operations is often a great factor of difficulty in overseas work. Temporary houses or tents had to be provided for the engineer and his workers, who had often to be provided with rations, medical attendance and sanitary requirements; the law had to be enforced, and the construction engineer, in some instances, had to be sworn in as a magistrate, in order to meet emergencies such as might be expected in outlying districts. Then, the engineer had less means to his hand for constructional contingencies than his brother at home, and, generally, owing to distance, not equal opportunities of consulting his superior officer. Frequently, in the case of railway construction, the object of which was to convert an uninhabited country into an inhabited one, the engineer was called upon to fix and lay out the sites for future towns which would be suitable as regards foundations, water supply, drainage, and generally conformable to surrounding conditions. All these considerations pointed to the necessity of greater resourcefulness on the part of the civil engineer abroad over and above that required at home; and in judging of the great works which had been accomplished they could not lose sight of those particular factors which had formed such an important part in their successful achievement.

THE INSTITUTION'S NEW PREMISES.

In the course of his remarks Mr. Elliott-Cooper stated that, although they had been somewhat disappointed in the progress made, the hope and expectation which the council expressed at the end of last session that some part of the institution's new building would be brought into use early in the year—was likely to be realised, and they were assured by the architect and builders that they might look forward with confidence to the work being sufficiently completed to ensure the building's official opening during the coming summer.

"The Surveyor" for Reference.—As an indication of the value placed on back numbers of THE SURVEYOR, it is interesting to note that copies of two issues published in 1904 at 3d. each recently brought the high price of 3s. 6d. They were probably bought to complete volumes for reference.

The Colne Tramways.—The Colne Town Council on Wednesday week decided to enter into negotiations with the Colne and Trawden Light Railway Company to effect a purchase of the whole plant, the price to be fixed by arbitration, and instructed the town clerk to take the necessary steps promptly. The total length of the line is 6 miles, and the system serves Trawden, Shawbridge, Nelson, Barlowford and Burnley, in addition to Colne itself.

Improvement in Sewage Treatment.—The new sewage works built by the Brentwood and Billericay joint authorities, at a cost of £20,000, were opened lately by Dr. Thresh, medical officer of Essex. Dr. Thresh said the new works were unlikely to be superseded for many generations, as the bacteriological process had been so improved that in these, the most modern works in the kingdom, the sewage effluent could be made pure enough to use over again as drinking water

Construction of Surfaces with Bituminous Materials.*

By ARTHUR H. BLANCHARD, M.AM.SOC.C.E., Professor of Highway Engineering, Columbia University.

Various kinds of bituminous materials have been used in the United States in the construction of roads and pavements for over fifty years. The introduction of the use of bituminous surfaces and bituminous pavements in the construction of highways outside of built-up districts is of comparatively recent origin in this country, dating practically from 1906. Since that period the growth of the use of asphalts, asphaltic oils and tars has been exceedingly rapid. For example may be cited the increase in the yardage of bituminous surfaces and bituminous pavements constructed with bituminous materials, not including light oils, under the jurisdiction of eight State Highway Departments of the East. In 1908 the total yardage was 416,700, while in 1911, 17,749,000 yds. were constructed. The discussion of this subject will be presented in the form of a brief *resume* of typical current practice, and a review of some of the causes of failure of the different types of bituminous surfaces and bituminous pavements.

In order to avoid misunderstandings, the various methods of using bituminous materials referred to in this paper will be explained by the following definitions:

(1) Bituminous surfaces are those consisting of superficial coats of bituminous materials, with or without the addition of stone or slag chips, gravel, sand or materials of a similar character.

(2) Bituminous-macadam pavements are those consisting of broken stone and bituminous materials incorporated together by penetration methods.

(3) Bituminous-gravel pavements are those consisting of gravel and bituminous materials incorporated together by penetration methods.

(4) Bituminous-concrete pavements are those having a wearing surface composed of stone, gravel, sand, &c., or combinations thereof, and bituminous materials incorporated together by mixing methods.

BITUMINOUS SURFACES.

Bituminous surfaces are usually constructed on macadam or gravel roads, or on bituminous pavements or cement concrete pavements. A notable innovation is the use of bituminous surfaces on brick and wood block pavements. In the case of roads, the mode of procedure is to thoroughly clean the surface by sweeping with hand-brooms or horse-sweepers, or combination of these methods. The bituminous material, which is generally heated, is applied to the surface with the aid of pouring-cans, hose attached to gravity tanks, hand-drawn gravity distributors, horse-drawn or power-driven gravity distributors and pressure distributors. After a varying interval, some kind of mineral coating is generally applied to cover the bituminous material.

The causes of failure of bituminous surfaces are numerous. They may be considered from the standpoint of the condition and character of the original surface, the material used, the method of construction or local conditions.

The failure of bituminous surfaces from the standpoint of the character of the original surface is many times due to failure on the part of those in charge to place the surface in satisfactory condition before the application of the bituminous material. Many cases are noted where bituminous materials are applied over a surface in which are found many potholes and ruts, or which is dirty, due either to accumulated dust and dirt, or to the original method of construction. With certain kinds of materials a damp condition of the surface has resulted in failure.

From the standpoint of the physical and chemical properties of the material, many instances may be cited in which failure is due to materials not having the proper characteristics for the conditions under which they are employed. As an example might be cited the case of a prominent thoroughfare in one of our large cities which is subjected to motor-bus traffic and a large amount of motor-car and horse-drawn vehicle traffic. This road is constructed of gravel, upon which has been applied an asphaltic oil and gravel top dressing. The surface at the present time in many sections is full of ruts caused by the traffic pushing the material from side to side. Again, the large percentage of volatile constituents contained in certain asphaltic oils has rendered surfaces constructed with them unsatisfactory, because of the long period required for these surfaces to "set up," so that the bituminous material will not track or the carpet thus formed will not creep and form waves and humps. In certain cases the use of light oils on tar or asphalt surfaces has softened the original bituminous surface to such an extent as to render the road or pavement unsatisfactory for use.

From the standpoint of construction, we find failures due both to the use of too small an amount of the bituminous material and an excess of material. Improper application, resulting in uneven distribution, is accountable for many failures of bituminous surfaces, while in other cases a lack of sufficient covering of stone chips or material of a similar character has rendered the surface sticky, mushy, sometimes in the first season, but sometimes not until the second summer.

There are numerous instances where bituminous surfaces have been adopted under conditions which call for the construction of bituminous-concrete pavements, or even some type of block pavements. A mat type of construction, which has been employed to a considerable extent, has proved inefficacious in cases where horse-drawn vehicle traffic has been more than a certain amount in combination with motor-car traffic, which in amount was not sufficient to satisfactorily iron out the calk holes caused by the horse-drawn vehicle traffic. There are cases where æsthetics should govern the selection of the type of surface, and generally in such cases the black or brown surface resulting from the use of bituminous material does not harmonise well with the environments.

BITUMINOUS-MACADAM AND BITUMINOUS-GRAVEL PAVEMENTS.

Bituminous-macadam and bituminous-gravel pavements are of many types, one of the primary differences in construction being the use of one or two applications of the bituminous material. The efficacy of many of the types depends upon the combinations of sizes of broken stone or gravel, and the combinations of bituminous materials used when two applications are employed. Variations in types also exist dependent upon the manner in which the different courses may be filled and the treatment of the filled course prior to the application of the bituminous material. The one-application method is very similar in its simplest form to the construction of a bituminous surface, except that the bituminous material is applied upon a much more open surface. In the case of the two-application method, in certain instances an attempt is made to build up a two-course pavement, while in others the second application is in reality used as a seal coat.

Unfortunately many are the instances where improper bituminous materials have been employed. In some cases the materials were satisfactory in themselves, but were used improperly. Many engineers having charge of bituminous work do not appreciate the cold fact that different types of bituminous materials have entirely different physical properties, and require entirely different treatment in use, although they may have been purchased under one and the same specification, covering chemical and physical properties. In some cases entirely unjustifiable combinations of materials are employed. For instance, one case is in mind where an asphalt of excellent characteristics was used for the first application, while for the second application an asphaltic oil, having decidedly solvent and fluxing properties, was employed. Overheating of the material has likewise proved the cause of many failures, as thus the properties of the materials are sometimes changed, and in many cases the materials are ruined.

Under the heading construction we find failures due to the uneven distribution resulting, especially from the improper use of hand pouring pots and hand-drawn distributors, and also in many cases when horse-drawn or power-driven distributors are employed. Many unsatisfactory bituminous-macadam

* Paper read before the American Road Congress at Atlantic City on October 4th.

pavements result from the use of the wrong sizes of broken stone. One instance will be cited where a hand-broken stone, ranging from 2 in. to 3½ in., was used for the wearing surface. After rolling, 1½ gallons of bituminous material were applied, and the road finished with a layer of chips. The rapid formation of fine cracks due to the rocking movement of the individual stones under traffic, finally resulting in ravelling and general disintegration, is of common occurrence. Segregation of sizes of stone preventing uniform penetration results in weak spots in some cases and "fat" spots in others. In certain cases after a rain the construction has been carried on before the broken stone immediately below the surface has dried out. Many of the causes attributed to the failures of bituminous surfaces may likewise apply to bituminous-macadam and bituminous-gravel pavements.

BITUMINOUS-CONCRETE PAVEMENTS.

Bituminous-concrete pavements, other than sheet asphalt and pavements laid by companies as proprietary articles, have received more attention during the past season. . . . Less fear of litigation proceedings, and the introduction of economical mixing machines equipped with heating attachments, have exerted a marked influence. But, furthermore, the rapidly growing recognition of the inherent advantages of bituminous pavements constructed by the mixing method has been largely instrumental in its adoption for traffic conditions, for which it is believed to be economical and suitable.

This type of bituminous pavement is constructed usually by one of three methods. These methods, although overlapping to a certain extent, may be described as follows, when broken stone is used as an integral part of the mineral aggregate:—

Type A consists of so-called one-size crusher run broken stone mixed with bituminous material. It should not be considered that the designation "one-size crusher run stone" means an aggregate composed of broken stone of uniform size. This term, as used here, refers to the product obtained at a crushing plant which passes over one size of screen holes, and through the next larger, or passes through a screen of one size of holes, and is retained upon a screen having smaller holes. It is evident to those familiar with the operation of crushers that the product thus obtained does not usually consist of stone of uniform size. For example, broken stone commercially designated as "¾-in." used in the vicinity of New York City, is obtained in some cases by passing over ½-in. and through 1¼-in. openings. The size of the stone varies from 1 in. to ⅛ in. It is self-evident that this variation in size produces a more stable pavement than if the aggregate consisted of broken stone of uniform size. Type A has been constructed by both hand-mixing and machine-mixing, and by using both unheated and heated stone. Many kinds of bituminous materials have been used, while in some cases one kind of bituminous material has been used in the mix and another kind for the seal coat, one of the most common combinations being the use of tar in the mix and asphalt for the seal coat.

Type B consists of coarse sand or fine broken stone and sand, or other fine mineral matter, mixed together with bituminous material. The wearing surface of the mix is sometimes finished by rolling in fine stone chips, but generally a seal coat is used together with fine mineral matter for a top dressing. When constructed on a commercial scale the mineral aggregate is always heated and mixed in a suitable constructed machine. Usually the same grade and type of bituminous material is used for the mix and the seal coat.

Type C consists of a wearing course composed of a graded aggregate of broken stone and sand with or without other mineral matter, which aggregate is mixed after being heated with a bituminous material in a specially designed machine. As with Type B this pavement is finished with and without seal coats of bituminous material. The Topeka and the bitulithic pavements may be cited as examples of Type C.

FAILURES.

Having reviewed the fundamentals of the various types, consideration will now be given to causes of failure of some bituminous concrete pavements. It should be noted that the percentage of failures of bituminous concrete pavements is much smaller than in the case of bituminous macadam and bituminous gravel pavements.

Poor and unsuitable materials have been accountable for certain failures. Attachment for a material of a certain type has led to a blind adoption of any material belonging to a given class. For instance, in one case coming under the writer's observation crude coal tar from one gasworks had given good results on the average. Based on this fact any crude coal tar was finally used, although those in authority had had an object-lesson in a failure due to the haphazard purchase of crude coal tar. Experiments in Rhode Island and in the borough of Queens seem to have demonstrated that high carbon tar of a certain consistency is not as satisfactory or advisable for a seal coat as come types of asphalts, when the percentage and volume of horse-drawn vehicle traffic is large. In some cases an apparent cause of failure has been an excess of flux or of the volatile constituents in asphalt cements. Pavements constructed with such materials many times are wavy, due to the movement of the surface under heavy traffic. Many cases are reported where materials have been overheated at the construction site, due to the belief that all materials may be and even should be heated to the same temperature before using, and that it is impossible to injure bituminous materials by heating to high temperatures.

During construction there are various details which demand careful supervision. Either too large broken stone or stone of too uniform size may cause a failure. Especially is this the case with very hard and tough broken stone. The rocking of the stone causes the formation of fine cracks which eventually lead to disintegration. Naturally the amount and character of the traffic is intimately connected with the condition of the pavement, but cases have occurred where failure, even under very light traffic, was due to using large uniform-size broken stone for the mineral aggregate of the mix. Poor combinations of sizes of broken stone and sand have resulted in segregation during mixing, transportation or spreading, resulting in a pavement of varying density and stability. Overheating of the mineral aggregate has caused burning of the bituminous material in some instances, or the formation of a thin film of bituminous material over the broken stone, which is not of sufficient amount to bind the adjacent stones together. The use of a wet aggregate will usually result in a poor mix with consequent unsatisfactory results. In many instances the seal coat has been applied ununiformly. The result is either uneconomical, due to the necessity of a second application before 75 per cent of the surface requires treatment, or the disintegration of the pavement wherever bare spots occur in pavements where a coarse aggregate was used, and where there is considerable horse-drawn vehicle traffic. Although of minor import to-day, some failures have been caused by using with unheated stone bituminous cements which will not adhere satisfactorily or which only mix with great difficulty under such conditions.

Many failures are due in part, or in full, to poor foundations. Sufficient attention has not been paid to this important part of the pavement.

Many of the above causes of failure would be eliminated if engineers would have more regard to a consideration of the mineral and chemical properties of the materials which they employ. Records should be kept showing the kind, and details of the specifications of every road noted. If a bituminous material laboratory is not connected with the department it should not be a matter excessive or difficult to secure certified analyses made by reputable chemical engineers.

In closing the writer wishes to emphasize the fact that a careful consideration of the causes of failure of bituminous surfaces and bituminous pavements constructed during the past five years will result in material benefit, inasmuch as a comprehensive knowledge of the various causes of failure is one of the most valuable assets of engineers having in charge the construction and maintenance of bituminous surfaces and bituminous pavements.

Sunderland Municipal Golf Scheme.—A municipal golf course scheme at Seaburn, near Sunderland, has been approved by the Parks Committee of Sunderland Corporation. It is proposed to rent 80 acres, and experts have pronounced the land suitable for an eighteen-hole course.

THE TRAINING OF SANITARY ENGINEERS.

By GEORGE C. WHIPPLE,
Professor of Sanitary Engineering in Harvard University.

Within the last quarter century a new profession has come to the fore—sanitary engineering. It represents the application of a new science to a new product of civilisation. The new science is bacteriology; the new product of civilisation is the modern city. How important sanitary engineering is to the world to-day is scarcely realised, so gradual has been its evolution, but its importance may be appreciated by comparing the conditions of life in our cities to-day with the conditions that existed in ancient days, or even a few generations ago. . . .

The problems of the sanitary engineer are so vast and so varied, they bring him into contact with so many branches of science and with so many classes of people, that an exceptionally broad education is demanded. . . . Not only must the sanitary engineer be versed in mathematics and mechanics, but he must have a working knowledge of parts of chemistry, biology, bacteriology, microscopy, meteorology, geology, hygiene, preventive medicine, vital statistics. Unlike other branches of engineering, sanitation is concerned not alone with iron and stone and other inert building materials, but with organic matter and living things. The purification of water and sewage is due largely to biological action, and the knowledge of bacterial processes is scarcely less important to the sanitary engineer than that of the laws governing the flow of water in pipes and the strength of materials.

While this is acknowledged, it is also true that first and foremost the sanitary engineer must be an engineer, and the collateral sciences must be subordinated. Hence, the student must be trained primarily in engineering, and secondarily in sanitation. The emphasis is important. It cannot be successfully reversed. Sanitary science teaches the student why this or that structure is needed, but it does not teach him how to design or how to construct, and these are for him the very fundamentals of his profession. The wisely arranged curriculum will therefore cover the field of sanitation in a broad and general way, without taking too much of the student's time from his detailed studies in structures and hydraulics.

But sanitary science is becoming so important that there is room not only for the constructing engineer, but for the sanitary specialist, and for him whose duty it is to operate the works after they are built, to take charge of the water filters and the sewage treatment plants, to manage the garbage works and superintend the cleaning of the streets and buildings. Such men need a slightly different training from the others, and the ideal course would give less attention to civil engineering features and more attention to mechanical engineering and laboratory work. Also more attention should be given to the subject of accounting and scientific management. This need for capable managers of sanitary works will soon be a pressing one, and our technical schools must be prepared to furnish men for this service.

Besides the sanitary engineer and the specialist in sanitation, the world to-day needs—and the need is very great—a kind of man just beginning to make his appearance—namely, the sanitary executive, or, as he is more often called, the health officer. . . .

In the pursuit of the elements of sanitary science the sanitary engineer, the sanitary specialist and the health officer meet on common ground, and to a certain extent their education may be appropriately conducted together. But for the most part their work, although mutually helpful, lies apart, and their education in the main should follow separate channels. . . .

HARVARD UNIVERSITY COURSES.

As an illustration of modern tendencies in the training of sanitary engineers, mention may be made of the newly established courses in the School of Engineering, Harvard University. Here sanitary engineering does not lead to a special degree, but is considered as a branch of civil engineering—in fact, all students in civil engineering are expected to take the general course in this subject. The same course is also open to candidates for the degree of Doctor of Public Health in the Medical School. For those who intend to engage in sanitary work at once after graduation, courses in water supply engineering and sewerage engineering are offered during the last term, and in these the students receive such detailed instruction as will fit them for the actual kinds of work that will be expected of them in practice. This instruction is not given as class-room exercises, but as individual work carried on as it would be in the office of a practising engineer. Much, too, is made of the study of actual works in operation for the benefit of those who intend to enter this field.

The extent to which specialised subjects in sanitary engineering should be taught is a difficult matter to decide. Generally speaking, experience has shown that specialisation in our technical schools has been carried somewhat too far. In the writer's opinion it ought to be carried only far enough to incite the permanent interest of the student and enable him, on graduation, to take up some particular line of work intelligently, and with such a degree of skill that he can earn a reasonable income during the early years in which he is getting his real experience in his chosen profession. In later years it is the effect of his general studies rather than of his special studies that make for his success.

One feature of interest in connection with the Harvard School of Engineering is the fact that it continues through the entire year, utilising the time usually devoted to the long summer vacation. This enables the student to accomplish his engineering studies, and obtain his Master's degree in two full years after receiving his Bachelor's degree. The summer work is of particular advantage in the study of certain phases of sanitary engineering, as it enables field work to be carried on at a season when the biological processes are at their maximum, and when material for study is readily available.

LONDON COUNTY COUNCIL ENGINEERSHIP.

APPOINTMENT OF MR. C. W. HUMPHREYS.

The London County Council on Tuesday adopted the recommendation of its General Purposes Committee, and promoted Mr. G. W. Humphreys, M.INST.C.E., from the position of deputy chief engineer to that of chief engineer and county surveyor, when that post will become vacant by the resignation of Sir Maurice Fitzmaurice, C.M.G., taking effect at the end of the year. Mr. Humphreys was appointed deputy chief engineer in March last, having served under the chief engineer since the beginning of 1910; and has been engaged on the design of all main drainage and improvement work and the preparation of Parliamentary plans. He entered the service of the London County Council in 1902, when he was selected in open competition as a chief officer of the council, and took over the control of the council's Works Department, which carried out a great deal of the council's construction work. Works to the estimated value of between £3,500,000 and £4,000,000 sterling were executed under Mr. Humphreys' supervision, the most notable being the enlargement of the northern and southern outfall sewers, and the whole of the formation of Kingsway and Aldwych, including the tramway subway from the Embankment to Southampton-row.

Mr. Humphreys' experience before entering the council's service has been extended to many kinds of work. He received his early training on the construction of new works for the Great Western Railway, and under Mr. Woodman Hill, ASSOC.M.INST.C.E., and later as an assistant engineer with Mr. Hill's firm, with whom he continued until his appointment with the London County Council in 1902, he was engaged on the construction, survey and design of works for water supply, sewerage, fortification, piers, harbours, roads, &c., in various parts of the United Kingdom. In 1890 he went to France, and was engaged for three years on the new dock and harbour works for the port of La Pallice, adjacent to La Rochelle. He afterwards spent five years at Plymouth, directing the works of the rectification and deepening of the Hamoaze entrances to Devonport dockyard, and designing all the special machinery used in the removal of nearly 1,000,000 tons of rock below water. Subsequently he directed the work of constructing the new naval harbour and its subsidiary works at Portland.

"The Civic Engineer's Who's Who."—The first issue of "The Civic Engineer's Who's Who" (London: St. Bride's Press, Limited, 24 Bride-lane, E.C., 2s. 6d. nett) gives wonderfully complete lists of the engineering officials of England and Wales. For a first issue it is very creditable.—*Glasgow Herald.*

CAPE TOWN MUNICIPAL WORK.

CITY ENGINEER'S REPORT.

The construction of a new high-level road to the suburbs of Cape Town is referred to in the report of the city engineer and surveyor, Mr. W. J. Jeffries, for the year ended June 30th last. The new road is some 2¾ miles in length. There is a road reserve of 100 ft.—the actual carriageway is 26 ft. wide, excluding channels 2 ft. wide on either side—and provision is made for footpaths 6 ft. wide. The remainder of the road reserve will be planted with a double row of trees. The watercourses are all well culverted, and of ample dimension for dealing with the storm water from the mountain side, the actual waterway being of concrete, and the retaining walls of rough-dressed sandstone. The minimum radius of curves is 170 ft., and this only for a very short distance on a reverse curve. The remainder of the curves are 200 ft. and over. The minimum gradient is 1 in 15, and this does not occur very often. When completed it will make one of the most charming drives in the Peninsula, and will considerably reduce the quantity of fast motor traffic on the main road.

The returns relating to some of the matters which have required the attention of the building surveyor show that there has been an increase in the activity of the building trades so far as new works are concerned. The approximate value of the works now in hand is £50 510, and that of the work submitted for consideration £205,543.

STREET MAINTENANCE.

There has again been a large extension of the area of streets treated with tar. Taking the streets as a whole, there has been a slight increase in the cost of maintenance, due partly to the fact that the untreated macadam roads have demanded more attention, and partly to the large number of streets treated with tar this year.

Out of a total length of 17 miles of tarred streets, there have been under maintenance for the whole of the year 5¼ miles. It has been possible, therefore, to take out the cost of maintenance in those streets for the purpose of comparing them with the paved streets and the untreated macadam streets, and from a table appended to this report it is evident that the tar-dressed streets give very favourable results.

The city engineer observes that the experiment is, of course, still new, but he is inclined to think that when a street has been treated with tar two or three times the process will be still more effective, and each application of tar more durable. He adds that there is a good prospect that the process, in addition to its other advantages, will actually result in economy.

SCAVENGING.

The work of the street cleansing branch has proceeded satisfactorily, the further extension of the area treated with tar having been of considerable assistance. The cost of the operations for the period covered by the report is given as £7,276.

There has been an increase of about 3,000 in the number of loads of house refuse removed. A return attached to the report shows that, although the number of cart loads has increased, the number of truck loads has been reduced. The tonnage, which is calculated at the rate of 4½ tons per truck, therefore also appears to have reduced. This apparent discrepancy is accounted for by the fact that special attention has been given to the loading of the trucks with a view to a reduction of the railway account, and more loads have been packed into the trucks than formally.

The watering of the streets was responsible for an expenditure of £2,403, and the flushing of catchpits and street gullies £878. The consumption of water for these purposes amounted to 16,521,100 gallons. The cleansing and flushing of the catchpits are now carried out during the night, thus obviating the annoyance formerly caused during the progress of this work in the daytime.

SEWERAGE.

The report states that the total length of sewers and outfalls is 92 miles. No extension to the main drainage system was made during the year.

WATER SUPPLY.

In a summary of inspections made during the year, it is obvious that a great amount of waste is taking place through defective pipes and fittings. "With the number of defects equal to 60 per cent of the number of inspections made," must be apparent to anyone," observes Mr. Jeffries, "that all is not being done that could be done in the direction of preventing waste; but although the advisability of increased inspection work has been repeatedly advocated, I regret to say that I have, as yet, met with little or no encouragement. I trust, however, that when the estimates are being framed for the ensuing year more favourable consideration may be given to the matter."

WATERPROOF CONCRETE AND MORTAR.

THE USE OF RESIDUAL PETROLEUM.

The properties of concrete containing a small proportion of heavy oil have for some time been under investigation by the United States Office of Public Roads, and with these studies the name of Mr. L. W. Page, director of the office, is especially associated. A recently issued bulletin gives the results of experiments which were made to find the best proportions and the best ways of mixing the materials for the mortar and concrete, describes their qualities, and suggests various purposes for which they may be employed in preference to ordinary concrete and mortar, or instead of more elaborate or costly methods of securing waterproofness combined with strength.

MATERIALS AND PROPORTIONS.

Experiments were made with a fluid petroleum residuum oil, and with a "cut back" oil asphalt, and the former, having given the better results in both laboratory and service tests, is recommended. The specification provides for a petroleum residual oil with specific gravity 0·930 to 0·940 at a temperature of 77 deg. Fahr., soluble in carbon disulphide at air temperature to at least 99·9 per cent, and containing not less than 1·5 per cent nor more than 2·5 per cent of bitumen insoluble in "86 degree B. paraffin naphtha." The oil must yield not less than 2·5 per cent nor more than 4 per cent of residual coke. When 240 cc. of the oil is heated in an Engler viscosimeter to 50 deg. Cent., and kept at that temperature for at least three minutes, the first 100 cc. which flows out shall have a viscosity of not less than 40 nor more than 45. When 20 grammes is heated for six hours in a dish 2½ in. in diameter and 1 in. in height, at a constant temperature of 163 deg. Cent., the loss in weight shall not exceed 2 per cent.

The proportion of oil used should for most purposes be 5 per cent by weight of the cement, 4·7 lb. per 94-lb. bag, or "about 2¼ quarts." In British measure the quantity would be little over 2 quarts, say 2·01 quarts for oil of specific gravity 0·935.

PHYSICAL PROPERTIES OF THE MORTAR AND CONCRETE.

The tensile strength of 1 to 3 mortar is not altered much by the inclusion of the oil, and the oil-mixed mortar gains substantially in strength during the twenty-eight day and six-month periods, compared with the strength at seven days. The addition of 5 per cent of oil delays the time of initial set by 50 per cent, and final set by 47 per cent. The crushing strengths of mortars and concrete are reduced by the addition of the oil. At twenty-eight days concrete with 10 per cent of oil has ·75 per cent of the strength of plain concrete. At the age of one year the crushing strength of 1 to 3 mortar with amounts of oil up to 10 per cent is but little less than that of the plain mortar. The addition of oil affects but slightly the resistance to impact or the stiffness of the concrete. Oil-mixed mortar and concrete containing 10 per cent of oil have very little absorption, and under low pressures both are waterproof.

Oil-mixed mortar containing 10 per cent of oil is absolutely watertight under pressures as high as 40 lb. per square inch. The addition of the oil much decreases the grip of concrete on steel reinforcement. The bond of deformed bars, it is stated, is not seriously weakened by the addition of oil in amounts up to 10 per cent.

MIXING THE MORTAR AND CONCRETE.

The sand and cement are mixed dry, and sufficient water added to make a "mushy" mortar. The oil is then added and the mortar turned until no trace of oil is visible. This mortar is then ready for use. To make concrete by hand the mortar is first made as above, and the stone added afterwards. When a mixing machine is used the cement, sand and water are mixed first, the oil and some of the stone being then added, a little of each in turn, and, finally, the remander of the stone is mixed in.

PURPOSES FOR WHICH THE PROCESS IS RECOMMENDED.

These mortars and concrete are recommended generally for the purpose of making waterproof walls and

floors, specific mention being made of basement and cellar walls and floors, barns, roofs, cattle troughs, cisterns or tanks, silos, concrete blocks and stucco for basement floors. A 6-in. foundation of porous material is recommended, and, if the ground be very wet, drain pipes in addition. Over the foundation a 4-in. layer of ordinary concrete may be placed, and, before this has hardened a top layer of the waterproof mortar. It is pointed out that the floor will dry very quickly after being washed, because it will absorb hardly any of the water used in washing it, and it is stated that such a floor will not be made slippery by the addition of the oil to the mortar.

For cellar walls the proportion of oil recommended is 10 per cent of the weight of the cement, and a thickness of about 12 in. for 6-ft. depth of earth is suggested, or a thinner wall of reinforced concrete when the top is held by floor joists. For existing walls a plaster of 1 part of cement to 2 of sand, with 5 per cent of oil, is recommended. The proportion of oil for work such as the construction of the walls of sunk tanks is 10 per cent.

To prevent the percolation of long-continued driving rain, the waterproof concrete may be used for the walls of buildings such as barns. Concrete building blocks need not be made so as to withstand the penetration of water under pressure, and a 1:2:4 concrete will be made sufficiently impermeable by the addition of 5 per cent of the oil, that is, 5 per cent by weight of the cement used. For stucco work either the first or both coats may be made with the waterproof plaster.

STORM-WATER SEWAGE DISPOSAL AT LEICESTER.

BOROUGH ENGINEER'S SCHEME.

As already reported in these columns, Leicester Town Council last week gave their approval to a scheme of the borough engineer and surveyor, Mr. E. George Mawbey, M.Inst.C.E., for dealing with the storm-water sewage of that town, the proposals including provision for additional pumping plant at the existing main sewage pumping station, and the expenditure being estimated at £118,916. There has been considerable opposition to the scheme locally, but Mr. G. Midgley Taylor, M.Inst.C.E., who, on Mr. Mawbey's suggestion, was called in to report on it, has expressed himself as being entirely satisfied that it is the most economical and convenient one that could be devised for overcoming the difficulties that present themselves, proposing only one or two minor alterations in the arrangements. Alternative suggestions which were brought forward were shown to be quite impracticable as compared with the scheme adopted. Eighteen years have elapsed since the present sewage disposal scheme was carried out, and in the interval 130 miles of new sewers have been laid down, 16,700 houses erected, and water carriage has been adopted in no fewer than 7,000 instances. The necessity for the large expenditure upon which the corporation have decided to embark will at once be apparent.

The present method of disposing of the sewage of the borough of Leicester is as follows. The sewage is conveyed to the Abbey pumping station by two main trunk sewers, one for the eastern and larger portion of the borough, the other for the portion of the borough lying on the western side of the river. The sewage is pumped to the Beaumont Leys Farm for combined bacterial land treatment. The average dry-weather flow is about 8,500,000 gallons in the twenty-four hours, but the flow during the daytime is at a much greater rate than this, and, of course, proportionately less during the night-time. It now requires during a large portion of every day three of the four engines to pump the dry-weather flow. The main sewers discharge at times at the rate of nearly 100,000,000 gallons of sewage and storm water per twenty-four hours, to pump which would require sixteen additional engines of the same power as the present ones.

Every available method of dealing with the question has been under consideration from time to time, and, having regard to local circumstances and the geographical position of the town, the borough surveyor is of opinion that the most practical and economical course to adopt is to construct screening plant, detritus and storm-water sedimentation tanks at the most suitable point to enable the water passing over the weirs down to the river to be freed as far as possible from deleterious matter.

Mr. Mawbey considers that, in order to bring the pumping plant up to the Local Government Board's requirements of the present day, the corporation should be able during rain to pump to Beaumont Leys, and purify on the bacteria beds and land, a minimum volume of crude sewage and storm water combined up to three times the ordinary dry-weather flow. To do this, and to have one stand-by set off for repairs and so forth, two more sets of engines and pumps, with boilers, are required, together with new buildings, the latter to be large enough to receive two further sets which will be required in the future. Another cast-iron rising main, 44 in. in diameter, he suggests, should be laid to Beaumont Leys, and two more sedimentation tanks there, for the extra sewage pumped, are required. Further, a set of motor-driven screens is necessary in order to intercept the floating solid matters in the sewage before passing to the pumps delivering to Beaumont Leys, and from all the excess storm-water sewage not so pumped, before allowing it to go over the weir at the Abbey pumping station to the storm-water tanks for treatment, and thence to the river. Mr. Mawbey insists that these screens must be large enough to deal with volumes up to 100,000,000 gallons a day.

The whole of the sewage and storm water, immediately after passing the screens, is to be sent through comparatively small detritus tanks, in order to deposit a large proportion of the very heavy mineral matters which now seriously damage the sewage pumps, and cause expensive repairs and renewals. The same heavy matters have choked the rising mains, which have on several occasions cracked, partly from that cause, serious sewage flooding of the road and houses being only narrowly averted. After going through the screens and detritus tanks, the ordinary daily flow of sewage in dry weather, and in wet weather the additional flow due to the storm-water washings of the sewers, will pass to the pumping engines to be delivered for purification to Beaumont Leys up to the before-mentioned volume of three times the dry-weather flow. The storm-water tanks will be placed at the Abbey pumping station, and constructed at such a low level that the excess storm water will gravitate into and through them and thence to the river below Wanlip through the outfall culvert.

The borough surveyor's proposals provide for four detritus tanks, each having a capacity, in normal conditions, of 85,000 gallons, or a total of 340,000 gallons; four covered storm-water tanks, having, including channels, &c., a total impounding capacity of 2,600,000 gallons; a set of four screens, 40 ft. wide; apparatus for emptying detritus tanks; sludge pumps, sludge pump-room and delivery main; electrical plant and engine-room for operating sludge pumps, screens, telpher plant, &c.; water-softening plant and condensing water supply, and the diversion of culverts and sewers. The estimated costs of these works, including 15 per cent contingencies, would be £73,167. Two additional sedimentation tanks at Beaumont Leys Farm are estimated to cost, including 15 per cent for contingencies, £2,558; and two sets of sewage pumping engines, boilers and other machinery, connections to rising mains, &c., pumping station and boiler-house buildings and sewage pumps for four sets of pumping plant, are estimated to cost, including 15 per cent for contingencies, £26,530. A sum of £16,530 is allowed for a new 44-in. rising main from Abbey pumping station to Beaumont Leys bacterial works, this including 15 per cent for contingencies. The consulting engineer's fee is £131.

At last week's meeting of the town council Alderman Patey, in submitting the proposals outlined above, paid a warm tribute to the work of the borough engineer, commenting in particular on the approval which had been given to the scheme by Mr. Midgley Taylor. It was not asserted that the scheme spelt finality, for if the town continued to grow, as it was hoped it would, further extensions of the works would be required. The scheme, however, would bring the sewage works up to date, and would have the effect of removing all possible grievances in regard to the pollution of the Soar.

Carters against Tar-macadam.—Festiniog Urban District Council received a petition last week from all the horse owners and carters in the district, urging the council not to proceed with the proposed improvement of the roads in High-street and another thoroughfare, as the tar-macadam had already been condemned in other towns as being most dangerous in wet and frosty weather. The petition was referred to the Road Improvement Committee.

WATER TOWER FOR VILLAGE SUPPLY.

The accompanying illustration gives a general view of a water tower of 6,000 gallons capacity recently erected at Yedingham for the Norton Rural District Council, Yorkshire, for supplying the village of Yedingham.

The floor and roof are designed on the square slab system, giving a light and at the same time a very strong construction. The lateral pressure of the water

Water Tower at Yedingham.

is sufficient to supply the tank, the top level being 14 ft. above ground level.

The work was carried out by Mr. Alfred Barnes, of Malton, from the Indented Bar Company's designs, under the direction of Mr. R. Richardson, the consulting engineer to the Malton Urban District Council.

London Water Supply. The eighth annual report of the Metropolitan Water Board states that the total amount of water supplied by that body during the year ended March 31, 1911, was 82,170,400,000 gallons, representing a weight of 366 8 million tons and a daily average of 225,000,000 gallons. The total quantity of water abstracted from the Thames was 49,962,000,000 gallons, the remainder being obtained from the Lea and from ground lands, natural springs and wells. The supply from the Metropolitan sources amounted to 114-4 6 gallons. The number of meters in use was 6,397, nearly 61 per cent. of the meters having been laid during the past year. The report states that both the river Lea and the wells are approaching their limits of maximum yield.

Bridge Building.—Students, young engineers, and surveyors will find much useful information in "Preliminary Studies in Bridge Building," by Reginald Ryves, Assoc.M.Inst.C.E. (London: St. Bride's Press, Limited, 24 Bride-lane, E.C. Price 2s. nett.) The book is described as the "first of a series of small volumes, each complete in itself, dealing with the design of ordinary highway bridges of moderate span." Though highway bridges alone are referred to, the matter contained in this volume is largely applicable to railway bridges, aqueducts, and similar engineering undertakings. The five primary types of bridges are described, and the conditions determining the best site for each of the three types of streams are discussed in detail; while, in connection with wandering streams various modes of designing abutments or approach spans are dealt with. Improvements of fords and the effect of eccentric loading of vehicles on the girder loads are among the numerous other items touched on.—*Scotsman.*

CONCRETE FOUNDATIONS FOR CARRIAGEWAYS WITH TAR-MACADAM AND BITUMEN-BOUND MACADAM WEARING SURFACES.

(Contributed.)

In a paper read before the Institution of Municipal and County Engineers at the Eastern District meeting held at Leigh-on-Sea on May 28, 1910, reference was made by the engineer and surveyor of that town (Mr. J. W. Liversedge, Assoc.M.Inst.C.E.) to a specification adopted by his council for new private street works which provided for the construction of carriageways with 6-in. Portland cement concrete foundations and 3-in. tarred granite-macadam finish. Considerable interest was evinced at the time by the members in regard to the adoption of these materials in respect of private street works, and in friendly criticism the adhesiveness of tar-macadam and concrete was called into question.

At that time one street, 40 ft. wide, had been constructed, at a cost of £2,235. The council, being thoroughly satisfied with the results, have adopted the specification for general use.

In the period between the reading of the paper and the present time the following roads have been made up and completed under this system:—

Road.	Length of road in feet.	Width in feet.	Total cost.	Remarks.
				Sections:—
Glendale-gardens ...	1,003	36	£3,148 0 0	Part Tarmac, part tarred granite macadam.
Western-road	404	36	892 0 0	Tarred granite macadam.
Salisbury-road	248	36	552 0 0	Plascom grouted granite macadam.
Leigham Court-drive	513	36	1,296 10 0	Plascom grouted granite macadam.
Leighton-avenue ...	1,286	36	2,91 10 0	Part Plascom grouted, part tarred granite macadam.
Oakleigh Park-drive	660	36	1,146 0 0	Plascom grouted granite.
Leigh Hall-road	1,464	40	2,470 0 0	Part Plascom grouted, part Tarmac.
Dawlish-drive	892	36	1,140 10 0	Part Tarmac, part Northern Quarries.
Queen's-avenue ...	263	36	561 10 0	Tarred macadam.
Totals	8,552		£13,794 0 0	

Note.—Separate surface water drains are included in all streets except Queen's-road, in which gullies and traced drains only are included. In the case of Glendale-gardens and Western-road a number of cross roads account for the increase cost.

The council have been successful in upholding its specification before the magistrates, having been able successfully to show and prove that the cost of making up the carriageways under the system can be carried out at practically the same cost as the previously adopted specification of 3-in. ordinary granite macadam, 3-in. flints and 9-in. metalling. In the case of Glendale-gardens there was a difference of only £50 in a £3,000 contract between the two methods of construction. In all cases alternative tenders have been asked for.

The materials used for the foundation are Thames ballast and best standard Portland cement, the proportions of 9 to 1 and 8 to 1 having been adopted and found to give good results. The subsoil in the district being for the most part heavy, stiff clay, every care is exercised to obtain a good substratum before laying the concrete, the surface excavated to contour being well and solidly rolled throughout with 8 to 10 ton steam rollers before commencing to lay the concrete. By this means it is assured that all gas, water and sewer trenches are properly solidified. The concrete is then laid to the required camber and is allowed three weeks to set before placing the top tar-tarred macadam or bituminous-grouted granite finished surface.

The advantages of adopting this class of construction over the ordinary macadam are:—

(1) Less excavation necessitated.

(2) Substrata kept in good condition, free from excessive moisture, frost in winter, and excessive heat in summer. (Considerable movement takes place in heavy clay soils under these varying conditions.)

(3) No possibility of clay substrata working up to surface through the foundations, to be cleared from the road by scavengers in the shape of mud.

(4) Foundation maintains regular shape under varying traffic conditions.

(5) Tar-macadam and bituminous surface materials form a cushion which prevents undue shock to foundations, being suitable for motor van and car traffic.

(6) Adequate adhesion takes place between the concrete and surfacing, the concrete is roughed or rubbed to prevent slip and form a key.

(7) On roads with fairly heavy gradients bituminous-granite macadam is preferable to tar-macadam, as a rougher surface can be produced, giving the necessary foothold. On more level roads tar-macadam, being brought to smoother surface, has an advantage in enabling water to get off more quickly.

(8) By the use of tar-macadam or bituminous-granite surfaces, the objectionable tar-painting process is in the main dispensed with, although a tar coat, even on tar-macadam surfaces, will be found beneficial every three or four years, although not absolutely essential.

(9) Reduction in scavenging and watering.

In view of the fact that concrete foundations and tar-macadam or bituminous-grout surfaces can be carried out at a cost no greater than the cost usually incurred in forming road with hard-core foundations and the ordinary macadam surface, there is absolutely no reason why this method of construction should not be more generally adopted. In the case of roads required to bear heavy traffic, an asphalt surface under suitable conditions might be adopted in lieu of tar-macadam. The principle of adopting concrete foundations in lieu of the Telford or broken-stone methods of construction has been proved practicable in respect of private street works carried out in this district, it has been found sound in principle and practice, and in view of the elastic wearing surface afforded by the use of bituminous materials with increased life and less upkeep charges than ordinary macadam, one looks for a more general adoption of this method of construction in the future, both in regard to private streets and in connection with our main county roads, which latter are so sadly lacking in many cases of the first essential of construction—*viz.*, a solid, firm and non-porous foundation.

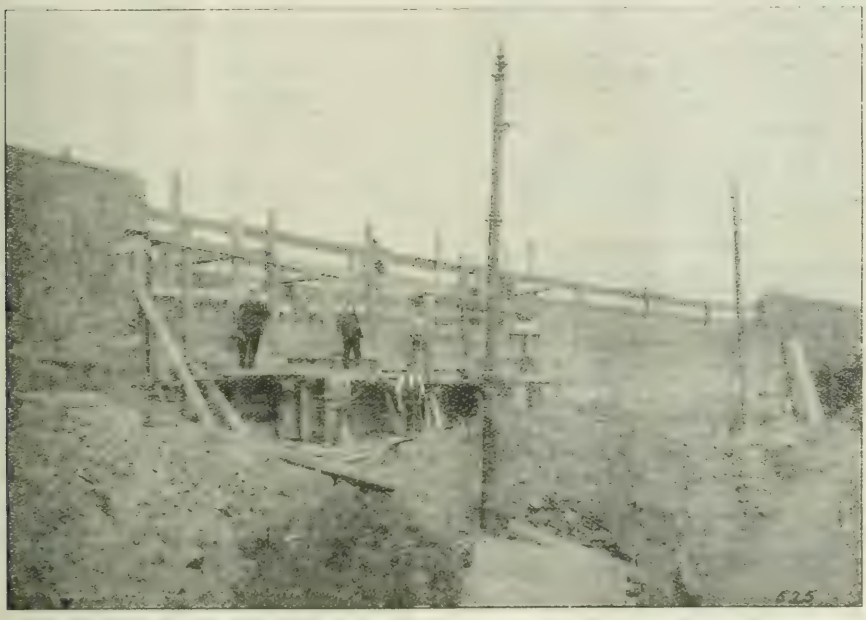
Swimming Bath Water.—Lancaster Town Council have negatived a proposal to instal a filtration and aeration plant at the corporation swimming baths. Which it was generally agreed that the scheme, the cost of which was estimated at about £1,000 was a good one, it was decided that the present was not an opportune time to proceed with the work.

REINFORCED CONCRETE RETAINING WALL AT BASFORD, STAFFS.

An existing retaining wall, separating Etruria-road, Basford, Staffs, on the high level, from the low-level road, showing signs of failure in places, it was recently decided by the borough engineer of Stoke-on-Trent, Mr. A. Burton, ASSOC.M.INST.C.E., to substitute a reinforced-concrete retaining wall. As considerable improvements are to be effected in this locality in the future, the new reinforced-concrete wall was designed to carry all the pressure that was ever likely to come upon it, and that part of the wall shown under construction in the illustration attains a maximum height of 20 ft. above future ground level.

It was essential that the high-level road should be interfered with as little as possible. Buttresses were, therefore, out of the question, and a cantilever wall was adopted with a base projecting under the low-level road, about 2 ft. beneath future road level.

The design and drawings were prepared by the



Retaining Wall at Basford, Staffs.

Indented Bar Company, Queen Anne's Chambers, Westminster, S.W., for Mr. Burton, and the contractors were Messrs. F. Barke & Son, Stoke-on-Trent.

Edinburgh Tramways.—A recommendation of the Tramways Committee of the Edinburgh Town Council in favour of municipalising the tramway service upon the expiry of the present company's lease has been agreed to.

Runcorn's Hard Water.—Runcorn's water supply is considered among the hardest in England, and some time ago it was decided to mix it in equal proportions with Liverpool Corporation water. Recently, owing to a breakdown of the engine, an unmixed Vyrnwy supply was used for several weeks. At this week's meeting of the council Mr. Pringle moved that Runcorn should take its water supply from Liverpool. It would mean 6d. in the £ on the rates, he said, but people demanded it, saying that they would save the money in soap alone. Mr. Gibbs said that the council had recently put electric pumping plant at the waterworks, which would be rendered useless under the proposal. Mr. Pritchard reminded the council that £70,000 was spent in purchasing the Runcorn waterworks in 1895, and that the ratepayers would have to provide £2,700 a year for 40 years yet in interest and principal. Finally it was decided to continue the use of mixed water.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top, left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

276. Roof Design.—It is found necessary in designing the steel trusses for a roof to adopt some system of wind bracing. Explain in detail how the cross-sectional area of the wind ties is determined. (H. F. W., *Tottenham.*)

283. Strength of Materials.—What is meant by the following terms: (*a*) Modulus of elasticity, (*b*) elastic limit, (*c*) permanent set, (*d*) plastic elongation, (*e*) ultimate elongation, (*f*) contraction of area? ("Inquirer.")

284. Wood Paving.—What are the comparative advantages and disadvantages of soft and hard wood for street paving? ("Suburban.")

285. Building Construction.—Explain, with sketches where necessary, the meaning of the following terms: (*a*) Larrying, (*b*) pugging, (*c*) gib and cotter joint, (*d*) lead soakers. ("Pupil.")

286. Hydraulics.—A hemispherical cistern is 20 ft. in diameter, and it is full of water. How long will it take to lower the depth of the water 5 ft., if the water escapes through a 3-in. diameter sharp-edged hole in the bottom of the cistern? The coefficient of discharge for the hole is 0·60. (H. V. O., *West Bromwich.*)

REPLIES TO QUESTIONS.

281. Surveying.—Upon what trigonometrical rule does triangulation depend? Prove that the sides of a triangle are proportional to the sines of the angles opposite to them.

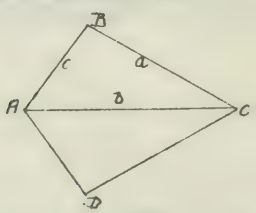
Answer (*a*).—Triangulation depends upon the fact that the sides of a triangle are proportionate to the angles opposite to them, and that the relationship between any side and the angle opposite to it is the same, no matter which side of the same triangle be taken.

This can be expressed in the following manner:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

where a, b and c represent the lengths of the sides opposite to the angles at A, B and C.

Application.—Let A B C D E be part of a triangulation survey. Suppose the length B C be known.



Measure the angles A B C and C A B with a theodolite. Then, by applying the formula

$$\frac{a}{\sin A} = \frac{b}{\sin B}$$

$$b = \frac{a \times \sin B}{\sin A} = a \times \sin B \times \operatorname{cosec} A.$$

This gives the length of A C.

Measure the angles C D A and D A C; then, by applying the above formula again, the length of D C is obtained.

NOTE.—Before proceeding with these calculations, the student should read all three angles of the triangle, and test his work by totalling them to see how near his readings are to 180°.

The lengths of the sides A B and D A may be found in like manner.

Example.—To find the lengths of A B and A C, having given the length of B C as 804 links, and the angles A B C = 97° 50′, B C A = 30° 24′, C A B = 51° 46′,

$$\frac{a}{\sin A} = \frac{b}{\sin B}$$

$$\therefore b = \frac{a \times \sin B}{\sin A}$$

$$= a \times \sin B \times \operatorname{cosec} A$$

$$= 804 \times \sin 97° 50' \times \operatorname{cosec} 51° 46'$$

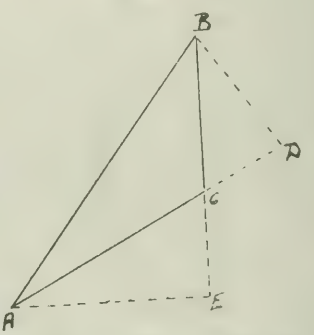
log 804 =	2·9052560
L sin 97° 50′ =	9·9959284
L cosec 51° 46′ =	10·1048555
log 1014 =	3·0060399

Similarly $c = a \times \sin C \times \operatorname{cosec} A$

log 804 =	2·9052560
L sin 30° 24′ =	9·7041795
L cosec 51° 46′ =	10·1048555
log 518 =	2·714291

Answer (*b*).—

In Δ A B C $\sin A = \frac{BD}{AB}$ or $\frac{p}{b}$



$$BC \text{ or } a = BD \times \operatorname{cosec} BCD = \operatorname{cosec} BCA \times BD$$

$$\therefore \frac{a}{\sin A} = \frac{BD \times \operatorname{cosec} BCA}{\frac{BD}{AB}}$$

$$= \frac{BD \times \operatorname{cosec} BCA \times AB}{BD}$$

$$= AB \times \operatorname{cosec} BCA$$

Again consider $\frac{b}{\sin B}$

$$b = AE \times \operatorname{cosec} ACB$$

$$\sin B = \frac{AE}{AB}$$

$$\therefore \frac{b}{\sin B} = \frac{AE \times \operatorname{cosec} ACB \times AB}{AE}$$

$$= AB \times \operatorname{cosec} ACB$$

$$\text{and } \frac{a}{\sin A} = AB \times \operatorname{cosec} ACB$$

$$\text{likewise } \frac{c}{\sin C} = AB \times \operatorname{cosec} ACB.$$

Hence the sides of a Δ are proportional to the angles opposite to them, for the relationship may be expressed by the equation

$$\frac{a}{\sin A} \quad \frac{b}{\sin B} \quad \frac{c}{\sin C} = AB \times \operatorname{cosec} ACB$$

282. Hydraulics.—Explain simply what is meant by the "hydraulic gradient" of a pipe, and how this may be obtained in any given case. ("Pupil.")

The hydraulic gradient or virtual slope of a pipe is the *loss of head per unit length* of the pipe.

The Surveyor

And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
Appointments Vacant	656
Assistants' and Students' Section	644
Cape Town Municipal Work	640
Concrete Foundations for Carriageways with Tar-Macadam and Bitumen-bound Macadam Wearing Surfaces	630, 642
Construction of Surfaces with Bituminous Materials	637
Construction of Workmen's Dwellings	647
Correspondence	645
Design and Construction of Masonry Dams	632
Institution of Civil Engineers	631, 636
Institution of Municipal and County Engineers: Notices	655
Institution of Municipal Engineers: Notices	656
Law Notes	646
Local Government Board Inquiries	648
London County Council Engineership	639
Lower Thames Valley District Surveyors' Association	655
Meetings	659
Mixing Cement with Bitumen	645
Municipal Competitions Open	657
Municipal Contracts Open	657
Municipal Work at Godalming	635
Municipal Work at Sheffield	653
Municipal Work in Progress and Projected	650
Personal	651
Recent Publications	653
Reinforced Concrete Retaining Wall at Basford, Staffs	643
Royal Institute of British Architects	631, 654
Royal Sanitary Institute: Notice	656
Spalding Housing Scheme	655
Storm Water Sewage Disposal at Leicester	641
Tenders for Municipal Works or Supplies	659
"The Surveyor" Special Issues	631
Training of Sanitary Engineers	630, 639
Traders and the Road Congress and Exhibition	631
Waterproof Concrete and Mortar	629, 640
What is a Garden City?	645

That is, if between two sections of the pipe, l ft. apart, the difference of head is h ft.

Thus $\frac{h}{l}$ is the hydraulic gradient between the two sections.

The difference in head between two sections of a pipe may be determined (*a*) practically or (*b*) by calculation.

(*a*) Pressure tubes or piezometers are inserted at the sections, and the difference in level of the water in the tubes gives the loss of head in that length of the pipe.

(*b*) The most important loss of head is that due to friction, which, in a pipe of uniform cross-section, is constant. The loss of head due to friction may be calculated by

$$\text{H loss} = f \cdot \frac{l}{m} \times \frac{v^2}{2g}$$

where f = an experimental friction coefficient, usually between ·005 and ·006.

m = hydraulic mean radius of pipe.

v = velocity of flow.

In long pipes only the loss due to friction need be considered, but stop valves, bends and changes in diameter of the pipe cause loss of head.

Having found the loss of head between the sections, the hydraulic gradient may be found as above by—

$$\text{Hydraulic gradient} = \frac{h \text{ loss}}{l}.$$

(H. V. O., *West Bromwich.*)

SEA-COAST EROSION.—For a very complete and inexpensive library on the cause, prevention and repair of coast erosion the following three works are recommended: "Coast Erosion and Foreshore Protection," by John S. Owens, M.D., Assoc.M.Inst.C.E., F.R.C.S., and Gerald O. Case (price 7s. 6d., post free 7s. 10d.), with numerous illustrations and diagrams; "Sea-Coast Erosion and Remedial Works," by R. C. Allanson-Winn, M.Inst.C.E.I. (price 1s., post free 1s. 1d.); and "Erosion of the Coast and its Prevention," by F. W. S. Stanton, Assoc.M.Inst.C.E., F.S.I. (price 3s., post free 3s. 2d.), with numerous maps and other illustrations. The publishers are the St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, London, E.C.

CORRESPONDENCE.

"Be calm in arguing; for fierceness makes
Error a fault and truth discourtesie."
— GEO. HERBERT, "*The Temple.*"

WHAT IS A GARDEN CITY?

To the Editor of THE SURVEYOR.

SIR, I am reluctant to trespass further on your space, but as Mr. Price has challenged my definition of a garden city perhaps you will allow me briefly to reply.

Mr. Price is only quibbling when he talks about 5 per cent return proving speculation. He uses these words, "These schemes are essentially promoted by building speculators;" and without wasting a column I say this is not so.

As your columns bore witness only recently, many schemes are being dubbed "garden city" which have no claim whatever to the name, except an attempt to delude the public, but it is no more just to blame the movement for this than it is to blame the medical profession for the quackeries of a charlatan.

The primary object of the garden city scheme is to stem the tide of population townwards, and to get the people back to the land under conditions where they may live in reasonably rented houses, and where their work may be close to hand. Can it be said that the men and women who are trying to do this are building speculators?

Mr. Price has entirely mixed up the garden city movement with other things. In his last letter he said he has "visited a number of garden cities." Well, there is only one in the world. And he quotes as "a leader of this movement" a gentleman whom every student of housing and town planning will always hold in the highest esteem, but who never was and who never posed as a leader of the garden city movement. No wonder, then, that if he has confused his subjects his deductions are erroneous.

He is very funny when he describes the drunken-looking posts and wire suffering from a nervous breakdown, but even if this were true the method employed by any particular architect or engineer does not affect the principles of the movement, which are in the main sociological, and which, although they have influenced to a considerable extent the adoption of town planning—altogether a different matter—cannot in any way come under the description of building speculation or jerry road making.

I do not need to be reminded that there is speculation in every enterprise, and that there are building speculators and building speculators. The term has its defined meaning, and as used by Mr. Price is an unworthy reflection upon the entirely disinterested motives of a band of men and women who have devoted their time and, in many instances, their substance in an endeavour to solve one of the most pressing problems of our modern civilisation.—Yours, &c.,

EWART G. CULPIN,
Secretary, Garden Cities and Town Planning Association.

3 Gray's Inn-place,
Gray's Inn, London, W.C.
November 5, 1912.

MIXING CEMENT WITH "BITUMEN."

To the Editor of THE SURVEYOR.

SIR,—While repudiating Mr. W. J. Howard-Smith's statement that I am engaged in "bitumen manufacture," I quite agree with his remarks that a proper classification of the various bituminous materials at present being used as binders in road construction is highly desirable, in evidence of which I refer him to the following articles from my pen which recently appeared in your journal—*viz.*, "What is Asphalt?" March 8, 1912, p. 404; "Asphalt-Macadam," July 19, 1912, p. 108.

If Mr. W. J. Howard-Smith is still desirous of learning why a percentage of cement is employed in the manufacture of asphaltic paving mixtures, he may do so, at the small cost of 8d., by obtaining a copy of my Patent Specification, No. 23064/1910.—Yours, &c.,

CECIL NATHAN.

3 London Wall Buildings,
London, E.C.
November 4, 1912.

Law Notes.

Edited by J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, one side only) should be addressed to "The Law Editor," at the office of The Surveyor, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used

Private Street Works Act, 1892. Objection to Final Apportionments: Disputed Ownership. "A.S.L." writes: A new street was laid out by an estate owner in the form of bottom foundation, and partly metalled for one portion of its length in the year 1907, and the remaining portion of the street was similarly constructed by the estate owner in the year 1908. The estate owner then leased the land abutting upon the street in building plots, and houses were erected on both sides thereof. The plans for enforcing the provisions of the Private Street Works Act of 1892 were prepared early in the year 1910, but they were not approved of by the council until June of 1911, eighteen months having thus elapsed before the service of provisional apportionments. When preparing the specification of the works the surveyor provided what, in his opinion at the time, and as far as could be gathered from superficial inspection, would have been sufficient to put the street into proper order, but in carrying out the work two years after preparation of plans, &c., it was found that, owing to excessive haulage from the estate quarry, and in consequence of building developments, the foundation of the carriageway had become defective, waterlogged, and out of level, and it was necessary partially to reconstruct it. This work, not being provided for in the estimate, was ordered to be carried out by resolution of the council after an inspection visit, while the preliminary works were in progress. The contractor having been ordered partially to reconstruct the carriageway, this necessitated an extra amount on the contract, which was afterwards apportioned against the respective frontagers. After the works had been completed the surveyor prepared his final apportionment under sec. 8 of the Act, and notices of such apportionments were duly served upon the respective frontagers, the apportionment being based on frontage, as in the case of the provisional apportionments. Within the month allowed under sec. 8 of the Act some of the owners have lodged objections on the grounds that there has been an unreasonable departure from the specification, plans and sections, and that the actual expenses have without sufficient reason exceeded the estimated expenses by more than 15 per cent. The questions are: (1) Can the extra work carried out—namely, partial reconstruction of the foundation of the carriageway—be termed an unreasonable departure from the specification and plans, having in view the time that elapsed between the preparation of the necessary plans, estimates, &c., and the execution of the street works, inasmuch as the true condition of the street could only be disclosed when the street works were actually in progress? (2) Having regard to the above facts, can the council show that there was sufficient reason for the extra cost incurred, and thereby recover from the frontagers the amount apportioned against them, which, in some cases, is over and above the 15 per cent allowed by the Act? (3) Can extra work of this nature, additional to the contract be charged against the frontagers, or can it be held to be an unreasonable departure from the specification? The object of the extra work was for the proper completion of the street, inasmuch as its true condition was only apparent when the works were in progress. (4) Kindly quote cases (if any) bearing on the question of departure from specification. In connection with the above street works a further question arises, namely, leading off the street in question there is a lane 15 ft. in width, which forms the only means of access to some stable premises at the rear of the houses fronting and abutting upon the said street. The frontage of the lane abutting upon the street was included in the provisional apportionment prepared by the surveyor, and described by him as a "private lane." The provisional apportionment was duly served upon the owner of the stable premises, inasmuch as he was believed to be the owner of the private lane, he having from time to time repaired the said lane; and although he lodged an objection to the council's proposals, being an owner of other property abutting upon the street, he never disputed the question of the ownership of the private lane. He, however, subsequently withdrew his objection to the works. Just before the expiration of the month allowed for objections to the final apportionment, the apportionment notice in respect of the lane frontage was returned by his solicitor repudiating ownership of the private lane, and thus the liability for the apportionment of the crossing. The questions are: (5) Inasmuch as the person served with the provisional apportionment in respect of the lane frontage did not raise the question of ownership at the proper time, that is to say, within one month allowed for objections, is he not now prevented from raising this question? Sec. 8, sub-sec. 2 states: "No objection which could be made under this Act shall be otherwise made or allowed in any court proceeding or manner whatsoever." (See *Woodford Urban District Council* v. *Henwood*, 64 J.P., 1900; *Wirral Rural District Council* v. *Carter*, 1903; *Wallasey Urban District Council* v. *Walker & Co.*, 1906.) (6) If you are of the opinion the person already served can sustain an objection to the ownership of the lane at this juncture, can the council recover the apportionment from the supposed owner, and, if so, under what section can such recovery be made? (7) Is the fact of returning the final apportionment with an accompanying letter pointing out that the person served is not the owner a valid objection under sec. 12 (2) of the Act? If not, what is the procedure for recovery of the amount claimed, as the council cannot dispose of the lane in the manner provided by the Act? (8) Please quote cases in support.

(1) Assuming that the additional works were essential to the effectual making up of the street, the departure from the specification would not appear to have been unreasonable. (2) Upon the same assumption the council could, I think, make out a good *prima facie* case. (3) No general rule can be laid down. The question whether the departure from the specification was reasonable or unreasonable would have to be decided by the magistrates upon a consideration of all the circumstances. (4) I do not know of any reported cases on this point. (5) Having regard to the decisions in *Woodford Urban District Council* v. *Henwood*, and *Wallasey Urban District Council* v. *Walker & Co.*, the person served not having objected within the time allowed by sec. 7, it would appear that he is now precluded from doing so. *Wirral Rural District Council* v. *Carter* shows that service on a reputed owner will not entitle the authority to recover from the real owner, but apparently they can recover from a reputed owner who has been served and has failed to object. (6) See reply to No. 5. (7) In my opinion it is not sufficient. The council can recover either by summary proceedings before the magistrates or by action. (8) I am not aware of any further cases in point.

Auctions on Private Land.—"S.V.R." writes: Will you please state what is the position, and if an adjoining owner could successfully apply for the injunction from facts stated hereafter, and if there are any test cases upon similar points? A firm of auctioneers recently purchased a plot of land immediately fronting a street or road which has two entrances communicating with main roads. A ratepayer who is the owner of adjoining property has written through his solicitor a letter to the auctioneers stating that if the ground is converted into a private sale ground and auctions are held there, it is his intention to apply for an injunction to restrain them from selling, on the grounds of the noise caused. This ground has for years past been used about four times a year for the large fair sales. There is no public market provided, but the council have powers under a special charter granted in the reign of Queen Elizabeth to compel any auction to be held in the streets. They have, through their clerk, written in this instance saying they do not intend to take any action in the matter. Can any ratepayer or owner of adjoining property object?

Unless there is anything in the charter giving private individuals power to enforce the provisions as to auctions, any person applying for an injunction in order to succeed, would have to prove that the auctions were a nuisance. Injunctions have been granted to restrain nuisances from noise caused by a peal of bells, by building operations at night, by the vibration of machinery, fireworks, a circus, merry-go-rounds, a rifle gallery, Sunday horse-racing, collecting disorderly crowds, &c. But I can find no instance of an injunction to restrain sales by auction. In considering cases of nuisance from noise, the Court has regard to the character of the neighbourhood, and the matter is emphatically a question of degree.

THE CONSTRUCTION OF WORKMEN'S DWELLINGS.

SCOTTISH LOCAL GOVERNMENT BOARD MEMORANDUM.

The Local Government Board for Scotland have had under consideration the principles which should be observed in the construction of houses for the working classes, and in a memorandum issued on Tuesday have summarised their views upon the more important of these principles so far as they are applicable to the erection of cottages or two-storey houses (whether semi-detached or in rows), with separate dwellings on each floor.

It is suggested that in designing such houses the first consideration should be that they meet the reasonable needs of the class of persons whom it is proposed to accommodate; and, while it is desirable that simplicity of design and economy in construction and general arrangements should be aimed at, houses erected by a local authority ought generally to be such as will be a model or standard for houses for the working classes which may be erected by private persons. Moreover, if a local authority propose to borrow money to defray the cost of the erection of houses, the board, in fixing the period for the repayment of the loan, could not allow the maximum period adopted by them for this purpose, namely, sixty years—unless the houses were to be built substantially. As a general rule, therefore, the standard of construction should, in the board's opinion, be such that, with only a moderate annual outlay for repairs, the houses should be capable of being maintained in a state in all respects fit for human habitation for a period of sixty years.

Special circumstances may exist in some cases rendering it desirable for the local authority to construct houses of a less permanent character, and to repay the loan in a much shorter period than sixty years. The saving effected in such a case in the cost of the erection might be such that a loan for the shorter period would not involve a larger annual outlay in respect of loan charges than if the houses had been constructed more substantially, and a loan for the greater cost of construction obtained for the full period of sixty years. In considering this point it was to be borne in mind that, taking interest at 3½ per cent, an annuity of £6 0s. 4d. would repay a loan of £150 in sixty years, £144 in fifty years, £128 in forty years, or £110 in thirty years.

As a general rule experience showed that houses suitable for the accommodation of persons of the better paid working-class community who could afford to pay a rent which would provide a fair return on the capital employed) were more likely to be provided by private enterprise than houses at low rents which were necessary for the accommodation of the poorer classes. It would therefore frequently be the case that the efforts of the local authority would be directed mainly to the provision of houses of the latter class.

The types of houses that might perhaps be regarded as the most suitable in ordinary circumstances for buildings on new sites were: (1) Cottages, either semi-detached or in rows, and (2) two-storey houses, either semi-detached or in rows, with separate dwellings on each floor.

ARRANGEMENT OF BUILDINGS.

The arrangement of houses on the site and, to some extent, the design of the houses would depend upon the size, situation and character of the land, but the site should be so utilised as to secure ample open space in connection with the houses and the best possible aspect for the living-rooms. Overcrowding of houses on a site should be avoided, and care must, of course, be taken to comply with any town planning requirements, by-laws, or other local provisions in force in regard to new streets or open spaces in connection with buildings.

On the question of the number of houses to be erected on a site, the local authority would doubtless consider it necessary to have regard to the cost of the site and the extent to which street works would be necessary; but it would be well to bear in mind that the annual charges in respect of a loan for the land, spread over the maximum period of eighty years, would in most cases constitute a comparatively small proportion of the total annual cost of providing the houses. On the basis of ten houses to the acre, and land at £100 per acre, the loan charges per house for land purchase would be less than 2d. a week. If the land cost £500 per acre the loan charges per house would be less than 9d. a week.

Where the houses were built in rows, it was desirable that they should be set back from the street line, so as to allow small gardens or forecourts to intervene between the houses and the street. It was undesirable that long rows of houses without a break should be constructed, and as a rule the number of houses in a continuous row should not exceed eight to ten. Long rows were open to objection, not only because overcrowding of houses on the site might be the result, but also because they gave a monotonous and depressing appearance and prevented easy intercommunication between streets. It was advisable where cottages were erected in rows to have the gardens placed back to back, without any back street intervening, except in cases where there were no water-closets, or daily removal of household refuse. In the case of houses of more than one storey the system of entering from balconies had many advantages, provided that these were so arranged as not to interfere with the lighting of the rooms.

In areas where land was less costly the dwellings would with advantage be built in pairs or singly, so as to secure better light and ventilation and larger gardens. Larger ground areas and frontage would, as a rule, be more often possible in rural areas than in urban areas, and where large gardens were provided and a slightly increased rent was charged the tenants should be able to secure some return in the form of garden produce, &c.

Where the statutes and by-laws admitted, it might be desirable to consider other arrangements of streets and buildings which might reduce the expenditure on land and on street construction, &c. (1) The formation of groups of houses on back land, access to the houses being either from comparatively narrow streets if the houses were set well back in the street line and if the streets were not intended or likely to become important thoroughfares, or from streets of full width, of which portions might be turfed or planted with trees; and (2) the grouping of a number of houses round an open space which would serve as a recreation ground for the occupants of the houses (sec. 11 of the Housing of the Working Classes Act, 1903).

In the laying out and development of sites for building, the execution of the necessary street works was frequently a source of heavy expense, and there was a tendency, especially where the streets were wide and of costly construction, to make the greatest use of the frontage. As a result, houses were sometimes built with an unduly narrow frontage, the necessary internal space being obtained by making the houses deep from front to back, or with projections at the back. These methods of construction interfered with the due access of light and air to the rooms, and in order to avoid these objections the frontages should not be unduly restricted.

ACCOMMODATION.

Although the actual arrangement of rooms might not lend itself to any great variety of planning, the dimensions of the rooms, and the arrangement of doors, windows, fireplaces, &c., needed careful attention, and some suggestions in regard to these matters are made in the memorandum.

The opinion is expressed that houses for the poorer working classes should contain at least a kitchen, a bed-room, a scullery, a large press for food, a water-closet, and a coal cellar. In such a house the ordinary necessities would be met by the following arrangement:—

Kitchen.—This was the living-room used by all the family in common, and ought to be as large and commodious as possible. It should contain a large press for food, ventilated from the outside, and a range with a boiler for hot-water supply.

Scullery.—The scullery should have a washing boiler and a sink.

Bed-rooms.—A bed-room should be as large and airy as practicable, and should be provided with a fireplace. The door, window and fireplace should be arranged so as to secure convenient space for bed and furniture, and to insure the freest circulation of air. If the bed-room is at the front of the house, a passage should be formed alongside for direct access from the front entrance to the kitchen. In this way the bed-room will not be used as a passage-room.

Height of Rooms.—Sec. 172 of the Burgh Police (Scotland) Act, 1892, provided that in new houses the height of rooms on the ground floor should be at least 9 ft. 6 in., and on the other floors, except attics, at least 9 ft. For working-class houses these heights might be considered too liberal, and burghal local authorities might with advantage consider the discretionary powers afforded by sec. 39 of the Burgh

Police (Scotland) Act, 1903, to secure a relaxation of these requirements. The advantage of such a relaxation would be either a reduction in the cost of the building or, as was frequently more desirable, an increase in floor space.

Water-closet Accommodation.—Water-closet accommodation should be provided for each house, and the entrance to it should be preferably from the inside of the house.

Bath.—Where practicable, the water-closet apartment should be made large enough to accommodate a bath.

Coal Cellar.—A coal cellar should be provided either inside or outside the house.

Windows.—Sec. 173 of the Burgh Police (Scotland) Act, 1892, provided that the window area of each room shall be not less than one-tenth of the floor area of the room unless in any case the town council otherwise determine. The windows should be made to open at top and bottom, and should be placed not more than 12 in. from the ceiling, in order that the upper as well as the lower portion of the room might be ventilated. At the same time windows should be sufficiently low to enable children to see out of them.

MATERIALS.

The materials of which the houses should be constructed would vary according to the locality. Brickwork, covered externally with harling or cement, was an economical form of construction. A cheap wall could be formed of two 4½-in. bricks, with a 2½-in. space between, and tied together with iron cramps at intervals. The outside face of the wall should be harled, and the inside face of the wall plastered directly on the brick.

The floors of kitchens and bed-rooms should be constructed of wood flooring—those of sculleries and outbuildings being of concrete finished in cement. Strongly framed and lined doors were preferable to panelled doors of inferior quality.

The memorandum adds that in order that the cost of construction might be reduced as much as possible special attention should be paid to arrangement of planning, detail of construction, and type of fittings, in order that these might be standardised for the whole scheme.

The board intimate that they are prepared to allow the maximum period of repayment only in the case of land; for houses, sixty years might be regarded as the maximum period to which consent would be given. In a further note, the board impress on local authorities the importance and value of effective management of their houses and tenants. Experience showed that this management should be retained in the local authority's own hands, and should be undertaken by a capable officer whose status and powers would secure from the tenants more regard than is given to private factors.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

India Office Appointment.—An assistant sanitary engineer is required for service under the Government of Bengal, on a five years' engagement. Candidates must be between twenty-five and thirty-two years of age, and should have a good engineering degree or should have passed the A.M.I.C.E. examination. They should also have worked on some sanitary engineering works under a first-class firm of specialists in that line for not less than five years, of which at least three should have been spent in supervising the actual construction of water or sewage works. The salary offered is Rs. 500 a month, rising by annual increments of Rs. 50 to Rs. 700, with travelling allowance and for a married board house rent allowance. Forms of application can be obtained from the Secretary, Revenue Department, India Office, Whitehall. Applications should be submitted to that address not later than December 1st.

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Ltd. Price 10s. 6d.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Exmouth U.D.C. (October 24th. Mr. A. G. Drury).—£8,500 for the purpose of constructing a marine-drive across the Maer and the building of a retaining wall.—The surveyor, Mr. S. Hutton, stated that the works for which the loan was asked were a marine-drive 65 ft. wide: (1) Across the Maer, with certain defence works, from the Coastguard Station to the end of the Queen's-path, 780 yds. in length; (2) a continuation under the cliffs, inside certain sea-defence works, to be carried out by Lord Clinton, 910 yds. long, giving a total length of 1,690 yds. The question of a continuation of the Esplanade as a carriage drive across the Maer had been before the council for many years. Considerable falls of the cliffs had, during the past four years, materially injured the cliff paths, and the council, anxious to retain the walks, appealed to Lord Clinton to consider the defence of the cliffs. His lordship, after due consideration, adopted the proposals of his engineer, and decided to build a sea-wall at the foot of the cliffs, some 970 yds. in length, at a cost of about £10,000, but, at the suggestion of the council, decided to place the sea-wall in such a position that a marine-drive could be constructed, subject to the conditions of the agreement.

Manchester T.C. (November 1st. Mr. T. C. Ekin).—£87,160 for purposes of the electrical undertaking. £30 630 for works of private street improvement, and £3,985 for tank extensions at the Withington sewage disposal works, Chorlton-cum-Hardy.—The deputy town clerk, Mr. P. M. Heath, stated that the chief expenditure now proposed was £68,820 for new plant at the Stuart-street station, which would complete the installation at that station, and enable the corporation to meet demands for the next three years. Then £2,640 was required for plant at the Dickinson-street station, £10,700 for plant at the other distributing stations, and £5 000 for hired motors. In the course of the inquiry the inspector said that from figures put in the undertaking had made a total profit so far of £523,281 and had paid £125,981 in aid of rates. There was no opposition with respect to the other applications.

Portsmouth T.C. (October 29th. Mr. R. H. Bicknell).—£8,000 for the purpose of the provision of a salt-water supply for street watering and sewer flushing in the northern part of the borough.—The borough engineer, Mr. A. W. Ward, stated that the scheme included the construction of a tank and an engine-house, on land now held by the corporation at Stamshaw. The water could be pumped either from the harbour or the bathing pond. The pond was filled by gravitation from the sea at high tide, and provision was made for pumping if the pond should be empty, so that there would be no difficulty in ensuring an adequate supply at all times. The tank would be depended on if the pond should be empty. Mr. Bicknell observed that he was not very sweet on a ferro-concrete tank for sea water, and suggested the possibility of the sea water affecting the steel rods in the walls. A representative from the contractors explained that the same method had been successfully applied to other sea works at Dover and elsewhere, and at Manchester there was a tank on the same principle with capacity for 300,000 gallons. In many other places there were similar tanks, and there was no fear of salt water affecting the concrete or the steel.

Prudhoe U.D.C. (October 22nd. Mr. Courtenay Clifton).—£1,527 for the purchase of land and buildings for council offices and the provision of a recreation ground. It was stated that at the present time the council were without any building or offices of their own. The surveyor's offices were in the rooms of the local co-operative society, and at certain periods in the quarter, when the society were paying out dividends, Mr. Burnie had to conduct his work in a smaller and more inconvenient room. He had no books or plans in his private house or to carry out his work in private. The council were also without any place to store their materials, and the tools and materials were scattered all over the district, which was a wide one. The council had purchased a fire engine, which was still at Messrs. Merryweather's, who were awaiting instructions to deliver, but as yet the council had no place to house it.

Ramsbottom U.D.C. (October 22nd. Mr. M. K. North). £4,300 for the purpose of erecting a refuse destructor and steam disinfector on the site in Stubbins-lane; and the sum of £1,280 for the purpose of sewerage works at Holcombe Old-road, Crow Wood and Pinfold, and Dearden Clough, three outlying portions of the district.—The surveyor, Mr. T. H. Bell, told the inspector that the estimate for the construction of the destructor was £3,775, and that was based upon the provisional contract they had entered into with Messrs. Dawson & Mansfield, whose tender had been accepted after careful consideration. There were several costs in addition to that, however, such as the construction of the approach road. At the present time they disposed of the refuse at five tips, situated in isolated parts of the district.

Southport T.C. (October 30th. Mr. F. H. Tulloch).—£8,500 for the further extension of the South Marine Park.—It was stated that the area was 5 acres, and the tender which was accepted was £6,895. Questions were asked whether the work was to be done by local labour, including the unemployed, and the reply was in the negative, but an assurance, it was stated, had been received from the contractor that local labour will be employed as far as possible. It was also stated that the previous scheme for extending the Marine Garden was delayed twelve months, and cost £1,300 extra, owing to the fact that unskilled labour and numbers of unemployed were engaged on the work.

Stockport T.C. (October 30th. F. O. Stanford).—£38,550 for the purposes of the gas undertaking and £5,024 for the purchase of land in Hempshaw-lane to provide a site for a new school, recreation ground, playing fields and a dry refuse tip.—It was explained that it was proposed to enlarge the condensing plant and put in new gas-tar extractors and an ammonia washing plant at the gasworks, and spend £24,000 on new mains, services and gas meters. It was also proposed to purchase 32 acres of land, and use 6 acres of it as a site for a new school, to take the place of the existing Banks-lane school, and a playing field for the school, and the remainder for a recreation ground and playing fields. The dry refuse tip would eventually form a new road.

Stoke-on-Trent T.C. (October 29th. Mr. T. C. Ekin). —£17,196 for the purposes of their electricity works.—The town clerk, Mr. E. B. Sharpley, stated that the loan for which sanction was asked was for sums which had been spent on the electricity undertakings in excess of sanction to March 31st last. A further application would be made also, with the inspector's permission, to borrow £10,000 for prospective expenditure, of which £7,000 was for extensions to mains and £3,000 for transformers and sub-stations. The Electricity Committee were constantly spending considerable sums on mains, sometimes amounting to £1,000 a month, and they understood the board would not be against a prospective sanction. The inspector examined the financial position of the four branches of the undertaking and visited the works.

Ulverston U.D.C. (October 8th. Mr. A. W. Brightmore).—£3,000 for the erection, as a Coronation memorial, of a public hall, estimated to cost £6,000, including the proposed site on the Wytarn estate.—Mr. F. W. Poole, clerk to the council, stated that of the £3,000 to be raised voluntarily £1,000 had been generously promised by Messrs. Kennedy Brothers, bringing the total amount already subscribed or promised to £2,600. It was considered there would be no difficulty in raising the balance needed. A poll of the ratepayers showed that 615 had voted for and 268 against. Mr. J. Y. Schofield and Councillor J. Mount opposed the application, and the inspector then heard the evidence of the supporters of the scheme.

Wellingborough U.D.C. (October 19th. Mr. F. H. Tulloch).—£3,500 towards the cost of carrying out an important improvement in the town. The work the council contemplate taking in hand is intended to remove a frustful source of danger at the spot where the road from Finedon discharges its traffic into Cambridge-street, one of the main thoroughfares of the town. It is proposed to acquire the site on which stands a factory, and also that occupied by a cottage adjoining, and clear it, so that there will be a wide open space extending from York-road down to Cambridge-street. At the same time Victoria-road, the street communicating to Midland-road, will be widened at the northern end by clearing away the properties now occupied as butcher's shop, house and yard. In the centre of the open space an underground public convenience will be built.

APPLICATIONS FOR LOANS.

Bacup T.C.—£1,000 for the electricity undertaking.

Brighouse T.C.—£225 for main sewerage works.

Briton Ferry U.D.C.—£20,000 for gasworks extensions.

Buckley U.D.C.—£15,000 for the sewerage scheme.

Carshalton U.D.C.—£5,250 for the purchase of land for a recreation ground.

Colne T.C.—£923 for paving with granite setts and £203 for flagging.

Halstead R.D.C.—£7,500 for Earls Colne water scheme.

Ilford U.D.C.—£10,000 for advances under the Small Dwellings Acquisition Act, 1899.

Kendal T.C.—£9,800 for improvements at the sewage disposal works.

Little Lever U.D.C.—£1,128 for street improvement works.

Maidenhead T.C.—£1,700 for extensions to the electricity equipment and buildings.

Newhaven U.D.C.—£150 for public lavatories.

Whitstable U.D.C.—£33,500 for a sewerage scheme.

LOANS SANCTIONED.

Barnard Castle U.D.C.—£450 for public conveniences.

Briton Ferry U.D.C.—£16,000 for the provision of workmen's dwellings.

Chester-le-Street R.D.C.—£2,500, additional cost of a new road and bridge over the Wear.

Cork T.C.—£2,621 for water supply works.

Epsom R.D.C.—£8,462 for sewage disposal works.

Essex C.C.—£2,290 for school extensions.

Forehoe R.D.C.—£1,500 for the erection of cottages.

Islington B.C.—£11,500 for repaving work (repayable in twelve years).

Knaresborough R.D.C.—£1,770 for the Goldsborough water supply.

Lewisham B.C.—£4,000 for street improvement purposes.

Liversedge U.D.C.—£626 for the provision of new screening and storm-water chambers.

Newry U.D.C.—£2,500 for the extension of the town hall.

Notts C.C.—£1,900 for main road improvement.

Penge U.D.C.—£3,537 for street improvement works.

Settle R.D.C.—£1,075 for a sewerage scheme.

Shanklin U.D.C.—£1,500 for the purchase of the literary institute buildings.

Stepney B.C.—£10,250 for electricity mains.

Sunderland T.C.—£37,200 for new plant and extensions at the electricity works.

Todmorden T.C.—£7,013 for works of street improvement.

FORTHCOMING INQUIRIES.

NOVEMBER.

	£
11.—**Dartford.** For refuse destructor purposes (Mr. R. H. Bicknell)	2,550
12.—**Cookham.** For rebuilding a bridge (Mr. P. M. Crosthwaite)	350
12.—**East Ham.** For the provision of a recreation ground (Mr. R. H. Bicknell)	3,883
12.—**Gravesend.** For electricity purposes (Mr. T. C. Ekin)	10,000
12.—**Hereford.** For the provision of a pleasure ground (Mr. Edgar Dudley)	—
12.—**Herne Bay.** For private street works (Mr. W. O. E. Meade-King)	2,350
13.—**Bournemouth.** For the erection of a fire station (Mr. W. H. Collin)	2,500
13.—**Bridgnorth.** For the sale of corporate property (Mr. Edgar Dudley)	2,000
13.—**Brierley Hill.** For sewage disposal purposes (Mr. R. G. Hetherington)	7,500
13.—**Scarborough.** For promenade extension and road widening (Major J. Stewart)	1,400
13.—**Thame.** For sewage disposal works (Mr. P. M. Crosthwaite)	—
14.—**Hornsey.** For fire brigade purposes (Mr. Courtenay Clifton)	9,360
14.—**Newport (Mon.).** For electricity purposes (Mr. T. C. Ekin)	3,250
14.—**Nuneaton.** For street improvement works (Mr. Edgar Dudley)	6,150
14.—**Rotherham.** For works of paving (Major J. Stewart)	5,000
15.—**Ashby Woulds.** For works of water supply (Major J. Stewart)	3,000

Municipal Work In Progress and Projected.

The Editor invites the co-operation of Surveyor readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Barrow £16,000, Clacton £8,000, Croydon £4,000, Leeds £6,000, Middlesex, Pontefract £5,600, Sheffield £45,000; housing and town planning—Barrow; roads and materials—London; sewerage and sewage disposal—Belfast; water, gas and electricity—Alnwick; miscellaneous—London.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

BUILDINGS.

Barnstaple T.C.—The question of providing public swimming baths is to be decided by a poll of the ratepayers.

Barrow T.C. Public baths are to be erected in Abbey-road, at a cost of nearly £16,000.

Brighouse T.C. A public mortuary is to be erected at a cost of £175.

Chelmsford T.C. The provision of public slipper baths is to be the subject of a report by the borough engineer, Mr. P. T. Harrison. - New stables are to be erected at a cost of £1,550.

Clacton-on-Sea U.D.C.—The question of erecting a bandstand, at an estimated cost of £8,000, is to be decided by popular vote.

Croydon T.C. Extensions and alterations are to be carried out at the South Norwood and Thornton Heath baths, at an estimated cost of £4,000.

Deal T.C.—The borough surveyor, Mr. T. C. Golden, has received instructions to prepare plans for a pavilion.

Durham C.C.—A new school, built from plans by the county architect, Mr. W. Rushworth, at a cost of £7,552, has been opened at Seaham Harbour.

Ellesmere R.D.C.—A bridge is to be erected at Llanfelin at a cost of £240.

Lancashire C.C.—It is proposed by the Main Roads and Bridges Committee to replace Scarisbrook Canal Bridge with a new bridge 33 ft. wide between the parapets. Application will be made to the Road Board for a grant towards the cost of the erection of the new bridge, estimated at £2,300. The canal company have agreed to contribute £500 towards the cost, and to undertake the ordinary maintenance and repair of the new bridge.

Leeds T.C.—New schools are to be erected in the Parish of St. George's at a cost of about £6,000. They are to accommodate some 550 children of both sexes.

Lymm U.D.C. Alterations are to be carried out at the isolation hospital, at an estimated cost of £500.

Middlesex C.C.—The Highways Committee have under consideration the important question of widening or reconstructing Richmond Bridge.

Newhaven U.D.C.—Three new lavatories are to be provided, one in South-lane and two in the recreation ground.

Northampton C.C. The Education Committee have accepted the tender of Messrs. J. G. Pullen & Sons, of Northampton, at £16,635, for a new secondary girls' school at Northampton.

Notts C.C.—The Education Committee have accepted the tender of Mr. J. Greenwood, of Mansfield, at £7,709, for the erection of a new school at Warsop.

Pontefract T.C.—It is proposed by the corporation to expend a sum of £5,600 on the provision of public baths. Under the plans of Mr. A. Nunweek, of Sheffield, the accommodation will include swimming bath, 75 ft. long by 30 ft. wide with thirty-nine dressing-rooms, and a public gallery for 250 spectators, a children's swimming bath, 30 ft. long by 15 ft. wide, five slipper baths and one Russian bath for each sex, and caretaker's house.

Rotherham R.D.C.—In connection with the scheme for the extension of the water supply to Ulley and neighbourhood the Council have accepted the tender of the Sheepbridge Coal and Iron Company, Limited, at £9,000 for the supply of pipes, and the tender of the Staveley Coal and Iron Company, Limited, at £3,151 for laying the pipes.

Sheffield T.C.—It is proposed to extend the town hall, and thus complete the building architecturally, at an estimated cost of £45,000. The extension will complete a rectangle, and will close up a gap on the Cheney-row side of the building. It has been designed by Mr. F. E. P. Edwards, F.R.I.B.A. (city architect)—who carried out the Bradford Town Hall extension, completed in 1909—to be in general harmony with the rest of the building, but it will be carried to a considerably greater height in order to increase the accommodation as much as possible.

HOUSING AND TOWN PLANNING.

Barrow T.C.—Two hundred houses are to be built to meet the pressing needs of the borough.

Leeds T.C.—The Improvements Committee recommend that an application be made to the Local Government Board for authority to prepare a town planning scheme for an estate off Buckingham-road, Headingley, which is about to be laid out for building. The estate is over 6 acres in extent.

Swansea T.C.—A letter has been received from the Local Government Board stating that they were prepared to sanction the purchase of land at Townhill from the Duke of Beaufort and another owner, subject to the following conditions: "That within eighteen months the council shall submit to the board plans for the erection of 300 houses for the working classes on part of the estate, and within five years definite proposals shall be submitted for entering the remainder of the land. The period for repayment of the money to be borrowed will be eighty years.

PARKS AND OPEN SPACES.

Brighton T.C.—It has been agreed to purchase, for £35,000, 1,067 acres of land between Brighton and Ovingdean.

Newcastle-on-Tyne T.C.—Six acres of land are to be purchased as a recreation ground for Scotswood, at a total cost, including laying out, of £7,500.

REFUSE COLLECTION AND DISPOSAL.

Horsham U.D.C.—The tender of Messrs. Heenan & Froude, at £1,450, has been accepted for the construction of a destructor. Buildings will involve an expenditure of £300, and a hopper £115, making the total cost of the scheme £1,865. The consent of the Local Government Board has been asked for a loan of £2,000.

Swansea T.C.—The borough surveyor, Mr. G. Bell, has prepared a special report on refuse collection and disposal, in which he proposes a rearrangement of the disposition of the cleansing districts and the district men. He deprecates the use of the old type of refuse receptacle, the ashpit, and advocates the adoption of iron ashbins. The practice in regard to trade refuse is to remove, without extra charge, reasonable quantities and he believes that a haggling policy in respect of this matter is not consistent with the duty of a sanitary authority. One of the gravest defects in Swansea's present arrangements is the presence of refuse receptacles and scavenging wagons collecting in the central part of the town within business hours. Rectification cannot be effected, however, he says, without a good understanding between the tradespeople and the cleansing staff, because there is the difficulty of the premises that do not open until about 9 a.m. There would be more satisfaction if the number of houses that have daily collections of refuse were increased. The conveyance of refuse to the tips by means of traction engines, he adds, is fraught with great possibilities, but required very earnest consideration, as it might spell a considerable gain or loss. At Westminster six motors supplanted thirty horses. The weekly cost of a motor is shown to be £10 3s. 10d., and the weekly cost of a horse is £3 4s. 6d.

ROADS AND MATERIALS.

Croydon T.C.—It has been agreed to construct a connecting road between Crowther-road and Birchanger-road, at an estimated cost of £700.

Dewsbury T.C.—A sum of £1,000 is to be spent upon the purchase of property in furtherance of the Northgate widening scheme.

East Grinstead R.D.C.—It has been agreed to support a resolution passed by the Hailsham Rural District Council urging that the revenue received from petroleum and motor licences should be distributed among all the road maintenance authorities in the area of collection, and the distribution should be proportioned according to the amount expended on materials by such authorities.

Headington R.D.C.—The tenders of Messrs. Thompson & Co., at £1,288 and £768, have been accepted for works of improvement in Ferry-road and William-street.

Hampton Wick U.D.C.—The tender of Messrs. Lavender & Bateman, of Sutton Bridge, for 200 yds. of broken granite, at 13s. 3d. per yard, has been accepted. There were fifteen tenders.

Hornsey T.C.—The tender of the Praed Road Construction Syndicate, Limited, at £3,072, has been accepted for road repair works.

Kensington B.C.—The council have adopted the recommendation of the borough engineer, Mr. A. R. Finch, to provide two pedestrian island refuges in Ladbroke-grove, at the junction of that thoroughfare and Lancaster-road, when the wood paving is renewed in Ladbroke-grove, which work will shortly be commenced.

London C.C. It was decided on Tuesday to apply to Parliament for authority to widen the Strand between Adam-street and Durham House-street, at an estimated cost of £135,000.

North Riding C.C.—It has been agreed to accept the offer of the Road Board of a grant of £2,750 towards the cost of the improvement of the Yarm, Thirsk, and York main road, and the loan, free of interest, of £10,000, repayable by annual instalments, and to make application to the Local Government Board for their consent to the borrowing of £10,000 in two instalments, the whole to be repayable in six years.

Seaton (Devon) U.D.C.—Broken Cliff is to be laid out at a cost of £200.

Staffordshire C.C.—The county surveyor, Mr. J. Mowatt, has informed the Midland Centre of the Roads Improvement Association that the county council have now decided to pull down the bridge over the river Stour near Stourton and to erect a wider one, and widen the approaching highways. The county council are also in negotiation with the landowners to complete a similar improvement to a bridge near the same place on the Wolverhampton side.

SEWERAGE AND SEWAGE DISPOSAL.

Belfast T.C. The terms of the Bill to be promoted in Parliament for powers to reclaim Sleibtands, and for other purposes, have been agreed to. The land, where a nuisance has arisen from the sewage, lies between the Connswater river and the Kinnegar, Holywood, and the work has been recommended by the Royal Commission on Sewage Disposal in their seventh report. Between 600 and 700 acres of land will be reclaimed, and the cost of constructing the huge embankment between the points already mentioned is estimated at something over £100,000.

Exeter T.C.—The Sanitary Committee have reported in favour of the purchase of necessary renewal plant (washers, screens, dredging apparatus, rails and pump), and clinker for the sewage disposal works, and of the work of washing the clinker being undertaken by the city surveyor, Mr. T. Moulding.

WATER, GAS, AND ELECTRICITY.

Alnwick R.D.C.—A committee has been appointed to consider and report upon the question of a water supply for Acklington.

Holborn B.C. It has been decided to light half of Holborn by electricity and half by gas. The electrical portion has just been completed. It extends from Chancery-lane to Kingsway. High efficiency Mazda drawn-wire lamps have been chosen, and a very fine lighting effect is obtained.

Morpeth T.C.—A new pumping apparatus has been installed in connection with the water supply, at a cost of £484.

Wellingborough U.D.C.—The council have accepted the tender of the Wellingborough Gas Light Company for the street lighting of the town. The contract is for seven years, at £1,085 per annum, which sum includes the disposal by incineration of all house and trade refuse delivered to the works by the council's carts.

MISCELLANEOUS.

Doncaster T.C.—The tender of Mr. I. W. Pearce, of Morecambe, at £2,424, has been accepted for the extension of the Bentley tramway route to the new colliery village. The contract is exclusive of the supply of rails, fish-plates and bolts, which will be provided by the tramways department. The estimated cost of the extension is £3,650, and the electrical work about £1,400. A further £2,550 will be required for additional cars, bringing the gross cost up to £7,600.

Edinburgh T.C.—It has been agreed to approach Parliament for powers to run motor 'buses over three routes in the city.

Hastings T.C.—A resolution has been passed objecting to the promotion of a Bill by the tramway company to establish an overhead system of traction on the Front.

London C.C.—The Highways Committee on Tuesday recommended that the tender of Messrs. John Batt & Co. (London), Limited, to supply 6,000 driving-wheel tyres for electric cars, at the price of £1 2s. each, and 5,000 pony-wheel tyres for electric cars, at the price of 18s. 10d. each, be accepted. The firm proposed to sublet the work to German firms. Mr. Whitaker Thompson moved that the recommendation be referred back to the committee, urging that the contract should go to a firm which would carry out the work in England. The amendment was carried on a division by fifty-six votes to forty-two.

PERSONAL.

Sir Alexander Binnie has been engaged to report on the whole question of the water supply of Rangoon.

Mr. John Bryce, burgh surveyor of Partick, will take service with the Glasgow Corporation under the scheme of incorporation.

Mr. F. G. Holmes, burgh surveyor of Govan, will transfer his services to the Glasgow Corporation under the scheme incorporating Govan with Glasgow.

Mr. Duncan Burns, burgh surveyor of Pollokshaws, in connection with the annexation of the district, has elected to serve under the Glasgow Corporation.

Mr. S. Gilbert, one of the surveyors to the St. Columb Major (Cornwall) Rural District Council, has been appointed highway surveyor of the Northern District of Truro, at a salary of £120 per annum.

Mr. Lewis Wynne-Roberts, son of Mr. R. O. Wynne-Roberts, M.INST.C.E., has gained second-class honours in his B.Sc. examination, London University, and a First-Class Diploma and Gold Medal at the Battersea Technical College.

Mr. T. Jones, surveyor to the Crediton Urban District Council, has been authorised by the council to attend the general conference of the National Housing and Town Planning Council, to be held in the Guildhall, London, on the 26th and 27th inst.

Mr. Wilfrid Wright, ASSOC.M.INST.C.E., of the town surveyor's department of Sutton (Surrey), has had his salary increased to £150 per annum, rising £10 annually to a maximum of £180, while the salary of Mr. H. Whetstone has been increased by £13 a year.

Mr. William Page Robinson, for over twenty years surveyor to the Skelton and Brotton Urban District Council, was found dead recently, and it was stated at the inquest on Saturday last that he had been depressed since the death of his wife. The coroner and jury expressed sympathy with deceased's three sons and other relatives.

Mr. Thos. McKie, ASSOC.M.INST.C.E., lately of Glasgow, has been appointed engineering assistant to Mr. Herbert E. Bellamy, resident engineer on the main southern and western ocean outfall sewer works for Sydney and suburbs. Mr. G. Paulin, B.SC., B.E., engaged on the same work as assistant, has accepted the appointment of district engineer in the Fiji public works department.

Alderman Pinkham, at the meeting of the Middlesex County Council on Thursday of last week, congratulated the council on being able to retain the services of Mr. H. T. Wakelam, the county surveyor, in reference to his withdrawal as a selected candidate for the engineership to the London County Council. The chairman, Alderman W. Register, also referred simi-

larly to the matter, and both speeches were received with applause.

Dr. L. W. Darra Mair, whose death in a London nursing home on Sunday is reported, has done work of much public value as medical inspector under the Local Government Board. He carried out many important investigations into outbreaks of infectious diseases in different parts of the country, the reports on which have formed valuable contributions to epidemiology, while other reports have had important bearing on the sanitary administration of rural districts.

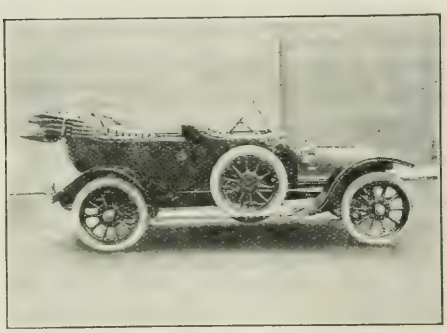
Mr. F. S. Oldfield, resident engineer at the Barnet sewage disposal works, and assistant teacher of sanitary engineering at the London County Council School of Building, Brixton, has been appointed lecturer on road making and drainage at the Northern Polytechnic, Holloway. Mr. Oldfield commenced his career in 1896 by serving for three years under Mr. J. Patten Barber, borough engineer of Islington, after which he became assistant engineer at West Ham, subsequently serving as sewerage engineer to the Durban Corporation, Natal, for a period of seven years. In 1910 he was appointed assistant resident engineer at the Para sewage works, Brazil.

OLYMPIA EXHIBITS.

THE TALBOT CARS.

Clement Talbot, Limited, Barlby-road, Ladbroke-grove, W., have arranged an attractive exhibit at Stand 69 at the Olympia Motor Show, which opens to-day.

In the twelve months which have elapsed since the last show many important improvements have been effected in this firm's cars. For example, their 12-h.p.,



12-h.p. Talbot Car.

15-h.p. and 25-h.p. cars are all being fitted with a new type of front axle, with ball-bearing pivots, this previously only being fitted to the 20-h.p. model. Enclosed valves will be a feature of all models, giving a neat appearance to the engine, and ensuring freedom from dirt and grease, while in future only two-gear wheels cut with silent helical teeth will be used. To the 12-h.p., 15-h.p. and 25-h.p. cars Talbot detachable wheels are fitted, with either Sankey steel wheels or artillery wooden wheels. To the 20-h.p. Dunlop detachable wire wheels are fitted without extra charge. In addition, all models have a new and improved aluminium dash, giving an exceptionally smart appearance. Other excellent advantages are the stiffening of the frame and steering column, the countersunk fitting of recording instruments, and the ease of detachment of the body without disconnecting any wires or engine fittings.

BENZ CARS.

Three types of Benz cars are being shown at Stand 28 by the Brompton Motor Company, Limited, 78 and 80 Brompton-road, S.W. A new model of their 12—20-h.p. chassis, which has taken a place in the front rank of small touring cars, is in particular an exhibit which is likely to impress all by its clean lines and simple design. A really magnificent car is a 35—45-h.p. limousine-landaulette of the latest torpedo type, painted dark grey and upholstered in grey cloth, a 15—25-h.p. Torpedo-de-luxe, painted dark mole-grey and upholstered in green leather, being another fine example of the Benz productions, which include no fewer than nine different models for 1913.

New City of London Subway.—A contract for a passenger subway at the junction of Cannon and Queen Victoria streets has been placed by the Corporation of London with Messrs. Mitchell Brothers, contractors, Limited, of 34 Victoria-street, S.W., who will carry out the work to the designs of the engineers, Messrs. Mott & Hay.

FOR OTHER ADVERTISEMENTS
See End of Paper.

BOROUGH OF PORTSMOUTH.

PORTSEA IMPROVEMENT RECONSTRUCTION SCHEME.

TO BUILDERS AND OTHERS.

Tenders are invited for the Erection, Completion and Maintenance in thorough repair for six calendar months from the completion thereof of the following works—namely:—

(1) The Erection of 22 Houses on the West Side of Curzon Howe-road, Portsea (Section X).
(2) The Erection of 17 houses on the East Side of Curzon Howe-road, and 4 houses in Kent-street, Portsea, together with a Wall and Iron Fence (Section Y).

On the deposit of the sum of £2 2s. (which will be returned on the receipt of a *bonâ-fide* Tender), a lithographed copy of the Bills of Quantities, with Form of Tender for each or both of the above works, can be obtained on application to the undersigned, and the Specification, General Conditions and Plans of both the above works can be seen at the Borough Engineer's offices at the Town Hall, Portsmouth, where any further particulars can be obtained.

The Contractor may tender for either or both of the above works, and Tenders, marked "Tender for the Erection of Houses, Portsea, Section X" (or "Section Y," as the case may be), must be filled up, signed and returned, together with the Bills of Quantities duly filled in, so as to reach the undersigned not later than 10 a.m. on Tuesday, the 26th day of November, 1912.

The Council do not undertake to accept the lowest or any Tender, and the acceptance of any Tender will be subject to the sanction of the Local Government Board being received to borrow the amount required to carry out the work.

G. HAMMOND ETHERTON,
Town Clerk.

The Town Hall, Portsmouth.
November 6, 1912.

CLEETHORPES URBAN DISTRICT COUNCIL.

TO GRANITE MERCHANTS.

The above Council invite Tenders for the Supply of 350 tons (more or less) of Granite, broken to 2-in. gauge. The whole to be delivered in trucks as and when directed at Cleethorpes Station (G.C. Railway).

Samples of material to be supplied must be sent to Mr. C. H. Waithman, A.M.I.C.E., Engineer and Surveyor, Town Hall, Cleethorpes. Sealed Tenders, endorsed "Granite," to be sent to me, the undersigned, not later than Tuesday, November 19th, 1912.

(By order)
B. GREAVES,
Clerk to the Council.

Town Hall,
Cleethorpes.
November 6, 1912.

TO MANUFACTURERS OF MUNICIPAL APPLIANCES.—An Engineering Firm, having Five First-class Specialities of considerable interest to Surveyors, Waterworks and Sewerage Engineers, and in which a valuable connection has already been established, desires to amalgamate with a firm already engaged in this line of business who possess good selling facilities: there is a good demand for these specialities, and a large number are already successfully at work, and the whole of the pioneer work has been carried out; excellent opportunity for the right firm seeking expansion. Principals only dealt with Address Box 1,198, office of The Surveyor, 24 Bride lane, Fleet-street, E.C.

MUNICIPAL WORK AT SHEFFIELD.

HIGHWAYS AND SEWERS.

The surveyor of highways and deputy city engineer of Sheffield, Mr. W. J. Hadfield, has just published the annual report of the department of highways and sewers for the year ended March 25th last, and from this we gather that the total expenditure upon highway and sewer construction and maintenance for the period under review was £120,575, compared with £107,313 in 1910—11. The gross expenditure in 1911—12 was £245,172, as against £215,575 in 1910—11. The increase is entirely accounted for by the more rapid progress of rubble-sewer conversion and the construction of the Tinsley tramways. Expenditure on insanitary back lanes shows an increase; many of the back lanes in and near the central district have been permanently paved and put into good sanitary condition, and others, more especially in the Park district, are on the list for the current year.

A table showing the classification of paving gives the following figures: Granite, 64 miles; whinstone, 1·99 miles; freestones, 69 miles; wood, 10 miles; combined wood and granite, ·17 mile; tar-macadam, 29 miles. The total mileage of adopted roads is 316, and of unadopted 85. It is intended to lay down 1 200,000 new wood blocks. During the greater part of the year a small gang of men was employed solely in repairing wood-paved streets, and 123,895 old wood blocks were cleaned, sawn to a uniform size, and re-used.

The new creosoting plant has been completed, and was at work during the winter. It is capable of dealing with 10,000 blocks in an ordinary working day, and the creosoting chamber is of sufficient length to accommodate the longitudinal wood sleepers used for tramway purposes. The whole of the wood blocks used for street paving are now being creosoted under pressure, which should add considerably to their life. Tramway sleepers are being dealt with by the plant, instead of being purchased ready creosoted, and a considerable proportion of the timber used by the department for other purposes, which was not formally treated in any way, is now being creosoted.

TAR-MACADAM ROADS.

The most notable feature in the table of street mileage is the increase in tar-macadam roads. Including tar-macadam roads along the centre of which are tramways paved with wood or other material, the length has increased during the last twelve months from 22½ miles to about 29 miles, and further extensions are, at the time of writing this report, in rapid progress. During the last four years the mileage of roads coated with tar macadam has increased by about 100 per cent. Special care has been taken on gradients to finish tar-macadam roads with surfaces affording suitable foothold for horses, and in order to provide this dry material has been rolled into the final coat. About 15,000 tons of tar macadam were made and used during the year, and arrangements have been made to largely increase the output.

The Road Board have sanctioned a loan of £11,000 free of interest for six years towards the cost of tar-macadamising certain main roads. The tar macadam, Mr. Hadfield states, will be carefully maintained, and it is anticipated that if present traffic conditions continue, the greater part of the roads will be in good condition at the end of six years, with several years' life before them. The area treated with calcium has been increased, largely because where tarring was omitted in consequence of the probable conversion of the roads to tar macadam a dressing of calcium was applied as a temporary measure. Longer experience of this class of work confirms the opinion previously expressed (Mr. Hadfield states), that both tarring and treatment with calcium are not only a great advantage in that they decrease the amount of dust, but both processes are found in the long run to be an economy from the point of view of maintenance. Road surfaces after treatment with either tar or calcium are much less liable to disintegrate, and the tarred roads on the whole produce much less mud during the winter. No work done by the department, Mr. Hadfield comments, seems to be more appreciated by the public than these efforts to reduce dust.

SEWERAGE WORK.

The returns show a great increase in the amount of sewerage work, it having been decided to raise, for the conversion of defective rubble sewers, loans amounting to £25,000. The total expenditure upon sewerage work (capital and revenue) was £39,803, and it is hoped that by March, 1914, all the rubble sewers urgently needing attention will have been dealt with leaving approximately 25 miles to complete, compared with an original total of 119 miles.

WORK AND WAGES.

Dealing with workmen and wages, Mr. Hadfield states that the number of men employed was 1,383 in 1911—12, compared with 1 252 in the preceding year, the total wages bills being £97 052 and £86.108 respectively. The average weekly wage is £1 7s., an all-round increase of 7d. weekly. The relation of wages, team work, establishment charges, &c., to the total expenditure of the department is tabulated below:—

	Year ended March 25, 1911.		1912.	
Wages	£86,108	39·98%	£97,052	39·59%
Hired team work ...	14,671	7·32%	18,313	7·47%
Materials, rent, rates and other expenditure	107,578	49·43%	122,648	50·02%
Establishment charges	7,043	3·27%	7,159	2·92%
	£215,400	100·00%	£245,172	100·00%

The amount spent upon renewals was much greater than in any previous year, due chiefly to the reconstruction of the Tinsley track. The principal item of this year's constructional programme is the doubling of a great part of the Fulwood track from Manchester-road to the point where the work was terminated last year, near Tapton Park-road. Mr. Hadfield states that for this work rails of a specially heavy section (120 lb. per yard) are being employed; the joints are being welded, and the rails are laid on longitudinal wood sleepers bedded on concrete and thoroughly anchored.

SOME RECENT PUBLICATIONS.*

Law of Repairs and Dilapidations. By T. Cato Worsfold, M.A., LL.D. Price 3s. 6d. net. London: Sir Isaac Pitman & Sons, Limited.

There can be few branches of law which are so far reaching in their effect, or which touch the personal interests of so many persons, as that which is the subject of this book. While of special interest to lawyers and surveyors, the law of repairs also directly affects a vast number of laymen in their capacity either of landlord or tenant. In writing this little book Dr. Worsfold has kept in view, so far as possible, the requirements of all these classes. He has dealt with the various aspects of his subject in an easily comprehensible way, and at the same time has given ample authority for the propositions of law which he discusses. The book is complete so far as its scope is concerned, dealing with ecclesiastical repairs, agricultural repairs, and repairs to settled property in addition to the more ordinary cases. As a concise handbook of the law Dr. Worsfold's book has much to recommend it.

Surveying and Surveying Instruments. By G. A. T. Middleton. Price 5s. nett. London: Whittaker & Co.

The popularity of Mr. Middleton's concise work on surveying is evidenced by a third edition having been called for. The welcome which has been accorded to the earlier editions is due to the fact that the book gives a concise account of modern instruments and modern methods of working. Thus, while it does not presume to compete with the well-known standard works on the subject which are larger in size and higher in price, the student will find in it all that he requires for the ordinary routine of daily surveying practice. In issuing the new edition, opportunity has been taken to illustrate the new Leiss level, and to add examples of a hasty plane-table survey, a completed traverse survey, and a tunnel survey. The general elementary character of the work has been retained, and it will doubtless maintain the position it has achieved as a popular text-book for students.

"THE SURVEYOR" BOOK DEPARTMENT.

In response to suggestions from numerous readers, resident in remote districts at home and abroad, who find it difficult to procure the books they require, we have decided to establish a department for the supply of technical and scientific books, a selected classified list of which will shortly be published in our advertisement pages.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

Royal Institute of British Architects.

MR. REGINALD BLOMFIELD'S PRESIDENTIAL ADDRESS.

On Monday evening last Mr. Reginald Blomfield, A.R.A., delivered his inaugural address as president of the Royal Institute of British Architects, the points to which the attention of the members was directed being: The position of this institute; the position of the architect; registration; and education.

Dealing first with the position of the institute, Mr. Blomfield said they had, in the last two or three years, incurred a large expenditure, which had induced some anxiety among the members in regard to the future. He thought he could safely reassure any member who had an uncomfortable feeling of insecurity. As a body the institute had never been so strong as it was to-day, the total of its membership, including licentiates, amounting to some 4,700, in addition to the numerous [illegible] and students from whom the members of the future would be drawn. The network of allied societies, working in close relation with the central body, now covered not only the United Kingdom, but practically the whole of the English-speaking dominions, and the council had recently taken in hand the consideration of the relations of the allied societies *inter se* and to this institute, in order that no district should be without a representative body to assist the architects practising within its boundaries.

POSITION OF THE ARCHITECT.

Continuing, Mr. Blomfield said: The position of the architect as a professional man has given ground for a good deal of anxious consideration in the last year or two. Adverse verdicts have been given in the Courts, which appear to saddle us with unfair and impossible responsibilities, and there can be no doubt that the position of a practising architect to-day is more difficult than it was forty years ago. He is expected to know a great deal more, and to do a great deal more for his money, than was expected of his predecessors in the halcyon days of the 'seventies. Applied science has developed so fast and in so many directions that it is impossible for an architect to keep pace with every branch of it; and, beside all this, he has his own art to master. For when all is said and done, the first business of the architect, that which differentiates him from other men, is his power and knowledge of design, and that, in the chaos of [illegible] [illegible] of the practice of building. At the same time, I think [illegible] in this matter.

[illegible] is higher, but this is due in the one case to causes beyond our control, in the other to our own efforts; and what we have to do is, on our part, to qualify [illegible] in the public a more intelligent appreciation of the [illegible] less of the regrettable misunderstandings that sometimes occur in the practice of architecture—but architects should not forget that the only effective passport [illegible]

REGISTRATION.

[illegible] 1907,

and your council has for some years endeavoured to give effect to that policy. Your council can hardly hope to produce a scheme that will at once satisfy all, or nearly all, shades of opinion, and also be within the range of practical politics—this last is important—for I think you will agree with me that if you run a horse you should run him for all he is worth, and that it is unworthy of serious men of affairs to waste time and money on mere *ballons d'essai*. We are after a practical scheme—one that will protect both the public and architects.

Various solutions have been proposed. So far none of them have met with general acceptance, but it must not be supposed that the labours of the last few years have been wholly in vain. They have at least shown us some of the difficulties in the way, and have brought it home to thoughtful men that this is a very difficult and intricate problem not to be settled off-hand, and that if a real and satisfactory solution is to be found for it, that solution will have to be built up by careful and exhaustive consideration of the case in all its aspects—of what is required by the public, of what is due to the architect, and of the effect of any such scheme on other professional bodies whose interests may be affected. And if, after this careful consideration, it is found to be impossible to go quite so far as some of the more ardent of our registrationists might desire, I would remind them that half a loaf is better than no bread, and I would appeal to them, and, indeed, to all of our critics, to have patience and not to take the bit in their mouths and bolt. It is no use striking before the iron is hot, and it has become clear that there are many issues to this question, all of which must be dealt with before it will be possible to reach the psychological moment of solution. . . . One of the first acts of your new council has been to appoint a large and carefully selected committee to consider the whole question of registration, and it has strengthened it by the addition of a number of representative members from the provinces. I would ask you to give this committee time to deal with the question in all its bearings, and, when the recommendations of the council come before you, not to look for impossibilities, but to give it your careful consideration as practical men of affairs, and with an anxious regard to the future of architecture. . . . On one point I feel sure we shall all agree. The object of a registration scheme should not be to make architecture a close profession, regardless of professional skill. . . . Our object is to put a stop to incompetence, and to establish and maintain a reasonable level of accomplishment, and to see that that level is reached by those who undertake the very responsible work of an architect. There is not a man in this room who would not say "la carrière ouverte aux talent," but what we insist on is that the "talent" should really be there, and that is the substantial issue to which registration should be directed. It should be really and effectually the hall-mark of professional competence.

PROFESSIONAL TRAINING.

So, by this roundabout way, we come back to the vital question of education, or rather, as I should prefer to put it, a sound and thorough professional and artistic training as the basis on which any form of registration must be founded. If we are to obtain public and formal recognition of the fact that architecture is not an art that can be practised by Dick, Tom and Harry with advantage to the community, and that there is a difference in kind between the work of the trained designer and the architectural efforts of the gentleman who combines the practice of architect, auctioneer and estate agent, we shall see to it, not only that our present standard is maintained by all who enter our ranks, but also that it is slowly and surely raised, so that there can be no question as to who is and who is not qualified to undertake the work that legitimately falls to an architect.

It is to this object that the institute, through its Board of Architectural Education, has steadily applied itself during the last few years. . . . The syllabus of training for architectural students has been thoroughly overhauled, and quite recently a serious attempt has been made to render our examination a more effective and intelligent test of architectural capacity, and also a real stimulus to the artistic enthusiasm of our students.

Design, the adequate invention of buildings which are good to live in and to look at, is, after all, the essential object of our training. Many studies are necessary as subsidiary to this, but the aim of our training must always be to make our students competent architects, artists to whom the methods and materials of building are as his canvas and colours to the painter, or his bronze and marble to the sculptor. . . .

ARCHITECTS AND ENGINEERING.

Under modern conditions it is more than ever imperative that power of design and knowledge of construction should go hand in hand—that the architect should have the technical knowledge of building necessary to realise the flights of his imagination. . . .

At the meeting of the British Association in September last Prof. Archibald Barr gave a very able address on the duty of the engineer to the community, and in the course of it called attention to the unfortunate severance of engineering from artistic design. The engineer, he said, takes a too exclusively utilitarian view of his calling, and architects have not sufficiently mastered the science of steel construction to be able to design in it freely. I think there can be little doubt that Prof. Barr is right in his contention; and the conclusion to be drawn from it is that in the modern practice of architecture the necessity of the study of scientific construction becomes more and more urgent. That is a point that will not be lost sight of in our scheme of architectural training, and I may assure you that on this point our examiners are adamant.

Yet there are one or two considerations which I venture to offer, to reassure the old-fashioned lover of bricks and mortar. I do not believe that the whole future of architecture rests with steel construction or reinforced concrete. . . . Brickwork and masonry must always hold their place in building, and though architects will do well to avail themselves of all the resources of applied science, that is no reason for throwing up their familiar tools and rushing headlong into methods, however brilliant their promise, which have not yet stood the test of time. . . .

I do not think that architecture is going to be stranded high and dry by the engineer; but I heartily endorse Prof. Barr's appeal for more thorough study of construction, and for closer co-operation between the engineer and the architect. The two should pull together, and should do so from the first. It is no use asking an engineer to design a bridge, or even a shop-front, as was recently suggested, and afterwards calling on an architect to invest it with "artistic merit." Both architect and engineer will have their views on the main form and distribution, but they will have studied the problem from different points of view, and it is only by laying their different points of view together, before the treatment of the problem as a whole is decided on, that it will be possible to attain the unity of effect essential to monumental architecture.

Chelmsford Housing. The completion of the first section of the Chelmsford Corporation housing scheme was signalised recently by the laying of a commemoration-stone. Over 140 dwellings are to be erected at a cost of £26,000.

Derwent Valley Water Dispute. The award of the arbitrator, Mr. C. A. Russell, K.C., in the dispute between the Derwent Valley Water Board and the Corporation of Sheffield, was issued on Tuesday. The hearing, which took place in London, was to determine whether the four constituent authorities composing the board—namely, the Corporations of Nottingham, Derby, Leicester and Sheffield—should pay for the entire Derwent Valley water undertaking in the proportions laid down by the Act of Parliament, or whether those works which were not needed for the common use of all four towns were to be paid for only by those corporations for whose benefit such works were needed. The former view was taken by the joint board, but the Sheffield Corporation disputed its ruling. The total cost of the works has been £3,500,000, and the amount in dispute was about £170,000. In his award, the arbitrator has upheld the contention of the three southern corporations that all the reservoirs, lands and easements are to be charged to the four towns in the statutory proportions, but as regards the 50-mile aqueduct, which is used to carry the water south, Sheffield is only to bear its statutory proportion of a part of this, Nottingham, Leicester and Derby having to defray all the cost of the remaining portion.

SPALDING HOUSING SCHEME.

CHEAP COTTAGES.

The erection of thirty-six cottages is proposed by the local authorities of Spalding, Lincs, where the housing problem has been acute for many years. It has been decided to construct a street through the allotments about 1¼ miles from the centre of the town, this land being already the property of the town, and the cottages are estimated to cost £5,176 to build.

The plans show the cottages in pairs and in blocks of four, with spaces of 10 ft. and 15 ft. respectively between each for access to back premises and the allotments, which remain at the rear.

Each cottage contains on the ground floor an entrance lobby, with door opening into a living-room, 14 ft. by 10 ft. 6 in. and 8 ft. high, overlooking the street; a kitchen, 14 ft. by 12 ft., with good pantry and stores adjoining, overlooking the yard and allotments; and rear premises. On the upper floors are bedrooms, 14 ft. by 10 ft. 6 in., 12 ft. by 8 ft. 6 in., and 9 ft. by 8 ft. 6 in. respectively, and 8 ft. 6 in. high.

At the proposed rent of 3s. 6d. per week the scheme will be entirely self-supporting, and although the plans have not yet been passed by the Local Government Board, there are already many applicants for the houses.

Baltimore's Municipal Motors.—The Municipality of Baltimore owns thirty-four automobiles and fourteen motor cycles to do the work of its numerous departments. In spite of the bad streets and heavy grades, the automobile, both for pleasure and business, has found favour, and the number is steadily increasing. Of the municipally owned cars, there are eleven in the fire department, twelve in the police department and eleven in what is known as the "city hall," the latter including the departments of sewerage, park board, commissioners for opening streets, paving commission, street cleaning, building inspector, subway, water, health, and so forth.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. Thomas, M.Inst.C.E., County Surveyor, Buckinghamshire.

The council of the Institution of Municipal and County Engineers are offering premiums to members, associate members and students of the institution amounting to twenty-eight guineas for the best plans for laying out a seaside pleasure resort.

The drawings are to be delivered prior to the annual meeting in July next at a date to be fixed hereafter. Further particulars will be issued shortly.

Thomas Cole.
11 Victoria-street, S.W. *Secretary.*

LOWER THAMES VALLEY DISTRICT SURVEYORS' ASSOCIATION.

At the ordinary monthly meeting of the above association, held at the Town Hall, Twickenham, on Saturday last, there was a very good attendance. The meeting had under consideration the re-drafting of the rules and regulations, among other matters discussed being that of the construction of public mortuaries, post-mortem rooms and by-laws in connection therewith. The association also discussed, at some considerable length, the question as to what is a new building, the points raised being those which are not specifically mentioned under Act of Parliament, one being whether the different classes of buildings and alterations and circumstances surrounding the cases could be classified in such a manner as to bring them within the scope of the various acts and the by-laws.

At the next meeting consideration will be given to a paper on the intercepting trap, by Mr. E. Willis, Assoc.M.Inst.C.E., of Chiswick.

The association have noted with pleasure the appointment of Mr. J. H. Brierley (one of its members), the borough surveyor of Richmond, to the South-Eastern District Committee of the Institution of Municipal and County Engineers.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. Frank Latham, M.Inst.C.E.I., F.S.I., Borough Engineer and Surveyor, Penzance.

COUNCIL MEETING.

At a meeting of the council held on October 30th the following applicants were recommended for admission:—

To Membership: Messrs. W. Yeo, surveyor, Lynton Urban District Council; C. W. Denny, engineer's office, Redditch Urban District Council; J. Seddon, surveyor, Little Lever Urban District Council; R. Rosbotham, chief surveyor, West Lancashire Rural District Council; W. F. L. Thomas, city engineer, Georgetown, British Guiana; A. O. Callear, water engineer, Harrington Water Scheme, Borough of Wenlock, and R. G. Coles, surveyor, Wells-next-the-Sea Port and Urban District Council.

Transfer to Membership: Mr. P. G. Eckersall, city surveyor's office, Manchester.

Transfer to Associate-Membership: Messrs. W. Walker, borough surveyor's office, Chesterfield, and H. K. Jordan, borough engineer's office, Wandsworth.

(Under the new by-laws these elections will be ratified at the next council meeting if no written objections are lodged within fourteen days.)

New Members, &c.—From the applicants recommended for admission at the last meeting three members and five associate-members were elected, and two transfers were made to the membership class.

Finance Committee.—The following members of the council were elected: Messrs. Carr, Cutler, Elson, Ennals, Farmer, Mundy, Whitwell and Veale.

Special Purposes Committee.—The following members of the council were elected: Messrs. Barralet, Boot, Cutler, Elson, Fidler, Lewis, Mundy and Shenton.

Chairman of Council.—Mr. E. A. Stickland was elected.

Honorary Librarian.—Mr. John Robinson was elected.

Delegates to the N.A.L.G.O.—The president and Messrs. J. T. Pegge and A. E. Prescott were elected.

Council Meetings.—It was decided that these be held alternately on the last Wednesday and the last Saturday in the month.

Provincial Council Meetings.—This matter was again considered, and a definite pronouncement upon it will be made at the next meeting.

District Boundaries.—Approval was given to the alteration in district boundaries as set out in the new List of Members.

JOINT SOUTHERN AND SOUTH-EASTERN DISTRICT MEETING.

A Joint Southern and South-Eastern District meeting will be held in the council chamber, No. 4 Southampton-row, London, W.C., on Wednesday, November 27th, 1912, at 8 o'clock, when a paper, "The Effect of Recent Decisions upon the Arbitration Clause," by Mr. W. Valentine Ball, M.A., barrister-at-law, author of "The Law Affecting Engineers," joint editor of "Emden's Building Contracts," 4th edition, will be read.

The subject of Mr. Valentine Ball's paper is of wide importance to engineers and others engaged in municipal work, and it is hoped that each member will, where possible, bring to the meeting his town clerk, chairmen of committees, and others interested in the matter. The discussion will be an open one, and an advance copy of the paper may be had upon application.

The building No. 4 Southampton-row, is almost opposite the Holborn Station of the Great Northern and Piccadilly Tube, and within a minute of the British Museum Station of the Central London Railway. Omnibuses from all parts practically pass the door.

Arthur Palmer,
J. Woolford Brook,
Joint Hon. District Secretaries.

NORTH-WESTERN DISTRICT.

It has been decided to hold a social evening at Manchester on Saturday, December 7th. The approximate expense per head will be 4s., and it is desirable that members should give notice, at the earliest possible moment, of their intention to attend. Full programme will be issued later.

"Brantwood," Jas. W. Gleave,
Commercial-street, *Hon. District Secretary.*
Heywood.
October 12, 1912.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*

ROYAL SANITARY INSTITUTE.

MEETING IN LONDON.

A Sessional Meeting of the Royal Sanitary Institute will be held at 90 Buckingham Palace-road on Tuesday next, when a discussion will take place on "The Report of the Departmental Committee on Intercepting Traps and House Drains," to be opened by Mr. H. Percy Boulnois, M.Inst.C.E., chairman of the council of the institute.

The following hope to be present and take part in the discussion: Prof. H. R. Kenwood, M.B., medical officer of health, Stoke Newington; Messrs. J. Patten Barber, M.Inst.C.E., Islington; Philip Boobbyer, M.D., M.R.C.S., medical officer of health, Nottingham; William Butler, M.B., D.P.H., assistant medical officer of health, London County Council; C. H. Cooper, M.Inst.C.E., Wimbledon; T. W. A. Hayward, M.Inst.C.E., Battersea; T. de Courcy Meade, M.Inst.C.E., Manchester; T. J. Moss-Flower, Assoc.M.Inst.C.E., Bristol; Louis C. Parkes, M.D., D.P.H., medical officer of health, Chelsea; W. H. Prescott, M.Inst.C.E., Tottenham; Ernest Van Putten, M.Inst.C.E., Lewisham; R. Read, Assoc.M.Inst.C.E., Gloucester; H. Alfred Roechling, M.Inst.C.E.; H. Scurfield, M.D., medical officer of health, Sheffield; F. Sumner, M.Inst.C.E., City of London, and W. C. Tyndale, M.Inst.C.E.

General discussion is invited.

The chair will be taken at 8 p.m. by Sir Maurice Fitzmaurice, C.M.G., M.Inst.C.E.

E. White Wallis,
Secretary.

Sewage Disposal at Solihull.—New sewage outfall works, constructed at Barston by the Solihull Rural District Council at a cost of £40,000, have been formally opened. Operations in connection with the scheme commenced in 1906, when the engineer and surveyor, Mr. A. E. Currall, received instructions to prepare a scheme and estimate.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, but those responsible for their despatch are recommended to arrange that they shall reach The Surveyor office by noon on Wednesdays to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.

ROAD FOREMAN.—November 11th.—Maidstone Rural District Council. £1 1s. a week.—Mr. R. Hoar, clerk.

TWO TEMPORARY ASSISTANTS.—November 11th.—Corporation of Swansea. £10 16s. 8d. per month.—The Town Clerk.

CLERK OF WORKS.—November 11th.—Lichfield Rural District Council. £3 13s. 6d. per week.—Mr. R. Green, 37 Waterloo-street, Birmingham. Applications to be endorsed "Clerk of Works."

JUNIOR ASSISTANT.—November 11th.—Clacton Urban District Council. £1 1s. per week.—Mr. Geo. T. Lewis, clerk.

SURVEYOR'S ASSISTANT.—November 11th.—Lewisham Borough Council. £80—£120.—Mr. E. Wright, town clerk.

CLERK OF WORKS.—November 12th. Stalybridge and Dukinfield Joint Sewerage Board. £3 3s. per week.—Mr. W. Moss, clerk, Market-place, Ashton-under-Lyne.

INSPECTOR OF NUISANCES.—November 12th. Southborough Urban District Council. £104 per annum.—Mr. Philip Hanmer, clerk.

INSPECTOR OF NUISANCES.—November 15th.—Westhampnett Rural District Council. £100 per annum.—Mr. W. D. Rasell, acting clerk.

SURVEYOR'S ASSISTANT.—November 16th.—East Suffolk County Council. £90—£120.—Mr. A. Townshend Cobbold, clerk, County Hall, Ipswich. Applications to be endorsed "Surveyor's Assistant."

SURVEYOR.—November 19th.—Upper Brue District Drainage Board. £115 per annum.—Mr. R. Bath, clerk, 11 Chilkwell-street, Glastonbury. Applications to be endorsed "Eastern District."

CLERK OF WORKS.—November 20th. Hackney Borough Council. £4 4s. per week.—Mr. W. A. Williams, town clerk.

MUNICIPAL ENGINEER.—November 21st.—Municipal Board of Cawnpore. Rs.800–1,000 per mensem.—Mr. C. E. Goument, C.S.I., M.INST.C.E., c/o Messrs. Thos. Cook & Son, Ludgate-circus, London.

ENGINEER AND SURVEYOR.—November 25th.—Rawmarsh Urban District Council. £200 per annum.—Mr. J. W. Bellamy, clerk. Letters to be endorsed "Engineer and Surveyor."

DEPUTY CITY SURVEYOR.—November 30th.—Corporation of Manchester. £750 per annum.—Mr. Thos. Hudson, town clerk.

ARCHITECTURAL DRAUGHTSMAN.—Public Works Department, Kedah, Malay States. £350 per annum and free quarters.—Box No. 1,194, THE SURVEYOR office.

ASSISTANT DRAINAGE ENGINEER.—Corporation of Madras. Rs.500—700 per mensem, and motor bicycle allowance. Age not to exceed thirty-five.—James Mansergh & Sons, agents to the corporation, 5 Victoria-street, Westminster. Envelopes to be endorsed "Drainage Assistant."

ENGINEER'S ASSISTANT.—Municipal Commissioners of Singapore. $350 per month. Age under thirty-two.—Mr. C. C. Lindsay, M.INST.C.E., 180 Hope-street, Glasgow.

DRAUGHTSMAN (Temporary). Corporation of Hertford. £3 3s. per week.—Mr. John H. Jevons, borough engineer.

MUNICIPAL COMPETITIONS OPEN.

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RHYL.—November 18th.—Plans, specifications and estimates for strengthening Rhyl pier, for the urban district council.—Mr. A. Rowlands, clerk.

ORSETT (Essex).—January 1st.—For the construction of a sewerage and sewage disposal scheme in the parish of South Ockendon, for the Orsett Rural District Council. Premiums of £50 and £25 are offered.—Mr. James Beck, clerk, 2 Orsett-road, Grays.

DUBLIN.—January 1st.—Designs for municipal buildings for the corporation. The proposed expenditure is £50,000, and the author of the design placed first will be appointed to carry out the scheme on a 5 per cent basis. Premiums of £150 and £100 are offered. The assessor is Mr. Albert E. Murray, F.R.I.B.A.—The Town Clerk.

HARROGATE. February 3rd. Designs for a council school, for 675 children.—Mr. C. E. Rivers, ASSOC.M. INST.C.E., borough engineer.

DURSLEY.—Competitive designs for thirty cottages, for the rural district council.—Mr. J. Collett, clerk to the Parochial Committee, Dursley.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1369 Holborn), subject to later confirmation by letter.*

Buildings.

CORNWALL.—November 9th.—For additions and alterations at a school, for the Education Committee.—Mr. F. R. Pascoe, secretary, Education Department, County Hall, Truro.

GLAMORGAN.—November 9th.—For the erection of two detached cottages and four pairs of semi-detached cottages, and the construction of accommodation road, for the county council.—Mr. T. Mansel Franklin, clerk, County Hall, Cardiff.

BLACKPOOL.—November 9th.—For the erection of public conveniences, for the corporation.—Mr. John S. Brodie, borough engineer.

FOREHOE.—November 9th.—For rebuilding a bridge, for the rural district council.—Mr. W. P. Smith, clerk, Vicar-street, Wymondham.

MARGATE.—November 11th.—For repairs to the water tower, for the corporation.—Mr. Edward Brooke, town clerk.

BIRMINGHAM.—November 11th.—For the erection of stabling, for the corporation.—Mr. William Holt, superintendent and engineer, Refuse Disposal Department.

CAMBRIDGE.—November 11th.—For the erection of cottages, for the corporation.—Mr. J. E. L. Whitehead, town clerk.

PETERHEAD.—November 11th.—For the construction of a storage reservoir, for the corporation.—Messrs. Walker & Duncan, engineers, 3 Golden-square, Aberdeen.

RICHMOND (Surrey).—November 11th.—For extensions to the public baths, for the corporation.—Mr. Henry Sagar, town clerk.

CLEETHORPES.—November 11th.—For the erection of a bandstand, for the urban district council.—Mr. C. H. Waithman, engineer and surveyor.

GLAMORGAN.—November 11th.—For the erection of new school and school extensions, for the county council.—Mr. T. Mansel Franklen, clerk, County Hall, Cardiff.

YORK.—November 12th.—For the erection of thirty cottages, for the corporation.—Mr. F. W. Spurr, city engineer.

STOCKPORT.—November 12th.—For the erection of a shelter, bowl house and tennis pavilion, for the corporation.—Mr. J. Atkinson, borough surveyor.

WEDNESBURY.—November 12th.—For the erection of a public convenience, for the corporation.—Mr. T. Jones, town clerk.

WOOLWICH.—November 13th.—For the erection of sanitary conveniences in Royal Victoria Gardens, for the borough council.—Mr. Arthur B. Bryceson, town clerk.

RUGBY.—November 14th.—For the erection of a discharge block at hospital, for the Joint Hospital Board. Mr. T. W. Willard, architect, Market-place, Rugby.

EASTBOURNE.—November 14th.—For the construction of a coal bunker retaining wall, for the corporation.—Borough Electrical Engineer.

PRESTON.—November 15th.—For the erection of a tram shelter and public convenience, for the corporation.—Borough Surveyor.

BIRMINGHAM.—November 18th.—For the erection of a school, for the Education Committee.—Mr. J. Arthur Palmer, secretary, Council House.

DURHAM.—November 18th.—For alterations at a school, for the county council.—Mr. J. A. L. Robson, Shire Hall, Durham.

CHELMSFORD.—November 18th.—For the erection of an engine-house, for the corporation.—Mr. G. Melvin, town clerk.

PORTSMOUTH.—November 19th.—For the erection of stores, for the corporation.—Borough Engineer.

CHESHUNT.—November 19th.—For carrying out structural alterations, for the urban district council.—Mr. J. E. Sharpe, engineer and surveyor.

HACKNEY.—November 21st.—For the erection of a branch library, for the borough council.—Mr. W. A. Williams, town clerk.

BEBINGTON.—November 21st.—For the erection of a school, for the Administrative Sub-Committee.—Mr. J. Harding, clerk, Library Cottage, Bebington, near Birkenhead.

LINDSEY (Lincs).—November 21st.—For the erection of a school, for the Education Committee.—Mr. S. Maudson Grant, secretary, 286 High-street, Lincoln.

CAISTOR.—November 21st.—For the erection of cottages, for the rural district council.—Mr. A. A. Padley, clerk.

NORWICH.—November 22nd.—For the erection of a shelter at the cemetery, for the corporation.—Mr. A. E. Collins, city engineer.

WEST RIDING.—November 22nd.—For alterations to a school, for the Education Committee.—Mr. Francis Alvey Darwin, clerk, County Hall, Wakefield.

HERTS.—November 25th.—For the erection of a school, for the county council.—Mr. Urban A. Smith, county surveyor, Hatfield.

Iron and Steel.

KEIGHLEY.—November 9th.—For laying line of water pipes and other works, for the corporation.—Mr. W. Bagshaw, town clerk.

MANCHESTER.—November 9th.—For the erection of a 96-tube fuel economiser, for the corporation.—Mr. Thomas Hudson, town clerk.

LEEDS.—November 15th. For laying cast-iron water pipes, for the corporation.—Mr. Chas. G. Henzell, waterworks engineer, Great George-street, Leeds.

EGREMONT.—November 18th.—For the supply of materials for and construction of water supply, for the urban district council.—Mr. John Nelson, clerk.

NEWMARKET.—November 25th.—For carting, excavating for and laying 5 miles of 3-in. cast-iron pipes, including fixing valves and hydrants, and erection of brick water tower, for the rural district council.—Mr. S. J. Ennion, solicitor.

NEWMARKET.—November 25th.—Supply of 163 tons of 3-in. cast-iron pipes and specials, the erection of cast-iron tank and other works, for the rural district council.—Mr. S. J. Ennion, solicitor.

KNOTTINGLEY.—(No date.)—For the supply of 10-in. and 6-in. cast-iron rising main and specials, for the urban district council.—Mr. W. Swaine, clerk.

COCKERMOUTH.—(No date.)—For scraping 16 miles of water mains and fixing hatch boxes, valves, covers, pipes and other fittings, for the rural district council.—Mr. J. H. Musgrave, clerk.

BERWICK.—For the supply of 745 tons of cast-iron pipes, valves, hydrants, engines, pumps and two Lancashire boilers, for the Sanitary Authority.—Mr. W. Weatherhead, clerk.

Roads.

HASTINGS.—November 9th.—For the supply of 1,200 yds. of best unbroken blue stone, for the rural district council.—Mr. A. R. Inskipp, clerk, 11 Wellington-square, Hastings.

WILLINGTON.—November 9th.—For work of making up, for the urban district council.—Mr. J. H. Gardner, clerk.

WALSALL.—November 9th.—For making up Charles-street, for the corporation.—Mr. J. R. Cooper, town clerk.

NORTHUMBERLAND.—November 9th.—For supplying, breaking and carting stone, for the county council.—County Surveyor, Newcastle-on-Tyne.

SKIPTON.—November 11th.—For work of making up, for the urban district council.—Mr. Richard Wilson, clerk.

WANDSWORTH.—November 11th.—For making up and paving part of Southcroft-road, for the borough council.—Mr. D. A. Nicholl, town clerk.

BEDLINGTONSHIRE.—November 11th.—For work of making up, for the urban district council.—Mr. Charles D. Forster, joint clerk, 24 Grainger-street West, Newcastle-upon-Tyne.

MANCHESTER.—November 11th.—For making up certain thoroughfares, for the corporation.—Mr. Thomas Hudson, clerk.

BROADSTAIRS.—November 11th.—For the supply of pit flints, for the urban district council.—Mr. H. Hurd, surveyor.

WHITSTABLE.—November 11th.—For the supply of pit flints, hoggin and granite, for the urban district council.—Mr. A. Goldfinch, surveyor.

EAST COWES.—November 11th.—For supplying 500 cub. yds. of granite, for the urban district council.—Mr. Atherstone Damant, clerk, Cowes.

SALTASH.—November 12th.—For making up certain streets, for the urban district council.—Borough Surveyor.

PENYBONT.—November 12th.—For making up nine streets, for the rural district council.—Mr. R. Harmer Cox, clerk, Union Offices, Bridgend.

LONDON.—November 12th.—For the supply of Jarrah and creosoted deal paving blocks, for the county council.—Sir Laurence Gomme, clerk.

EDMONTON.—November 12th.—For making up certain private streets, for the urban district council.—Mr. W. Francis Payne, clerk.

TODMORDEN.—November 12th.—For paving several streets, for the corporation.—Mr. D. Sutcliffe, town clerk.

RAWTENSTALL.—November 13th.—For work of paving and setting, for the corporation.—Mr. J. Johnson, borough surveyor.

BIRMINGHAM.—November 13th.—For work of reconstruction, for the corporation.—City Engineer.

EASINGTON.—November 13th.—For paving certain streets, for the rural district council.—Mr. G. Watterhouse, surveyor.

HAMBLEDON.—November 13th.—For making up two streets, for the rural district council.—Mr. Ferdinand Smallpiece, clerk, 138 High-street, Guildford.

BUCKLOW.—November 13th.—For carrying out road repairs, for the rural district council.—Mr. George Leigh, clerk.

BARNSTAPLE.—November 14th.—For the hire of steam roller, for the corporation.—Mr. E. Y. Saunders, borough surveyor.

CHELMSFORD.—November 14th.—For the supply of Guernsey granite and granite chippings, for the corporation.—Borough Engineer.

BRIGHTON.—November 15th.—For the supply of granite kerb and broken granite, for the corporation.—Mr. H. Talbot, town clerk.

METHLEY.—November 16th.—For works of flagging and kerbing, for the urban district council.—Mr. T. Thompson, surveyor.

NELSON.—November 16th.—For private street works, for the corporation.—Mr. J. H. Baldwick, town clerk.

SITTINGBOURNE.—November 18th.—For the supply of Guernsey granite and granite chippings, for the urban district council.—Mr. W. L. Grant, surveyor.

DOVER.—November 18th.—For making up two roads, for the corporation.—Mr. R. E. Knocker, town clerk.

REIGATE.—November 19th.—For the supply of four slop carts, two rotary horse brooms, and four hand trucks, for the corporation.—Mr. Alfred Smith, town clerk.

TRING.—November 20th.—For street and sewerage works, for the urban district council.—Mr. A. W. Vaisey, clerk.

LUTON.—November 21st.—For works of private street improvement, for the corporation.—Borough Engineer.

ARGYLL.—November 21st.—For works of road repair, for the county council.—Messrs. W. & W. Disselduff, district clerks, 160 Argyll-street, Dunoon.

EAST SUSSEX.—November 22nd.—For the supply of materials, cartage and team labour, for the county council.—Mr. F. J. Wood, county surveyor.

FRIERN BARNET.—November 26th.—For work of making up, for the urban district council.—Mr. E. J. Reynolds, engineer and surveyor.

Sanitary.

COCKERMOUTH.—November 9th.—For works of sewerage, for the rural district council.—Mr. J. H. Musgrave, clerk.

TADCASTER.—November 9th.—For the construction of manholes, for the rural district council.—Mr. G. A. Bromet, clerk.

NORMAN CROSS.—November 9th.—For the construction of sewage disposal works, for the rural district council.—Mr. T. H. Peach, clerk, Union Offices, Broadway, Peterborough.

THORNE.—November 12th.—For the removal of town refuse, for the rural district council.—Mr. Harold Plewes, surveyor.

TAVISTOCK.—November 13th.—For laying a sewer and water main, for the rural district council.—Mr. A. K. G. Johnstone, clerk.

CHELMSFORD.—November 14th.—For laying sewer and surface water sewers, for the corporation.—Mr. G. Melvin, town clerk.

MANCHESTER.—November 15th.—For carrying out sanitary alterations, for the corporation.—Chairman of Drainage Sub-Committee.

HALIFAX.—November 16th.—For the construction of earthenware pipe sewers, for the corporation.—Mr. J. Lord, borough engineer.

BELFAST.—November 19th.—For the construction of an outlet sewer, for the corporation.—Mr. R. Meyer, town clerk.

LEWES.—November 19th.—For the construction of sewage disposal works, including screen chambers, buildings, settlement and storm tanks, tidal storage tanks, and sludge drying beds, for the corporation.—Mr. Montague S. Blaker, town clerk.

LEWES.—November 19th.—For the construction of the low-level pumping station and contingent works, for the corporation.—Mr. Montague S. Blaker, town clerk.

GLOUCESTER.—November 26th.—For the construction of a main outfall sewer, for the corporation.—Town Clerk.

ARDSLEY.—(No date.)—For the construction of small sewerage works, for the urban district council.—Mr. C. McNaughton, clerk.

Stores.

BIRMINGHAM.—November 11th.—For the supply of stores, for the Water Department.—Mr. E. Antony Lees, secretary, 44 Broad-street.

WOKING.—November 16th.—For the supply of oil, sludge press cloth, gulley frames and gratings, brooms, shovels, mud scrapers, pickshafts, fagging hooks, pennant kerb, tar paving, dust skips, coke, coal, lamp standards and lanterns, Izal disinfecting fluid, Izal empty pint tins, Izal soft soap, Izal sulphur candles, Sanitas No. 2. hard soap, gummed rolls for disinfecting, disinfecting powder, lime and oats, for the urban district council.—Mr. Robert Mossop, clerk.

Miscellaneous.

LLANFAIRFECHAN.—November 12th.—For laying out a recreation ground and constructing footbridge, for the urban district council.—Mr. W. Ellis, clerk.

COVENTRY.—November 25th.—For the supply of earthenware or stoneware pipes, bends and junction pipes, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

COVENTRY.—November 25th.—For the supply of cast-iron manhole covers, gullies, pavement channels, and step irons, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.

BEXHILL.—For works of sewerage, for the corporation.—Mr. G. Ball, ASSOC.M.INST.C.E., borough engineer and surveyor:—

S. Carey, Bexhill.*—Contract No. 1, £1,526; No. 2, £807; No. 3, £863; No. 4, £1,333. Total, £4,050.
S. Wood, 192 Victoria-road, N.—£1,191, £938, £699, £1,226. Total, £4,054.
S. Johnson, Son & Marsh, Strand, W.C.—£1,360, £931, £630, £1,381. Total, £4,304.
Peerless, Dennis & Co., Limited, Eastbourne.—£1,072, £872, £647, £1,355. Total, £4,536.

BOOTLE.—Accepted for paving and sewering, for the corporation.—Mr. B. J. Wolfenden, borough engineer and surveyor:—
W. A. Gale, Bootle, £236.

BRANDON AND BYSHOTTLES.—For laying sewers with manholes, for the urban district council. Mr. Geo. D. Denkin, surveyor:

	Sleetburn.	Brandon.	Littleburn.
Bradley & Co., Durham	£81	£58	£146
R. Parkinson, Durham	79	58	—
J. Carrick, Durham	66	46	123
Watton Brothers, Crook	65	47	118*
Wood Brothers, Brandon Colliery	62*	45*	122

BROADSTAIRS U.D.C.—For the hire of a steam roller and scarifier the tender of Messrs. Finn & Co., Canterbury, at 2s. 11d. per hour, has been accepted for a three years' agreement. Messrs. Finn & Co. are the present contractors.
For the supplying and laying of 630 yards super. of limestone tar paving, the tender of Messrs. Constable, Hart, & Co., at £90, has been accepted.

DORSET.—Accepted for the erection of an elementary school, for the county council:—
Jesty & Baker, Portland, Dorset, £3,949

GLYNCORRWG.—For making-up work in several streets, for the urban district council.—Mr. W. P. Jones, surveyor:—

D. Lloyd, Cymmer	£375
Barnes, Chaplin & Co., Cardiff	369
A. G. Collins & Co., Barry*	335

GOLDER'S HILL.—For the adaptation of a part of the mansion at Golder's Hill as a residence for the superintendent, for the London County Council:—

G. Godson & Sons, Pembroke Works, Kilburn-lane, W.	£297
Rowley Brothers, Boundary Works, Wood-green	295
J. C. Mather, Islington	270
Marchant, Hirst & Co., Kentish-town, N.W.	245
J. Grover & Son, Wilton Works, Islington	243
Stevens & Sons, Crouch-hill, N.†	237

Architect's estimate, £240.

GUILDFORD.—For making-up approach to isolation hospital, for the corporation:—

A. J. Bullen, Farncombe	£787
H. M. Blaker, Leatherhead	620
A. Streeter & Co., Limited, Shalford	597
G. A. Franks, Guildford*	595

GREENWICH.—For enclosing, paving, and draining additional land in connection with Randall place school, for the London County Council:—

Lister & Co., Holborn viaduct	£508
Galbraith Brothers, Limited, Camberwell green Works	586
J. Appleby & Sons, Southwark park	187
T. W. Heath & Son, 151 Cromwell-road	180
H. Bragg & Sons, Limited, Brixton	169
G. Parker & Sons, Peckham	165
W. V. Good, Camberwell	156
W. Bailey, East Greenwich	149
E. Mills, Siebert Works, Blackheath†	147

Architect's estimate, £112.

HORSFORTH.—Accepted for making up certain streets, for the urban district council.—Mr. H. Raven, surveyor.—
Hannan & Co., Otley, £1,485.

KENSINGTON.—For building works at Middle-row school, North Kensington, for the county council:—Building works at 22 schools, tenders for which were expected to be received during the summer recess, 1912. In the case of the Middle-road school (Kensington, N.), tenders were opened as follows—

Leslie & Co., Limited, Kensington-square	£24,529
C. F. Kearley, Great Marlborough-street	23,498
F. & H. F. Higgs, Herne-hill	23,235
W. Johnson & Co., Limited, Wandsworth-common	23,086
J. & C. Bowyer, Limited, Upper Norwood	22,936
G. Godson & Sons, Kilburn	22,730
G. E. Wallis & Sons, Limited, Haymarket	21,944
Patman & Fotheringham, Limited, Islington	21,923
McCormick & Sons, Limited, Essex-road	21,332
E. Lawrance & Sons, Limited, City-road†	21,300

Architect's estimate, £21,500.
† The amended tender recommended for acceptance was £20,205.

LEWISHAM.—For making up work with artificial stone, for the borough council. Mr. E. van Putten, borough surveyor.—

	Per super. yd. s. d.
J. Wainwright & Co., Limited, Shepton Mallet	4 6
Gibson & Co., London	3 10½
Thames Stone Company, Limited, Barking	3 10
Atlas Stone Company, Cambridge	3 9
W. Pearce, Forest Hill	3 7

POPLAR.—For installing heating apparatus in Riccardo-street school, for the London County Council:—

J. Grey, Limited, Chelsea	£1,080
J. C. Christie, Aldgate	875
B. Harlow & Son, Macclesfield	870
The Brightside Foundry and Engineering Company, Limited, Westminster	853
Hayward Brothers, & Eckstein, Limited, Borough	845
A. Macintosh & Sons, Limited, Cambridge†	788

Architect's estimate, £825.

ROMFORD.—For the supply of Guernsey granite, for the urban district council.—Mr. J. Turvey, surveyor:—

	Per ton. s. d.
Fry Brothers, Greenwich	14 10
A. & F. Manuelle, London	14 9
J. Mowlem & Co., Westminster	14 5
W. Griffiths & Co., Bishopsgate-street	14 4
Brookes Limited, Westminster	14 0
Croft Granite Company, Croft	13 11
E. Jarrett & Co., Seething-lane, E.C.*	13 6

ROTHERHAM.—For excavating, laying, jointing, and filling in 21 miles of cast-iron spigot and socket pipes, the sizes ranging from 8-in. to 3-in., for the rural district council:—
Staveley Coal & Iron Company, Limited, Staveley Works, near Chesterfield.—At prices (1) in turf; (2) in metalled road; (3) in ash footpath. Amounting approximately to £3,164.

ROTHERHAM.—For the supply of 1,330 tons of cast-iron spigot and socket pipes with special castings, for the rural district council:—
Sheepbridge Coal and Iron Company, Limited, near Chesterfield.—At approximately £9,000. Special fittings, to Guest and Chrimes, Rotherham.

ST. COLUMB MAJOR.—For constructing sewers and under-drains and laying out irrigation ground, for the rural district council.—Mr. C. E. Whitford, clerk.

J. Shaddock, Plymouth	£559
E. R. Lester, Plymouth	415
C. L. Duke, Plymouth	372
W. E. Bennett, Bodmin	364
T. Shaddock, Plymouth	363
J. Budge, Stonehouse, Devon*	236

SEDGEFIELD.—For work of scavenging, for the rural district council.—Mr. J. Stones, sanitary surveyor:—

A. Robinson, Trimdon Colliery	£170
H. Downs, Trimdon Cottery	124
H. Robinson, Trimdon Colliery	41
J. Redfern, Trimdon Colliery	40
G. W. Hamston, Hainsforth	28
W. J. Carter, Old Trimdon	24

These are accepted prices for the various districts.

SPRINGFIELD PARK.—For the erection of a bandstand, for the London County Council:—

H. Newell, Phœnix Works, Poplar	£477
R. Harding & Son, Brixton, S.W.	475
G. Godson & Sons, Pembroke Works, Kilburn-lane, W.	366
J. C. Mather, Islington	324
Marchant, Hirst & Co., Kentish Town, N.W.†	294

Architect's estimate, £289

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

NOVEMBER.

8.—Junior Institution of Engineers: Mr. J. W. Wainwright on "The Diesel Engine."
11.—Surveyors' Institution: First Ordinary General Meeting of the Session: The Hon. Edward Gerald Strutt delivers his opening address: Presentation of Gold Medal. 8 p.m.
12.—Royal Sanitary Institute: Discussion on Report of Departmental Committee on Intercepting Traps in House Drains, 90, Buckingham Palace road, S.W. 8 p.m.
13.—Junior Institution of Engineers: Annual General Meeting. Institution of Electrical Engineers. 7 p.m.
14.—Institution of Electrical Engineers: Address by the President, Mr. W. Duddell, F.R.S.; presentation of premiums. 8 p.m.
14.—Concrete Institute: Mr. E. P. Wells delivers his presidential address. 7.30 p.m.
28.—Concrete Institute: Mr. John M. Theobold, F.S.I., on "Bills of Quantities for Reinforced Concrete Work." 7.30 p.m.

DECEMBER.

12.—Concrete Institute: Messrs. R. Cathcart and Lawrence Gould, F.C.S., on "The Effects on Concrete of Acids, Oils and Fats." 7.30 p.m.

TENDERS WANTED.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (*No.* 1359 *Holborn*), *subject to later confirmation by letter.*

EAST SUSSEX COUNTY COUNCIL.

MAIN ROADS.

TENDERS FOR ROAD MATERIALS, CARTAGE AND TEAM LABOUR.

The Roads and Bridges Committee invite Tenders for the Supply of Materials, Cartage and Team Labour for the Maintenance of the Main Roads in the West, South, Central and East Districts of the County, for the year ending 31st March, 1914—*viz.*:

1. Stone, Granite and other approved Material delivered in cargoes to the Council's Wharf in Newhaven Harbour.
2. Flints, Stone, Granite and other approved Material delivered to various Railway Stations and Wharves.
3. Flints, Local Stone and other approved Material delivered on the Sides of the Main Roads.
4. The Cartage of Materials from Railway Stations and Wharves to the Sides of the Main Roads.
5. General Team Labour.

Further particulars, Conditions of Contract and Forms of Tender can be obtained on and after 8th November on application to the undersigned.

Tenders to be delivered at the County Surveyor's Office, County Hall, Lewes, on or before Friday, 22nd day of November, 1912.

The lowest or any Tender will not necessarily be accepted.

F. J. WOOD, Assoc.M.Inst.C.E.,
County Surveyor.

County Hall, Lewes.
October 26, 1912.

(Continued on p. xviii.*)*

APPOINTMENTS OPEN.

EAST SUFFOLK COUNTY COUNCIL.

SURVEYOR'S ASSISTANT.

Applications are invited for the appointment of an Assistant in the County Road Surveyor's Office.

Candidates must possess a sound, practical knowledge of surveying and levelling, drawing, and be quick and accurate with figures.

Commencing salary at the rate of £85 per annum, rising, on approved service, to £90, as from the 1st April, 1913, and thereafter by annual increments of £10 to £120 per annum.

Applications, in candidate's own handwriting, stating age, experience, and enclosing copies of three recent testimonials, and endorsed "Surveyor's Assistant," to be sent to County Road Surveyor, County Hall, Ipswich, on or before 10 a.m. of the 16th November, 1912. Duties to commence as soon as possible.

A. TOWNSHEND COBBOLD,
Clerk to the County Council.

County Hall, Ipswich.
November 5, 1912.

DRAUGHTSMAN (Good) wanted at once for about two months, for the Preparation of Plans for a Sewage Disposal Scheme; must be neat, quick and accurate; able to take measurements and levels. Salary £3 3s. per week.—Apply, with three copies of recent testimonials, to John Hy. Jevons, Borough Engineer, Hertford, Herts.

COUNTY BOROUGH OF SWANSEA.

The Corporation require Two Temporary Assistants in the Borough Surveyor's Office for Private Street Works for a period of 12 months.

Candidates must have a thorough knowledge of the Private Street Works Acts. Salary £10 16s. 8d. per month.

Applications, stating age and qualifications, together with three recent testimonials, to be sent to Mr. George Bell, Borough Surveyor, not later than Monday, the 11th November next.

Guildhall, Swansea.
October, 1912.

DIBDIN'S BIOLOGICAL

NO SLUDGE NUISANCE

SMALL WORKING EXPENSES

CONTRACTORS TO H.M. GOVERNMENT.

SLATE BEDS

47 VICTORIA STREET, WESTMINSTER, S.W.

TELEPHONE—2211 VICTORIA.

The Surveyor

And Municipal and County Engineer.

Vol. XLII. NOVEMBER 15, 1912. No. 1,087.

Minutes of Proceedings.

The Intercepting Trap.

The meeting which was held at the Royal Sanitary Institute this week to discuss the Local Government Board report upon the use of the intercepting trap in house drains was a success so far as the attendance was concerned, and served to indicate the great interest which has been aroused among sanitarians by the publication of this report. In addition to the opening address of Mr. H. Percy Boulnois, nine speakers contributed to the discussion, and it was then decided to adjourn the meeting until next week in order to give an opportunity for others who wished to voice their opinions upon the subject.

Of the nine speakers who have given their views so far five were in favour of the abolition of the intercepting trap and four in favour of its retention, and unless the proceedings take a different turn at the adjourned meeting next week the discussion will, in our opinion, produce very little practical result. We cannot help feeling that this repetition of the pros and cons of the subject is futile. It does not appear to have occurred to the speakers that the Departmental Committee of the Local Government Board spent four years making special investigations and considering arguments for and against the trap from fifty-two witnesses, and to continue the procedure now is simply beating the air. To our mind, two courses are open to the Royal Sanitary Institute. If the general consensus of opinion is to the effect that the conclusions arrived at by the Local Government Board Committee are not justified by the evidence laid before them, it is open to the Institute to set up an impartial committee of its own to carry out similar investigations and take evidence afresh with the view of demonstrating where the conclusions published in the report are wrong; but if this is done as fully and as impartially as by the Local Government Board Committee, it would be necessary to carry out a larger number of experiments extending over a longer period of time and with more perfect apparatus which would deal with every possible condition. Further, it would be necessary to examine more than fifty-two witnesses whose qualifications were superior to those of the persons examined by the Local Government Board Committee, which is absurd.

On the other hand, it is open to the Royal Sanitary Institute to appoint a committee of experienced men selected from the various professions which are concerned in the matter to consider the best means of putting into effect the recommendations of the Local Government Board Committee, and, if it is found desirable to devise some means for providing additional security against the entry of sewer air into buildings in the event of the intercepting trap being omitted from the house drain, to make investigations to decide what new or improved methods of construction or appliances may be introduced for that purpose. If this idea were adopted some practical good would be done, but it is waste of time to continue the rehearsal of the divergent views of the experts. It is not a question of adopting some new, unproved theory. There are a number of towns where the intercepting trap is not used, and no ill results have followed its omission from the house drains. No arguments will alter these facts; but there is room for discussion of the methods which should be adopted to bring the omission of the trap into general practice. The wastes from sinks and baths are already disconnected from the drains at the gullies, and it is not to be supposed that the inventive ingenuity of our experienced sanitary engineers and manufacturers of sanitary appliances is unequal to the task of discovering some means of effectively disconnecting the water-closets and rain-water pipes from the drains without having recourse to an appliance which would perpetuate the defects of the intercepting trap. In these days of progress in sanitary science surely it cannot be necessary to accept the intercepting trap as finality! Limits of space prevent us from dealing with the subject at greater length on the present occasion, but we venture to hope that the Royal Sanitary Institute will rise to the occasion and utilise the splendid opportunity afforded by the adjourned meeting next week to deal with the subject in a more useful manner.

Money Wasted on the Roads: Who is to Blame?

We have given earnest and careful attention to an important editorial article which appeared in a recent issue of *The Commercial Motor*, in which an attempt is made to get at the root of some of the unsatisfactory features of road maintenance in the United Kingdom. In the view of our contemporary highway surveyors do much that is wrong, and waste a great deal of public money against their will, being forced to do so by the corrupt councils of which they are the servants. In some cases, for instance, the surveyor "knows full well that it is to his best interests to let the road get into such a bad state that stone will be required to resurface it, and necessary labour, so much the sooner;" and again, "the method which requires a road to be re-metalled for its whole width, say, once in two years is retained, in preference to the newer method which would give it a life of six or more years." The council is not, however, to be regarded as primarily responsible, for we read:—"Councillors who vote in favour of changes of road construction methods which will reduce annual outgo

upon maintenance do so at imminent risk of the loss of their seats at the next election." In so far as this is a true picture, the state of affairs is, of course, to be deplored, but more as a matter affecting the public purse than as tending to the maintenance of roads in a state prejudicial to the use of motor vehicles. As our readers know, our own solution is the carrying out of such administrative changes as would bring the highway engineers of the country generally into an organisation of sufficient strength and vitality to resist such evil influences: Road Board, county surveyor and district surveyor all working together for the same ends—economy and efficiency. At the same time we are bound to suggest that the view taken by our contemporary seems to be unduly influenced by the contemplation of a relatively small number of bad cases. We cannot, for instance, accept as a statement applying to the country as a whole, "most surveyors simply ignore potholes, or have loose stones dropped into them;" and even so far as this is true the counsel of despair comes quite as often from the would-be road "improver" as from the local councillor. The power for wrong-doing which local councillors possess, and their desire to do it, are neither so great nor so general as to lead to such a result. Many members of local bodies are anxious to do their duty by the community, and have local influence and force of character enabling them to succeed to a large extent; in plain words they are wise and good, not bad and foolish. As regards the responsibility of the ratepayers, there are, in many districts, strong parties in favour of economy, and although the influence of such parties is sometimes adverse, owing to their following a policy of penny wisdom and pound foolishness, this is by no means a general condition. Taking the country as a whole, a large proportion of the electors of local bodies makes efforts to counteract the influence of those who rob the elector *quâ* ratepayer to pay the ratepayer *quâ* elector, and themselves [illegible]

* * *

Why Tar, Particularly?

While recognising that the trend of *The Commercial Motor* article is on the whole towards the light, and welcoming its wholesome outspokenness, we find ourselves in opposition to it as regards contentions made in engineering matters. "Why is it," we read, "at the present time, that there is so much resistance from the departments of some road surveyors against changes in methods of road construction and maintenance? Why was it that the use of tarry and bituminous binders was adopted so tardily, and why are these systems still regarded with disapproval in many districts?" The answers to these questions are to be found in recent issues of The Surveyor, their immediate effect being to suggest another question: Why is it that it is impossible for any person to be connected in any way with motor vehicles without adopting almost fanatical views, one result of which is that the importance of tar and bituminous materials is magnified fourfold relatively to that of other materials? Surveyors are bound to make road crusts which will serve for horses and cyclists as well as for motor vehicles, and we are confident that on the whole they have done as best and as far as can reasonably be expected. Some of the experiments made with bituminous road crusts point very strongly to the need for carrying out such operations more as a matter of engineering work and less as a matter of trial and error. There are, moreover, very good reasons why materials which may ultimately prove widely serviceable cannot be adopted otherwise than very gradually. As regards the construction of roads to suit motor vehicles there are [illegible] signs that the ordinary macadam is better able to overcome road difficulties than almost any other vehicle which is less an authority than Mr. E. Shrapnell Smith himself has assured us that the commercial motor vehicle is to a large extent an instrument of trade rivalry rather than an economic advantage. 'Minutes of Proceedings,' Civil Engineers, Vol. clxxxvi., p. 254.] As regards antagonism to the Road Board, our contemporary is to be thanked for pointing out where this is due to the fact that the Board is letting light into dark places; but with regard to differences of opinion on engineering questions, we are concerned to maintain that any district surveyor is as much entitled to an opinion as any one else. It may be admitted that there is a certain amount of uneasiness abroad as to the influence which may be exerted by the motorists' societies and the Roads Improvement Association upon the practice of British highway engineering. We do not share in this uneasiness. The Roads Improvement Association, we hope and believe, is tending to become a more generally representative body than it is at present, and the Road Board is fully alive to the necessity for a careful sifting of all evidence with respect to the merits of different materials and methods. While we welcome, then, the bold assertion that the Road Board is "stirring up the mud of not a few monstrous examples of wasted public money," we regret that considerations of this kind should be accompanied by remarks which suggest an attitude of—we will not say antagonism, but rather tutelage—towards road surveyors. Referring to London's local bodies, our contemporary states that: "They nearly all still dearly love wooden blocks and asphalt, and use one or other where modern tar or bituminous systems might well be laid." With this gaping crack in its lute *The Commercial Motor* will pipe in vain—to London borough surveyors at any rate. We can hardly bring ourselves to believe that the sentence quoted actually lies before us on the printed page. If it is intended to apply to only a small mileage of streets with comparatively light traffic it is singularly ill-placed. And why "modern tar"? Just as there is "no merit in procedure *quâ* procedure," so is there no value in modernity *quâ* modernity, and the expression "dearly love" suggests that the writer is, for all his moderation of language, straining in a leash.

* * *

Officials as Architects.

Mr. Percy B. Tubbs, F.R.I.B.A., the president of the Society of Architects, dealt at some length in his inaugural address last night with the subject of the desirability of officials to various public bodies being called upon to design important buildings requiring special knowledge and skill. In certain quarters it is sometimes suggested that the design of practically every class of building should be left to the practising architect. When such a [illegible] advanced by architects themselves, they are evidently open to the criticism that their contentions are based on self-interest. Mr. Tubbs, however, regarded the question from the point of view of the public, and in his admirable address very properly confines his plea to the design of original creative works of architecture. We may say at once that we entirely concur in what he said with such commendable moderation. The employment of the official architect or surveyor in such work is fair neither to the authority, the official, nor the public. As Mr. Tubbs observed, a life of official routine faithfully performed does not foster the development of the imaginative faculties or make for that high standard of skill in design which our great public buildings ought to show. He freely admitted, however, that the co-operation of the official architect with the skilled practitioner is wholly desirable, and pointed out that many of our public authorities maintain a staff of assistants of a high standard of knowledge and experience who are intimately acquainted with the practical requirements of every class of public building, and that if this knowledge and experience could be placed at the disposal of the most brilliant creative designer obtainable, when any original work was contemplated, the result would be a blending of the practical with the artistic and the production of a well designed and thoroughly satisfactory public building.

Housing in Ireland.

The practical impossibility of building houses for the working classes at a cost sufficiently low to render it practicable to let them at rents which are economically possible, having regard to the means of those for whom they are intended, is a question which has been pressing upon housing reformers for a long time. Some time ago the National Housing and Town Planning Council determined to urge upon the Government the desirability of practically contributing to the solution of this problem by giving financial assistance to local authorities to enable them to build houses for rural labourers in special areas, and for the poorest classes in the towns, who are at the present time quite unable to pay an economic rent for a sanitary dwelling. The idea of a State subvention of this kind has been severely criticised in certain political quarters, but with this aspect of the question we have nothing to do. We have to call attention, however, to a very careful report which was recently made by a deputation appointed by the National Council to visit Ireland for the purpose of investigating on the spot the effects of the various Irish Labourers Acts for the provision of cheap dwellings for the labouring classes in that country. A perusal of this report shows that, while the general way in which the Acts are being administered is open to some criticism on certain points of minor detail, the policy of a State grant in aid has been abundantly justified by the results which have been achieved. The report states that the supreme merit of the work accomplished in Ireland rests in the fact that local authorities have been enabled to clear away the hovels which existed in all parts, and to build up new houses and a new people in a way which no other method has accomplished elsewhere. In an earlier memorandum published by the council a strong appeal was made for the adoption by the Government of a similar policy in regard to the housing of the poor in country and town in Great Britain. The inquiries in Ireland have convinced the deputation of the wisdom and justice of the appeal then made for the granting of some similar measure of State aid. In conclusion they point out that no other practical remedy has yet been suggested by which British local authorities may be adequately assisted to perform the difficult task of clearing away unfit houses and providing homes in which the poorest families can be reared in decency and comfort.

The Sewerage of Sydney.

The sewage from the Western Southern, Illawarra and Botany districts of the city of Sydney, New South Wales, has hitherto been treated at the Botany Sewage Farm, which is situated on the south side of Cook's River, where the latter enters Botany Bay. This farm, which was originally intended to deal with the sewage from the Southern District only, has from time to time been called upon to serve other divisions of the city, with the result that it is now inadequate to meet the demands made upon it. This fact was recognised some four years ago, when a report was presented by the Parliamentary Standing Committee on Public Works, in which it was recommended that the farm should be totally abolished, and that a system of disposal by discharge into the ocean should be adopted. It was ultimately decided by the authorities to act upon this recommendation, and the work—which is now in hand—is being carried out to designs prepared by the Department of Public Works in consultation with Sir William Matthews, Sir Alexander Binnie and Dr. G. F. Deacon. The magnitude of the works may be gauged from the estimated cost, which is £457,400. The main outfall sewer is being constructed partly in aqueduct and embankment, partly in open trench, and partly in tunnel through sandstone, and there is a syphon under Cook's River, designed with such a fall between its inlet and outlet as will give a velocity of over 5 ft. per second when discharging at its full capacity. The execution of a work of such magnitude and importance is of interest to all municipal and sanitary engineers, and we therefore feel confident that the article which we are enabled, by the courtesy of Mr. Herbert E. Bellamy, the resident engineer, to publish this week will meet with general appreciation.

* * *

Insanitary Rural Cottages.

That the building laws should be enforced without fear or favour is, of course, a truism; but the difficulties of doing this in the case of old properties can only be appreciated by officials concerned with carrying out the law. One of these was alluded to recently at a meeting of the Tiverton Rural District Council, where the suggestion was made by a member that in sanctioning plans "it should be mentioned as a defect that there were no fireplaces in the upstairs rooms." This is a particularly mild way of putting a matter as to which the law lays down specific instructions. The outstanding feature of the discussion, however, was the admission that there are plenty of old cottages with no fireplaces upstairs, and the further suggestion by a councillor who is an owner of cottages that if fireplaces were enforced in all bedrooms "poor people in the country would suffer far more from lack of cottages than they do now," as owners would be compelled to close the houses altogether. The Tiverton Council allowed the matter to drop, with the expression of a pious opinion—for nothing was formulated—that owners should be recommended to provide fireplaces where possible. The practical line, of course, would be for the local authority to consider seriously the question of promoting a housing scheme, and thus seek to replace ancient insanitary dwellings with houses of an improved type. Judging from the comments of councillors, however, this would be the very last thing they would think of doing. This *laissez-faire* attitude should receive in due course attention from the higher authorities, considering the supreme importance of the human interests involved.

* * *

The Surveyors' Institution.

The question of rural housing was referred to by Mr. Edward Gerald Strutt in his presidential address to the members of the Surveyors' Institution on Monday. Mr. Strutt pointed to the absolute necessity for securing improved housing conditions in agricultural districts if the tide of rural depopulation is to be stemmed. At the present time it is practically impossible to build decent and sanitary dwellings at a remunerative cost. Mr. Strutt regarded the question as of so serious a character as to demand an immediate solution. Existing conditions may be mitigated to a slight extent by suitable amendment of the building by-laws, but such a course is by no means sufficient to meet the present need. It is interesting in the light of the report of the deputation appointed by the National Council (which is referred to elsewhere) to observe that Mr. Strutt suggested the possibility of following the example of Ireland under the Labourers Acts. He pointed out, however, that if such legislation were passed for this country, it would be incumbent upon landlords to do their part by finding the necessary sites for the cottages at a low rate.

The Manchester Appointment.

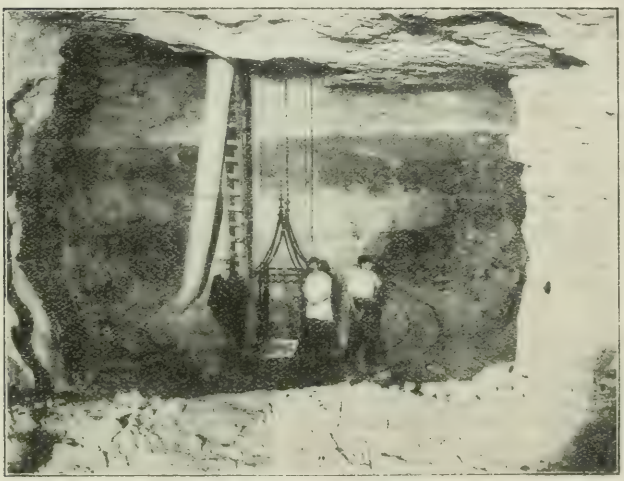
We venture to congratulate the City Corporation of Manchester on the revision they have made in the terms of the contemplated appointment of a deputy city surveyor. As will be seen from the official advertisement (see p. xvii.), the commencing salary offered is now £750; and the scope of the appeal is widened by the removal of the previous restriction of applicants to full members only of the Institution of Civil Engineers. Obviously the prospects of the appointment are attractive, and we have no doubt there will now be keen competition for the post.

Sewerage Construction in Sydney, New South Wales.

GRAVITATION SCHEME FOR WESTERN, SOUTHERN, ILLAWARRA AND BOTANY DISTRICTS.

By the courtesy of Mr. Herbert E. Bellamy, resident engineer in charge of the construction of the first Pacific Ocean outfall section, we are afforded the opportunity of giving a few brief particulars of the scheme now under construction for the disposal of the sewage from the Western, Southern, Illawarra, and Botany districts of Sydney, New South Wales.

Sydney, the capital of New South Wales, is situated on the shores of the land-locked harbour of Port Jackson, which has a coast line of some 200 miles. The population of the city, according to the last census, was 119,800, and that of the suburbs 502,430, making a total of 622,230, distributed over an area of about 140 square miles. The general death-rate, which was 26·77 per 1,000 in 1875, has gradually fallen to 10·36 per 1,000 in the year 1910. For the year ending December 31, 1910, for Sydney and suburban municipalities, the improved capital value of properties was £101,318,074, the unimproved capital value was £43,776,191, the assessed annual value was £6,336,165, the total rates levied was £647,762, while the limitation of rating was £1,081,556.



Sydney Sewerage Scheme: Excavation of Outfall Chamber in Solid Sandstone 100 ft. below Surface.

The areas, population in the years 1908, and prospective population of the districts the scheme now in hand is required to serve are as follows:—

—	Area in acres.	Population, 1908.	Prospective population
Western suburbs	13,010	122,000	360,290
Southern suburbs drained by southern outfall sewer	973	55,080	65,000
Illawarra suburbs	4,879	8,720	60,000
District from Cook's River to ocean	8,000	8,040	182,000
Totals	25,862	193,820	667,290

The prospective population is estimated on a basis of from 20 to 35 per acre for the Western suburbs, 67 per acre for the Southern suburbs, 17 for the Illawarra suburbs, and 20 per acre for the area between Cook's River and the Ocean. Seventy-five gallons per head per day is the quantity of sewage and waste water provided for as the maximum flow, any excess over that, due to storm water finding admission to the sewers, will, when the maximum estimated population is reached, be dealt with by storm-water overflows at the creeks and at Cook's River.

The ordinary average daily volumes to be dealt with as per population in 1908 are as follows:—

Suburbs.	Population, 1908.	Rate per head per day.	Average flow per day. Gallons.
Western suburbs	122,000	21·5	2,623,000
Southern suburbs	55,080	50·8	2,797,048
Illawarra suburbs	8,720	36·15	605,874
District from Cook's River to ocean	8,040		
Totals	193,820	—	6,025,922

At the present time practically all the sewage from the above districts is treated at the Botany sewage farm, which is situated on the south side of Cook's River, where the latter enters Botany Bay. This sewage farm, originally determined upon for the purpose of dealing with the southern sewerage system of Sydney, and in 1898 extended to allow of the sewage of the Western suburbs being treated there, has an area of 620 acres, and the system of disposing of the sewage is partly by irrigation and partly by intermittent downward filtration. It is intended that this farm shall be abolished in its entirety when the works now under construction are completed.

In the year 1908 the Parliamentary Standing Committee on Public Works reported, among other matters, as the result of a most exhaustive and thorough inquiry:—

(1) That the unsuitableness of the soil on the Botany sewage farm, its exposure to tidal influence, the fact that even if used to its full capacity the area of land available would not meet requirements, and the large and increasing population in the locality, to whom the farm is now reasonably a nuisance, render it advisable that the farm should be abolished, and the sewage now treated there, and that which with the retention of the farm would probably be treated there, dealt with by some other method.

(2) That, though the biological or septic tank system of treatment would be a considerable improvement upon the present sewage farm, it is a system not free from conditions which make it, to a certain extent, offensive and otherwise objectionable, and such as should not be adopted if some more effective method, practically inoffensive and capable of being carried out at a reasonable expenditure, can be found.

(3) That the most effective system, if the circumstances justify its adoption, is that of disposing of the sewage by discharging it into the ocean.

(4) That of the different schemes placed before them, the gravitation scheme of the Public Works Department is the most suitable.

(5) That the site chosen for the outfall—the north head of Long Bay—is the most suitable for the purpose.

(6) That, with the abolition of the Botany sewage farm and the adoption of the Long Bay Ocean outfall scheme, all nuisance to the residents of the Illawarra suburbs caused by the present method of sewage disposal will disappear, and

Botany Bay and Cook's River will be greatly improved.

Four schemes for conveying the sewage to the ocean were put before the committee, three by the Department of Public Works, and one by the Metropolitan Board of Water Supply and Sewerage—these prepared by the Department of Public Works comprising an all-gravitation scheme (the scheme proposed), a partial pumping and partial gravitation scheme, and an all-pumping scheme; and that submitted by the Metropolitan Board of Water Supply and Sewerage being a partly pumping and partly gravitation scheme.

Briefly, the proposed gravitation scheme as submitted to the committee at the opening of their inquiry consisted in the construction of a duplicate sewer, with a grade of 1 in 4,400, from the Botany sewage farm to and under Cook's river, and thence, partly through sand and partly through rock, to the north headland of Long Bay, the discharge level being fixed there at 15 ft. below high-water spring tides. The sewer was to be of sufficient capacity to deal with the sewage from the whole of the drainage areas when they are carrying a prospective maximum population of 657,200 persons—but one barrel it was considered would meet requirements for the ensuing twenty years, and therefore, when the service would be in trench or in tunnel through sand, it was proposed to construct one barrel then and the second when required. In aqueduct and in rock tunnel, however, it was considered advisable to construct the sewer of the full size at the outset.

Throughout the investigations of the committee there was a direct conflict of statement and opinion respecting the two principal points in the proposed scheme—grade and outfall—between the officials of the Department of Public Works and those of the Metropolitan Board of Water Supply and Sewerage. Consequently it was deemed advisable to obtain expert evidence from competent witnesses entirely independent of both the department and the board. Several witnesses were examined, and eventually it was decided to obtain a report from the three following experts in England—Sir William Matthews, K.C.M.G., Sir Alexander Binnie, and the late Dr. G. F. Deacon. These engineers made several important recommendations relative to the amendment of the scheme, the principal being as follows:

(1) That the proposed grade of 1 in 4,400 be increased to 1 in 3,650.

(2) That, if possible, the trade effluents be reduced when the sewer is first brought into use.

(3) That the soffit of the outfall discharge pipes be 20 ft. below high water of spring tides, instead of 15 ft.

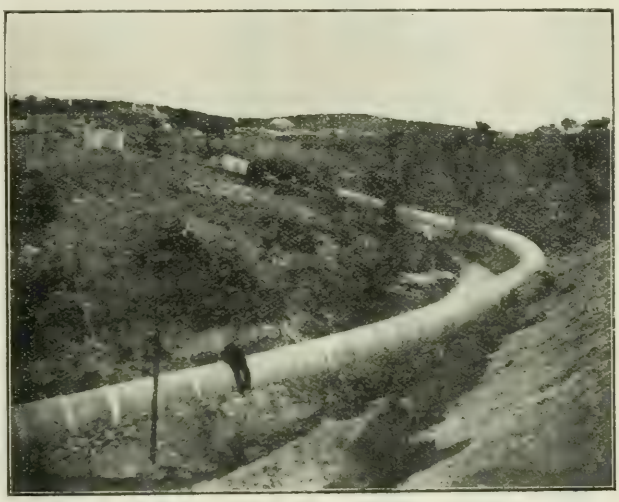
(4) That, instead of the two outfalls from the air-shaft at the end of the main sewer being parallel, they should be spread out, so that, on reaching the sea face of the rock benching, they shall not be at a less distance apart than 150 ft., and that the mouth of each outfall be tapered by means of iron pipes to a distance of 3 ft.

(5) That, wherever the work will be in rock tunnel or cutting, a single instead of a double sewer be constructed; the single sewer to be of a size capable of discharging the maximum quantity of sewage proposed to be dealt with, and the covering of the sewer to be carried out with some curvature.

The following extract from the "Minutes of Proceedings" in September, 1908, shows the resolution passed by the committee: "That, having considered the various schemes submitted to them for the disposal of the sewage from the Western, Southern, Illawarra and Botany districts, the committee are of opinion that the gravitation scheme prepared by the Department of Public Works, and referred to them by the Legislative Assembly, should be carried out, with modifications as recommended in the joint report of Sir William Matthews, Sir Alexander Binnie and Dr. G. F. Deacon, by which the grade of the main sewer shall be 1 in 3,650, and the soffit of the outfall discharge pipes 20 ft. below high-water spring tides: the total cost of the scheme not to exceed £452,400.

The estimated cost of the scheme, at that time amended in accordance with the recommendations of the English engineers, was: capital cost, £452,400; annual cost, £14,120; the details being as follows:—

ESTIMATED COST.	
Sewer across farm (duplicate with screening chambers)	£49,332
Syphon	13,200
Sewer on aqueduct—north side (duplicate)	39,883
Sewer in trench—in soil (duplicate)	24,271
Sewer in trench—in rock (single)	25,854
Sewer in tunnel—in wet sand (duplicate)	134,624
Sewer in tunnel—in rock (single)	93,296
Pumping plant, buildings, &c. (low level)	8,000
Interception of southern outfall	4,920
Engineering and contingencies, 10 per cent	39,320
Interest on cost during construction	15,200
Land resumption	4,500
Capital cost	£452,400
ANNUAL COST.	
Interest on capital cost, at 3½ per cent	£15,900
Renewal fund—buildings, machinery, c.i. pipes, &c.	180
Pumping charges	1,340
Screening sewage, western side of syphon	250
Maintenance of sewers	250
Gross annual cost	£17,920
Less estimated ultimate cost of working farm	3,800
Net annual cost	£14,120



SYDNEY SEWERAGE SCHEME. 48 IN. DIAMETER REINFORCED CONCRETE MONIER PIPES BEFORE FILLING.

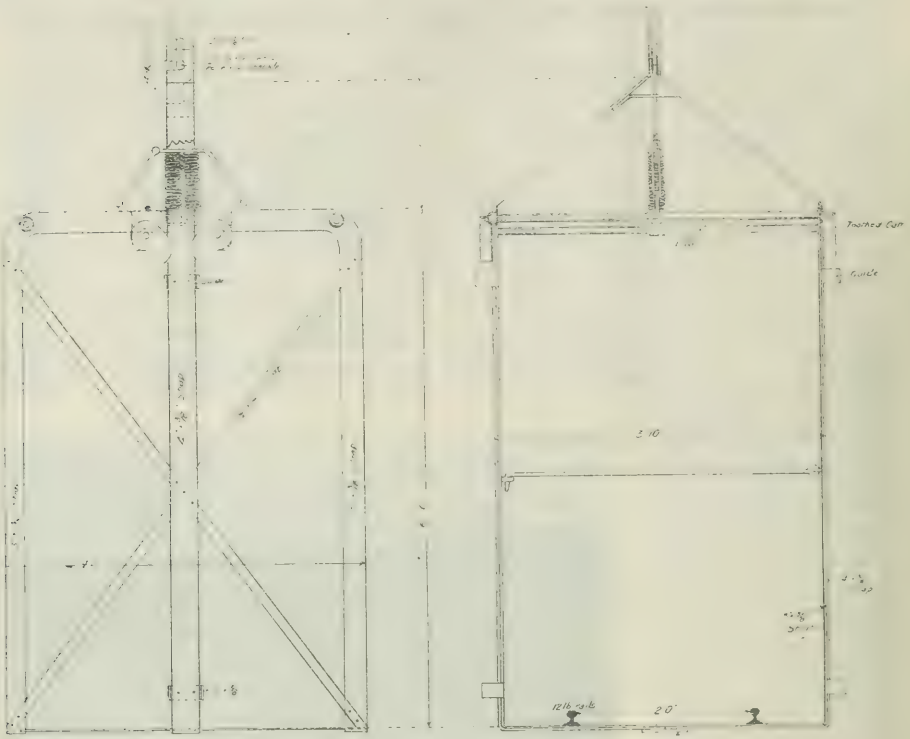
The works now in hand are being executed under the direction of Mr. H. H. Dare, M.E., M.INST.C.E., engineer-in-charge of water conservation and drainage; while the engineer responsible for their design was Mr. L. A. B. Wade, M.INST.C.E., chief engineer of irrigation and drainage.

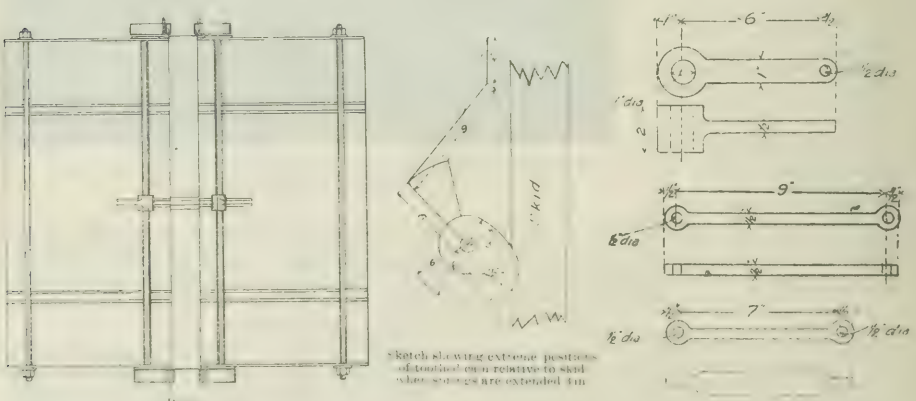
The length of the sewer is about 6¼ miles, with a uniform gradient of 1 in 3,650 throughout, and the average flow velocity in feet per second is calculated at 2·21 with a maximum flow of 2·53 ft. per second. The maximum daily discharge for prospective maximum population on the whole drainage area on this basis will be 153 cusecs.

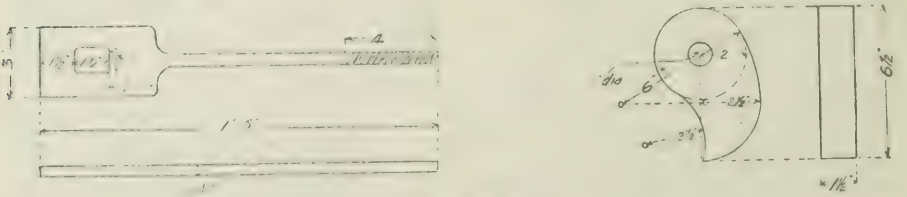
The sewer is being constructed partly in aqueduct and embankment, partly in open trench, and partly in tunnel through sandstone. The syphon under Cook's River is designed with such a fall between its inlet and outlet as will give a velocity of over 5 ft. per second when discharging at its full capacity. Provision has been made for intercepting the present southern outfall on the river side of the screening-house, and carrying it in aqueduct along the river frontage to connect with the ocean outfall sewer near the old Botany water supply pumping station. This sewer is 5 ft. 6 in. in diameter. Provision has also been made for the connections of the triplicate 6-ft. western suburbs sewer, and the main sewer from the Illawarra suburbs. Within the area, the sewerage requirements of which the scheme is expected to meet, there is some low-lying land from which the sewage

...ed, have to be pumped, and for this provision will be made under a separate scheme.

The system existing in the Southern suburbs is a ... is also a "partially combined" one, providing for 75 gallons per head per day and a rainfall of 2 in. per day over a catchment of 200 sq. ft. per head. The





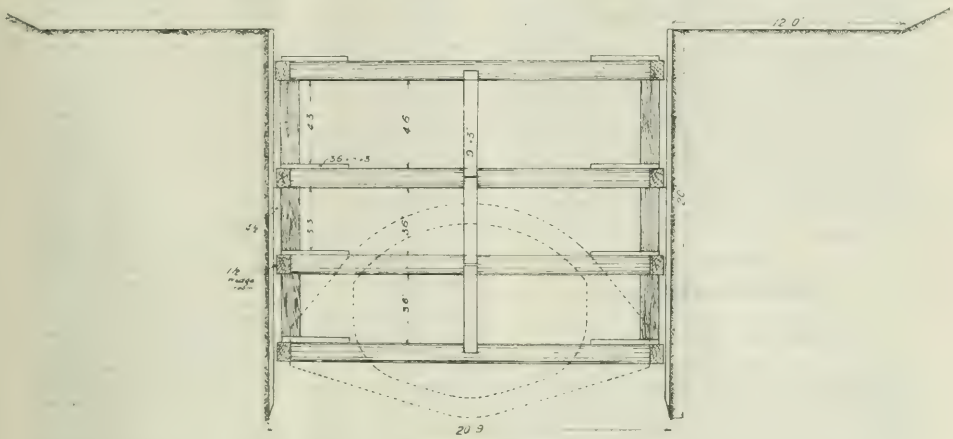


SUBWAY SANITARY SCHEME. SAFETY CAGE FOR LIFTING AND LOWERING WORKMEN IN SHAFTS.

...partially combined one, and designed for 75 gallons per head per day and 1 in. per day rainfall on ... area. In the Western suburbs the system ... estimated maximum prospective population taken into consideration in both cases.)

Regarding the outfall, advantage was taken of the

conformation of the ocean bottom to design the ocean outfall at such a depth below the surface that waves during an ordinary storm would not cause interruption to the flow of the sewage. The outfall at Long Bay on the Pacific will be subject to the influence only of waves of oscillation, owing to its discharge from a vertical cliff with deep water in front of it. The photograph shows the excavation for a chamber formed in the sandstone rock at the bottom of a 12-ft. by 6-ft. ventilating shaft sunk to a depth of 100 ft. This chamber is 24 ft. in height, 30 ft. wide at its widest part, and 32 ft. in length in the line of the sewer, and is 100 ft. back from the ocean cliff. The size of the sewer as it enters this chamber is 12 ft. 3 in. wide at springing level, and 7 ft. 6 in. high from invert to soffit. From the chamber two tunnels are being driven to a submerged cliff standing 200 ft. out from the ocean cliff. The cliff is of hard sandstone, dipping south 70 deg., west about 2 deg., and presents a bold escarpment to the east. The land cliff is about 90 ft. high, and the base is 10 ft. above high-water springs. The sea cliff is about 42 ft. high, and practically vertical, the top being at the high-water level of spring tide, and the base 37 ft. below the level of low water. The bottom for at least ½ of a mile seawards is composed of large rough boulders, swept by the prevailing southerly current, and has a mean depth of about 100 ft.



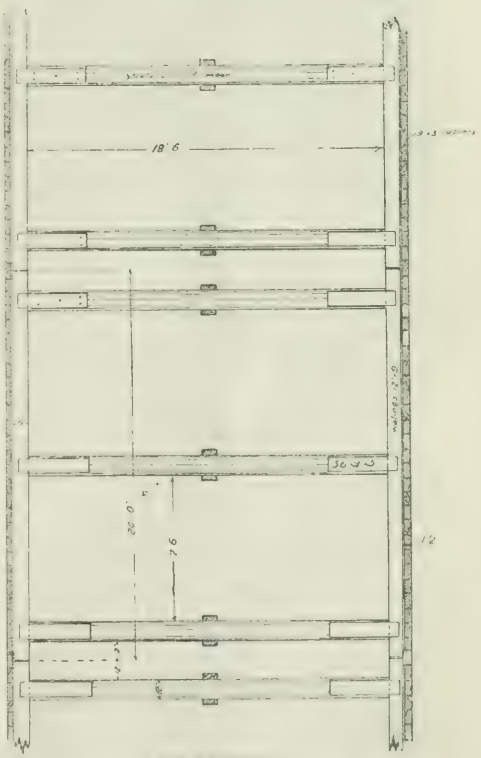
Section of Open Cut

The outfall pipes, two in number, are each 5 ft. in diameter, with falls of 1 in 14·41 and 1 in 12·36 respectively, and the ends are splayed out in the form of a V about 20 ft. apart. The object of spreading out the outfalls is that a wave striking the rock would be less apt to cause a simultaneous pulsation in the two branches of the outfall than if adjacent to each other and on parallel lines. Moreover, with the forked or V system, a pulsation up one of the branches would tend to clear out the sewage from the adjacent branch.

As steps are not provided in the invert, the sewer has been widened in cross-section for certain lengths at such places where important branch sewers enter the main sewer. This was necessary so that the water surface would not have a reduced gradient and velocity just above each junction. The greatest cross-section of the sewer is 12 ft. 3 in. by 9 ft. high. The work of tunnelling through the sandstone rock for 2 miles (nearly completed) is being done partly by machine and partly by hand. With regard to the rate of progress in the various drives, experience proved that driving through soft sandstone rock and shale could be done rather quicker by hand than by machine. Nine shafts, each 12 ft. by 6 ft., were sunk, and vary in depth from 38 ft. to 133 ft. respectively. The greatest depth of the sewer below ground level is 170 ft. The longest tunnel drive is 1,586 ft. The cost of excavation in tunnel through the rock for labour only averages about 24s. per cubic yard, and the cost for explosives about 1s. 9d. per cubic yard removed. The ordinary average forward lineal progress per miner per week in a drive having a sectional area of 92 sq. ft. equals about 2½ ft. The work of scabbling or trimming the tunnels before concrete lining is put in is being done with jack hammers and poppers worked by compressed-air plants, all of which were manufactured and supplied by the Ingersoll Rand Company.

The sketches show the safety cages in use as designed by the writer for lowering and lifting the workmen in the shafts.

As is to be expected on a works of the magnitude of the one in question, a considerable sum has had to be expended on plant. Fortunately, electrical power generated by the Sydney City Council is accessible, and has been utilised throughout, the charge for power being 1½d. per unit. In the water-bearing sand strata, interlocking steel piles in 40-ft. lengths have been driven. These piles were obtained from the Carnegie Steel Company, and are 12 in. wide, and weigh 40 lb. per lineal foot. A travelling gantry, 52 ft. high, equipped with a 2-ton Arnott pneumatic hammer, has-



Plan of Timbering.

Sydney Sewerage Scheme.

been constructed for driving the sheet piling, and two water jets are being used, one at the back and one in front of the toe of each pile.

A drawing shows the system of numbering adopted, another including a dotted outline section of the 12-ft. 3-in. by 9-ft. sewer in an open cut through sand 48 ft. deep.

Disposal of surplus soil is nearly always an expensive item. In one case, where a natural creek ran through a public park, the creek was culverted and filled up for about 20 ft. with 40,000 cub. yds. The photo shows 48-in. diameter reinforced concrete Monier pipes laid before filling is done.

The whole of the works described are being carried out by the Government on the day-labour system. It is estimated that another eighteen months or two years will elapse before they are finally completed.

For information dealing with the whole of the sewerage systems of Sydney, readers are referred to the paper on the subject by Mr. Joseph Davis, M.Inst.C.E., presented to the Institution of Civil Engineers on January 28, 1902, and published in vol. 148 in the "Proceedings" of that body.

OFFICIALS AS ARCHITECTS.

By Percy B. Tubbs, F.R.I.B.A., President of the Society of Architects.*

The question of official architects is one which most seriously affects the future of our profession. Just when a generation of able men has arisen who have devoted their lives to the study of the more monumental aspect of architecture, we find the growth of a system which threatens to deprive them of their livelihood and of any opportunity of placing their special attainments at the disposal of the community. But, although the growth of the practice of employing official architects deprives the independent and specially trained men of the bulk of the public work, it is necessary to endeavour to approach the subject from the broadest possible point of view, in the interest of the public and the advancement of architecture, for, after all, architects exist for the good of the community. I think that the present system only exists because the public is misinformed, and it will only continue to exist just as long as the indifference and ignorance of the public lasts. The public has a right to the services of the best talent in the country, but under the present system it does not get it, although it may be under the impression that it does.

There can be no doubt that every building erected by public authorities should be designed by the one man in the country who is best able to solve the particular problem involved. The system of employing the official architect does not insure this, and the public interest suffers in consequence. Instead of securing the best available architect by public or limited competition or otherwise, we find corporations and Government departments entrusting important buildings, requiring special skill in design, to the officials who were appointed to their positions for qualities of an entirely different character, such as administrative ability or because of their special qualifications as surveyors.

The result has not been able to close effectively between knowledge and skill, the knowledge of the requirements of a building or of a public department, on the one hand, and the architectural skill in the designing of that building which, although acquired, which is the property of an architect can possess.

I do not think that the arguments which apply to the appointment of surveyors and engineers to the boards, do not apply to the appointment of architects. One never hears of a medical man being called upon to perform surgical operations or a lawyer being asked to act as a doctor, but the official architect is being called upon to design buildings requiring special knowledge and skill and it seems to me that a life of this sort, faithfully performed does not foster the development of the imaginative faculty or make for the high standard of skill in design attained not by long experience which a new public building should possess. Nor can I see the public benefit in having to make room, that the ablest designers we possess and will need in official positions under present conditions, and that when a public body advertises for an official architect the very men to whom the public work should be entrusted refuse to apply for the post.

Figures have lately been produced to prove that it is as economical to employ officials as to employ independent architects, but even if this is true the value of the article obtained is not the same. The lower standard of design produced by officials compared with what might be produced by the very best of our designers destroys the value of the comparison. If the conditions of official service were so revolutionised as to tempt the most gifted designers to sacrifice their independence and produce the best possible architecture in their capacity as officials, the cost of official architecture would be far in excess of what it is at present, and far in excess of what it would cost to employ the same man as an independent architect, under conditions that entail no sacrifice on their part.

It appears to me that there is a certain obligation resting on the president of such a society as this to place these facts before the public without fear or favour, for, after all, the public suffer most by the present system, and it must be clear that if the present tendency increases till all the public work is done by officials, the ablest men, finding no opportunity in this direction, will no longer devote their attention to public work, but will concentrate on private work, and the standard of public buildings will be permanently fixed at that level of respectable mediocrity that is now characteristic of nearly all the official architecture in the country. I venture to think that when the public realise that they get better work for less money by employing an independent architect they will not hesitate to demand an alteration in the present system, and will not be content till they get it.

It must not be supposed, however, that an architectural department for routine and advisory work is not capable of doing good public service; on the contrary, I think it almost indispensable, but it should not be employed in original creative works of architecture. Many of our public authorities maintain a staff of assistants of a high standard of knowledge and experience who are intimately acquainted with the practical requirements of every class of public building, and if this knowledge and experience could be placed at the disposal of the most brilliant creative designer obtainable, when any original work was contemplated, the result would be a blending of the practical with the artistic and the production of a well designed and thoroughly satisfactory public building.

* [illegible] address as president of the Society of Architects, the matter contained forming part of the [illegible].

Address Wanted.—A firm of engineers require the address of the Watkins Heat Recorder Company. Please address "H. N." c/o The Editor.

Architectural Competitions. In his presidential address to the Society of Architects last night, Mr. Percy B. Tubbs, F.R.I.B.A., said the remedy for the unsatisfactory conditions existing in this connection rested very largely with the profession itself. The promoting bodies did not always purposely err, but were sometimes in ignorance of the existence of the conditions which the profession considered should be laid down for competitions. Something might be done by having a statement issued in the first place to every local authority in the kingdom, and from time to time to other promoters of competitions, giving the details on which it was suggested a competition should be conducted, and making it clear that if these lines were departed from architects who were members of architectural societies would refrain from competing. This circular should be signed by the responsible officials of every architectural society in the kingdom. He also felt that if an advertisement were inserted each week in the professional journals making it clear to promoters of architectural competitions that the conditions had to be approved by the society [illegible] any of their members would be asked, and suggesting that the conditions governing the competitions should be drawn up to agree with the printed particulars issued by the society and the Royal Institute of British Architects, it would very soon educate the promoters up to a proper standard. Some architects hold the view that in the case of limited or local competitions, if the invited competitors or the architects within the defined area were agreeable to the conditions laid down, whatever they were, such competitions should not be barred by architectural societies, but he personally felt that all competitions should be conducted on recognised lines, and that there should be no exception to the rule.

Intercepting Traps in House Drains.

THE DEPARTMENTAL COMMITTEE'S REPORT: ROYAL SANITARY INSTITUTE DISCUSSION.

A largely attended meeting of the Royal Sanitary Institute, presided over by Sir Maurice Fitzmaurice, C.M.G., M.INST.C.E., was held in London on Tuesday evening, when a discussion on the recently issued report of the Departmental Committee of the Local Government Board on Intercepting Traps in House Drains was initiated by Mr. H. Percy Boulnois, M.INST.C.E., chairman of the council of the institute. The number of speakers made it impossible—even with a time limit vigorously enforced—to finish the discussion in a single evening, and it was therefore adjourned until next Tuesday. Mr. Boulnois' paper is really a review of the report. The author did not read it, but touched briefly upon its main points, which are also the main points of the report, concluding with the query: What are to be the substitutes for the trap?

Mr. Boulnois said: The controversy with regard to the question of intercepting traps is not new. At a sessional meeting of the Royal Sanitary Institute held in London on February 4, 1906, Dr. Butler, medical officer of health of Willesden, read a paper entitled "Is the Intercepting Trap a Failure?" and Mr. Read, the city surveyor of Gloucester, followed with a short paper on the same lines. Both these gentlemen condemned the trap as a failure to secure isolation from the sewer. An interesting discussion followed, in which various opinions were expressed. Dr. Butler evidently did not let the matter rest, for in 1908 the Willesden Urban District Council approached the Local Government Board with a proposal to adopt a series of building by-laws in which the requirement as to the provision of an intercepting trap was to be omitted. The Local Government Board refused, but promised that an inquiry into the question should be made. A departmental committee was formed, investigations and inquiries proceeded, and after four years' work the report of the committee has been published.

The report practically condemns the intercepting trap. Our long-cherished belief in the efficacy of the trap has been rudely shaken, and it behoves us very seriously to consider this report and the conclusions at which the committee have arrived. For at least thirty years the Local Government Board have insisted on the provision of an intercepting trap, and proper air circulation, in all by-laws relating to house drainage; and it will be interesting to see what line will now be taken by the board in view of this report from a committee of their own officials. The members of the committee are all personally known to me, and are all highly experienced in their respective professions. The report has taken four years to produce, and bears evidence of the extreme care and labour with which the investigations were made, and the manner in which the conclusions were arrived at. We shall all of us agree, whatever our opinions may be on the merits or demerits of the intercepting trap, in thanking the committee for their labours, and for the very interesting and valuable report which they have produced.

I will endeavour to deal, during the short time at my disposal, with the various indictments which are raised in the report against the use of the intercepting trap, and the conclusions at which the committee have arrived in each case.

No. 1.—That, as the trap forms an obstacle to the passage of sewer air through the house drain its use renders the ventilation of sewers more difficult and costly.

This contention raises the whole question of the ventilation of sewers, on which much time has often been spent, and many papers written and discussed. We are all of us acquainted with the difficulties which surround this subject, and the committee have evidently been thoroughly aware of these difficulties, with which they deal at some length, and it is interesting to observe that on page 41, par. 119, they state:

> "Too much importance has been attached to the question of sewer ventilation, for there is a considerable amount of evidence which indicates that the necessity for ventilation of sewers has been exaggerated."

In connection with this, I may perhaps be allowed to point out that at the Sanitary Congress at Dublin, in September, 1884, I read a paper which I called "Isolation versus Ventilation," in which I endeavoured to point out that the practice of openings in the streets for the so-called purpose of ventilation of sewers then in vogue was unsatisfactory and unnecessary, and that it was more important to isolate the house "by means of simple and effective traps" than to make these openings in the sewers, and that all that was needed, if this were done, was to erect a few "relief pressure shafts" at proper positions on the sewer.

I gave a chronological list of different methods suggested and tried for the purpose of ventilating sewers, from the year 1840 to 1884 and it is interesting to note that in regard to the year 1882—

> "Mr. Read, the surveyor of Gloucester, suggested that all house drains should be used as upcast shafts to ventilate the sewers, for he argued that, as the sewer was used for the benefit of owners of house property, so should they contribute to the ventilation."

Which shows, I think, that even twenty-eight years ago the question of the advantage of the intercepting trap was doubted.

The Departmental Committee's report goes very fully into this question of ventilation of sewers, and arrives at the following conclusion:—

> "If, therefore, the objection to the intercepting trap rested solely or mainly on its interference with sewer ventilation, we should be inclined to question the importance of such an objection." (Page 42, par. 121.)

Personally, I agree with this conclusion, though no doubt the advocates for the abolition of the trap may have many arguments in favour of the free ventilation of sewers through the house drains as being the solution of the problem.

It is contended by many persons, and the report also deals with the question, that the presence of the trap in the house drain containing sewage, often in a state of decomposition, largely contributes to the formation of gases and offensive smells in the sewer, and there is some considerable weight in this contention, if it can be shown that a house drain, without an intercepting trap, would never contain decomposing sewage. I propose to deal later with this contention.

No. 2.—It is asserted that the presence of an inlet necessitated by the practice of the intercepting trap often acts as an outlet for foul air and creates a nuisance.

This contention is supported by considerable evidence in the report especially by Dr. Butler, of Willesden, who stated, *inter alia*, that diphtheria had prevailed in his district more, by scores of years, in areas where the intercepting trap is universal than in other areas where the trap was absent.

The report says [page 3, par. 10]: "With few exceptions the evidence was unanimous that the inlet is an objectionable feature of the house drainage system," not only as an outlet for smells, but also as being sometimes responsible for blockage of the trap through earth and detritus getting into it. The committee, moreover, were not sure that a fresh-air inlet is essential for an intercepting trap, and they quote some experiments made by Mr. Steele in support of this contention.

We shall, I think, all agree that if the fresh-air inlet is placed in an inappropriate position it may at times become a nuisance by acting as an outlet for drain air instead of as an inlet, even if provided with a mica flap; but even if this is so, it may be argued that a smell coming from this inlet indicates that there is "something wrong" with the drain which requires remedying. In other words, the fresh-air inlet becomes a useful "detective." The remedy also if a remedy is required, would appear to be that of placing the mouth of the inlet in such a position that, even if it did act as an outlet, it would be harmless.

No. 3.—It is contended that the provision of a trap and its companion ventilation of the house drain increases the cost.

This is obvious, and the report does not deal with this question beyond stating it as a fact. It is not of much importance, for if the trap is really required the question of cost need not be considered.

No. 4.—The final indictment, and that which is of the greatest importance is that the intercepting trap "forms a serious impediment to the passage of sewage from the house drain to the sewer, and that this frequently results in more or less complete blockage of the drain."

It was this alleged blockage by the presence of traps in the house drains at Willesden that first called the

attention of the Local Government Board as to whether the intercepting trap was not more of a danger to the occupiers of a dwelling-house than a safeguard against the intrusion of the air from a sewer. The whole trend of the report is in the direction of proving that this indictment is correct, that such blockage may and does often occur by reason of the trap failing to clear itself, and that this objection causes a greater danger to health than the possible admission of sewer air into the house drains.

The contentions by the opponents of the intercepting trap in this respect are:—

(*a*) That it is always a positive obstacle, and is never clean;

(*b*) That it is the main cause of the blockage of house drains, with all the attendant evils;

(*c*) That it contains sewage which, under certain circumstances, is in an advanced state of decomposition, and is the chief cause of bad smells in the sewers;

(*d*) That the primary object of good drainage—*viz.*, to get rid of the fouled water expeditiously—is defeated;

(*e*) That it is at best an insufficient safeguard, liable to be forced by air pressure at any moment;

(*f*) That it forms no obstacle to the passage of rats;

(*g*) That the supposed dangers of sewer air have been greatly exaggerated.

With regard to these indictments the report contains some exceedingly interesting evidence, and the results of careful investigations and experiments.

The report gives the results of the systematic examinations by Dr. Butler of intercepting traps in his district, which show a total number of blocks of 3·7 per cent of the total drain inspections. In addition to this the committee caused examinations to be made of traps in other districts throughout the country, with the result that of the traps examined 6·9 per cent were found to be blocked at the time of examination, and 16·2 per cent "gave evidence that at one time and another they had been blocked sufficiently to cause an accumulation of sewage in the inspection chamber." The total number of traps either blocked at the time or indicating previous blocks amounted to no less than 23 per cent of the total traps examined for both purposes. But this is not all. Mr Patten Barber, the borough surveyor of Islington, carried out a series of exhaustive trials in order to ascertain what amount, if any, of the solid matters usually flowing in a house drain would be retained in an intercepting trap placed in the usual manner upon a house drain. These experiments showed conclusively that with every class of trap he tried (seven in number) more or less solid matter was always retained in the trap. In some cases this amounted to from 42 to 49 per cent of the solid matters, and in others from 73 to 78 per cent. If it were not for these experiments it might be argued that some, if not all, the blockages might have arisen from one or other of the following causes: The improper fixing of the trap, the choice of an improperly designed trap; the insufficient fall of the house drain; or, from its size, the admission of some foreign matter into the house drain; or from some other cause for which the intervention of a trap *per se* was not responsible; but in view of Mr. Barber's experiments, which appear to have been carried out with great skill and care, these arguments appear to be inadmissible.

It may, of course, be argued that the 2-gallon or even the 3-gallon flush is insufficient to keep the trap or even the house drain clear of obstruction. In this connection I may perhaps be permitted to mention that about twenty years ago I carried out some experiments with house drains laid at similar gradients to those in Mr. Barber's experiments, which conclusively proved that such flushes were insufficient to clear a drain (laid without any trap), except by many successive flushes. It was very interesting to observe how it required flush after flush to induce the faecal or other solid matter to move a few inches at a time in a drain, and it showed that until there was sufficient obstruction to raise a slight "head" of water on the obstruction itself, it remained unmovable. If this was so in the drain itself, we can, I think, quite understand that there must arise at times a considerable accumulation in the intercepting trap. I do not know if Mr. Barber found the same difficulty in moving the solid matter in the drain itself when carrying out his experiments. If there is this difficulty in keeping the house drain clear of deposit, the indictment against the trap to which I have already referred, that it is one of the principal causes of foul smells in the sewer, must be greatly modified, as the drain itself becomes a greater contributor.

The remedy, if the trap is to be retained, appears to be either that a larger flush of water is necessary, or that the drain must be laid with a steeper gradient, or that the design of the present trap must be altered. Mr. Barber's experiments go to show this, for whereas a 4-in. trap, "No. 4," retained 79 per cent of solids, an "experimental" trap he tried only retained 8 per cent of the solids, and this after ten experiments, in which on six occasions no solids whatever were left in the trap. Mr. Barber does not give the design of this trap, but no doubt he will pursue his investigations in this direction.

With regard to the possible forcing or unsealing of an intercepting trap by air compression in a sewer, the committee deal with this question at some length, and refer to the Bristol experiments. They come to the very proper conclusions that—

> "When a trap is forced by air pressure the water seal though reduced in depth, is not liable to be destroyed."

and they further state [page 16, par. 50]—

> "On the whole, therefore, it would appear, according to the evidence presented to us and according to our own experimental observations, that under practical conditions the intercepting trap usually answers its purpose as a barrier to the passage of air from the sewer into the house drain."

With which conclusion I cordially and entirely agree; it is well known that air will always take the least line of resistance.

As to the passing of rats through a trap, the report states that, in the opinion of the committee, it is doubtful whether the trap is a barrier, and they give two instances of chased rats seeking refuge through traps into house drains. In the cases quoted it would appear that the rats were actuated by fear, and that in order to escape they preferred a bath to sudden death! I am personally of opinion that the trap is a barrier to rats under normal conditions, and that they will not pass through the water in a trap except under some dire pressure. I have known several cases of houses connected to old sewers which were infested with rats, and that these pests disappeared when the house drains were properly trapped and disconnected. It is evident that rats, like sewer air, will take the line of least resistance.

I will now pass on to one of the most important investigations of the committee—*viz.* that of the chemistry and bacteriology of sewer and drain air, on which considerable time and thought appear to have been devoted. Evidence on the chemistry of sewer air was laid before the committee by such well-known experts as Dr. T. S. Haldane and Dr. Hurtley, and the report of Prof. Delépine on the Manchester sewers is also referred to. The conclusion to which the committee arrived [page 20, par. 62] is as follows:—

> "The results obtained by these observers are practically identical, and they indicate that in sewers, whether old or new, ventilated or unventilated, in which sewage is moving and is not lying stagnant, the air differs but little from that of the atmosphere outside."

Carbon dioxide was only found to the extent of from 17 to 20 parts per 10,000, as compared with 3 or 4 parts per 10,000 outside, the excess of ammonia and organic matter was also negligible, and the sewer air was free from any appreciable trace of methane or carbon monoxide, and I presume must have been due to the admission of coal gas. Sulphuretted hydrogen also, they state, is not present in the air of sewers. In some sewers notably at St Helens, Lancashire, the gas is found due to the nature of the trade effluents discharged into the sewers, but, of course, this is a rather abnormal case. Dr. Haldane, however, has found that this gas is given off in considerable quantity from the traps of house drains in which sewage is apt to be retained, such as large grease traps. The evidence by Dr. Haldane is another serious indictment of the trap, although in this case he refers specially to "large grease traps."

With regard to the smell of sewer air, which is evidently not due to unpurified hydrogen, but more probably from "the presence of minute quantities of a variety of volatile substances," the report says, "it is doubtful whether the smell of sewer air is usually more offensive than drain air," and that "untrapped waste pipes of sinks and lavatories discharging into the open air" may cause a "serious nuisance." The committee are further of opinion that the effect of smell on the human body may not only be repugnant,

but that "there seems to be no reason to doubt that it may produce definite ill-health."

With regard to the bacteriology of sewer air, they made many investigations, and, *inter alia*, they say:—

"The bacteriology of sewer air has been the subject of many investigations, and in one respect the results obtained have been practically uniform—namely, in showing that, notwithstanding the immense number of microbes in sewage, the number to be found in sewer air is extremely small."

Further, they say that—

"It seems also clearly established that not only the bulk of the bacteria of sewer air are derived from the atmosphere, but also that bacteria of sewage origin (that is, those that may be pathogenic) are very rarely present in sewer air, and that, when their presence can be detected at all, their number is very small."

They then deal with the bacteriology of *drain* air as distinguished from *sewer* air, and quote the experiments made by Colonel Horrocks, Dr. Andrews, Dr. Renney, and Prof. Winslow, and they arrive at the conclusion that there are more microbes in drain than in sewer air, and that this is mainly accounted for by "splashing," which occurs in the passage of sewage in a house drain, "especially when falling from a height or passing through a trap." This makes a further and rather unexpected condemnation of the intercepting trap, and I do not see how splashing could be prevented in a soil pipe unless it were made in the form of a spiral, and even then I fear there would be some splashing. The question of the possible passage of microbes from sewers into drains is dealt with at very considerable length, and altogether no less than fourteen pages of the report are devoted to these questions of the chemistry and bacteriology of sewer and drain air. The conclusions at which the committee arrive are as follows [page 33, par. 97]:—

"The results of these experiments emphasise the point to which we have already referred—namely, that the bacteriological evidence indicates that if any bacterial danger exists at all in house drainage, it is to be found in the drain air that may escape from the outlets of ventilating shafts of house drains. But even this danger requires to be regarded in its true perspective, as we have pointed out. [Pars. 91 and 92.]"

The paragraphs here referred to are of considerable length, and refer, so far as I understand them, to the important point as to whether disease germs from a neighbouring house can find their way through an untrapped drain into the house in question. This seems to be the crux of the whole question. The object of the intercepting trap, as I have always understood it, is to sewer, or isolate, the house from the joint drainage of other houses in order to secure safety from possible infection from other houses.

It would appear from this important report that it is extremely doubtful if this result has been obtained, and that, notwithstanding the numerous legal cases that have been fought and won on the question of sewer air entering houses and causing disease and even death, we are now told that drain air is more dangerous than sewer air, and that the intercepting trap is not only a delusion and a snare, but that it is a positive danger to the health of the inhabitants owing to its liability to choke, the accumulation of sewage which it holds, the germs which it emits, the splashing which it causes, and its interference with the proper ventilation of the sewers. To those of us who have been brought up in the belief that great reliance was to be placed on the proper trapping and pneumatic severance of a house drain, this report is bound to shake our faith, for in view of the evidence that was laid before the committee, and the care with which they carried out their investigations, we are, I think, bound to accept the conclusions at which the committee have arrived.

In connection with this vital question, and in conclusion, it is very interesting to refer to a book published in the year 1898 by Mr. Alfred Roechling, M.Inst.C.E., a Fellow of our institute, entitled "Sewer Gas and its Influence upon Health," in which the author deals with the question of sewer air and its dangers, and he gives a number of quoted cases in which sewer air had been held by the Courts to have produced disease, and even caused deaths. Time only allows me just to call attention to this book without discussing it, but, in view of the departmental report on which this paper is written, I feel that attention should be drawn to the book, as it is in some respects contrary to the evidence and conclusions of the committee. I have endeavoured in this short paper to lay before you some of the most interesting points contained in the report, and I trust it may be productive of an interesting and useful discussion.

THE DISCUSSION.

Considerations of space prevent our giving in the present issue more than a comparatively brief outline of the discussion on the paper, but a full report will appear next week.

Mr. R. Read, the city surveyor of Gloucester, in opening the discussion, said he was sorry that Mr. Boulnois did not appear to be convinced as yet as to the wisdom of the abolition of the intercepting trap. His own experiments from the year 1879 onwards had shown that the trap was a dangerous and useless obstruction, and that thirty-five years of "tinkering" had failed to remedy its defects. The experiments of the committee had shown that no pressure of sewer gas came upon the intercepting trap when water rose in the sewer; this might be so, but he urged that when it rose above the end of the house connection the air in that connection—which was more foul than the sewer gas—would then be compressed and forced through the interceptor into the house system. If, as frequently occurred, the cleaning eye stopper were blown out it would fall into the mouth of the trap, and block it so that sewage would find its way out only through the cleaning eye, and thus leave the house drain permanently partly full of sewage. Rats could easily dive through a trap, but they could not get past the grids of gullies. He estimated that in a town system there were 5 yds. of house drain beyond the interceptor to every yard of sewer; these drains needed ventilation. The flow in drains was intermittent, that in sewers was constant. Hence drains were more likely to be foul than sewers. The committee had not been asked to report upon sewer ventilation, but they had expressed a pious opinion based chiefly upon experiments at Bristol. He claimed that no system of sewers was unventilated. A sewer was a breathing machine affected by the external force of the wind, and by the internal force of the sewage flowing down the sewer. Messrs. Mawbey and De Courcy Meade had found that a vent pipe would act alternately as an inlet and outlet; it therefore followed that the currents of air in a sewer were alternating. The flow of the sewage would induce a current of air in the same direction as the flow. When one found a shaft acting as an outlet, it would be found that the vent shaft on the uphill side acted as an inlet. He expressed the hope that the Local Government Board would now have the courage of their convictions and withdraw the by-law demanding intercepting traps.

Dr. Philip Boobbyer, medical officer of health of Nottingham, stated that he accepted the scientific results of the committee, but he demurred at their general application to cases essentially different to those reported upon. The behaviour of sewers differed according to a number of conditions. Sewers of steep or flat gradient required different treatment. The gradient affected the ventilation and the amount of deposit. Certainly there were sewers like those mentioned in the report, in which the air did not smell badly, but there were others! Sewers taking the wastes of slaughter-houses or offensive trade wastes at high temperature smelt very badly. He did not consider that there could be any relation between drain air and diphtheria, as inferred by the report. Personally he was in favour of retaining the intercepting trap. He considered that the results obtained in the experiments of the committee were probably due to badly constructed apparatus. Sewer air was much more likely to create a nuisance than drain air; it was not more dangerous to health, but it was apt to smell much worse. It was impossible to make the average person believe that the smell of sewer gas was not dangerous to health. If some sewers were ventilated by house-drain vent pipes the smell would be drawn in at chimney tops, windows and ventilation openings. He further quoted an instance of an 8-in. vent pipe fixed on the wall of a vicarage. This pipe was connected to a sewer with a gradient of 1 in 6, and the nuisance caused thereby was so great that it had to be removed. Similar results were very likely to happen in hilly districts if the sewers were ventilated through the house-drain vent pipes. Again, unoccupied houses in which the traps of water-closets became unsealed would be filled with sewer gas, which would be very objectionable. The committee's experiments had apparently been made with defective traps. He did not think that traps became stopped up as a rule. In three large hospitals, two having six traps and one sixteen traps, only one trap had been stopped up during twelve years. These drains were constantly inspected, so that stoppages would have been detected.

Mr. T. de Courcy Meade, city surveyor of Man-

chester, stated that he had made a number of tests, the results of which he had tabulated. He had made these tests, not only with artificial excreta, but also with real excreta. His results made with artificial excreta agreed with those made by Mr. Patten Barber and quoted in the report, and also with those made in 1892 by Mr. Rogers Field, but it appeared that the results of the experiments made with real excreta differed from the others. He had submitted these results to the Departmental Committee, but he had not given evidence. Out of a large number of traps used at Manchester, only 0·64 per cent per annum were found to be clogged. This he attributed to the fact that all the traps had been fixed within the last twelve or fifteen years under very careful supervision, and generally by the contractors of the corporation.

Mr. Frank Sumner, chief engineer to the Corporation of the City of London, said that he was strongly against the use of intercepting traps on long drains, where the flow naturally dwindled. Traps on such drains became clogged owing to an insufficient flush. He found that all sewermen were healthy, and regarded this a proof of the harmlessness of sewer gas. He was in favour of the removal of all intercepting traps on the drains of small houses where the flush was poor. In the case of large houses or City offices, where there were, say, from thirty to forty water-closets connected to the drains, the removal of the trap might be optional. There were prejudices to be overcome. He strongly advocated the use of iron drains, and was of opinion that the additional expenditure for such work would not exceed 20 per cent of the whole cost.

Dr. Wm. Butler, medical officer of health, London, deprecated the partisan spirit shown in approaching the subject of the intercepting trap. He considered that a percentage of 0·64 of complaints of stopped traps in Manchester was high, and indicated that there were many undiscovered cases of stoppage. In Willesden inspection showed that traps were in very many instances stopped without the fact being discovered. Inspection also proved that 10 per cent of the stoppers were out and that 4 per cent of the traps were choked, but there had been few complaints nevertheless. The Willesden drains were as well laid as those in Manchester. The ordinary vent-shafts on a sewer were inadequate, and hence a single vent-pipe on a house might cause a nuisance, but if sewers were ventilated at every house this condition would be done away with, and there would be no nuisance. The intercepting trap caused drains to become foul, and should therefore be removed. Fresh-air inlets were often placed close to windows. Such openings might well allow sewer gas, as well as drain gas, to come out when the stopper came out of the trap. This was happening in about one case in ten at present.

Dr. Louis C. Parkes, medical officer of health of Chelsea, said that in considering the stoppage of traps, one should also consider how much of this was due to the faulty laying of drains, to the bad form of the older traps, and to traps being of a larger diameter than necessary. Also, it was customary to leave the old connecting drain beyond the trap untouched when laying a new system. This old drain was often [illegible] In Chelsea it was often found that the stoppage of [illegible] was due to blockage at the flap on the sewer end. He did not consider that the experiments made with artificial excreta were convincing. [illegible] as a rule. The artificial excreta contained clay, tow [illegible] Dr. stated that Mr. Harper had said at the Departmental Committee [illegible] ing through house vent-shafts. If smells issued [illegible] the need for a fresh-air inlet in order to keep drains [illegible] Mr. Percy Boulnois, barrister, [illegible] air. If drains were defective the interceptor would [illegible] and other objectionable wastes entered. Sewers gave off smells which needed ventilation, and if interceptors were abolished there would be better ventilation. Rats could not get out of a drain unless it were defective, and it was useful as a proof that they were defective if rats did come out. There were eighty-nine sewer ventilators in Lewisham, which had been attached to houses on condition that they should be removed if required. None of these had been removed. The stoppage of traps was considerable. He contended that their removal should be optional.

Mr. A. J. Dickinson, surveyor to the Redditch Urban District Council, said he was in favour of the abolition of the intercepting trap.

Mr. G. B. Hartfree, surveyor to the Alton Urban District Council, stated that he had made a careful investigation of the causes of the chokage of traps. These were due to such things as bath towels, brushes, and so forth, finding their way into the drains, as well as to improper fixing of the traps. Leaking drains permitted the water to escape before it reached the trap in other cases. Also he found that the joint immediately beyond the trap, which could not be cleared by the man who laid the pipes, generally had a ridge of cement projecting on the inside which caused an obstruction and produced blockage. An improvement was required which would make it possible for the pipe layer to make certain of leaving the pipe beyond the trap clean inside. Personally he had been poisoned by streptococci in sewer air, and he therefore considered that the air was dangerous to health and ought to be excluded from the drains.

DEPARTMENTAL COMMITTEE CHAIRMAN'S DEATH.

On taking the chair at Tuesday's meeting, Sir Maurice Fitzmaurice said he was sure all present would have heard with very great regret of the death [reported in last week's Surveyor] of Dr. L. W. Darra Mair, the chairman of the Departmental Committee, whose report they had assembled that evening to discuss. He would ask Mr. Boulnois to move a resolution on the subject.

Mr. H. Percy Boulnois observed that it was his painful duty to move a resolution of condolence with the family of Dr. Darra Mair on his most lamented decease. It was indeed a regret to himself personally when he heard of his death. He (Mr. Boulnois) was associated with Dr. Darra Mair at the Local Government Board; he was one of his colleagues, Dr. Mair being in the medical, while he was in the engineering department, and the news of his death came to him as a great shock, particularly after he had written his paper and published it. If the paper had not been published he would have seriously considered whether they should have held that meeting. Dr. Darra Mair's death would be a great loss to the department, a great loss to the Government, and a great national loss. Without further remarks he moved the following resolution:—

"Resolved, that this sessional meeting of the Royal Sanitary Institute, held on November 12, 1912, in order to discuss the report of the Departmental Committee of the Local Government Board on Intercepting Traps in House Drains, have heard with deep sorrow of the death of Dr. L. W. Darra Mair, who was chairman of the committee. The meeting wish to record their appreciation of the valuable services which Dr. Darra Mair rendered in the cause of public health by his many years of official service and by his researches in connection with preventable disease, and they desire to express to Mrs. Darra Mair and the members of his family their sincere sympathy in their sad bereavement."

Dr. Buchanan seconded the motion and associated himself with every word that Mr. Boulnois had so well said as to the great public service which Dr. Mair had rendered, and the loss to the public health service which his unexpected death would be. Dr. Darra Mair was in his prime, and he gave promise of greater achievement a promise which they all hoped would be fulfilled. The work he had done in many respects in which it was available for the public had appeared mostly in Blue-books, but they would find one characteristic running right through it, and that was that in every investigation he made he showed a determination to get at the fundamental facts, and in his writings he always showed a logical sequence of ideas, extracting every lesson that could be learned, either scientifically or otherwise, from the inquiry. He would refer to two reports for which he was responsible those on back-to-back houses, and the

causation of the excessive mortality from fever in Belfast, as showing what he meant. He (the speaker) and Dr. Mair entered the Local Government Board within a few years of each other. They both learned their work and inspiration under the same master, and they worked together for often years constantly, and almost side by side. In the circumstances it might be natural that he should say a word about Dr. Mair's personal characteristics, but he would content himself by saying that, with reference to the subject to be discussed that night, there was no man who was more keen in his search after the truth, no matter whether the results were likely to lead in the direction which he hoped they would or in a contrary direction. No man welcomed criticism of his work more than he did, and as to the work he devoted his life to, and upon which he bestowed the closest attention, he was sure no one could wish for freer discussion or welcome the fullest possible criticism more than his old colleague, whose loss they all so greatly deplored.

The audience remained standing while the resolution was passed in solemn silence.

INTERNATIONAL ROAD CONGRESS.

THE ROAD EXHIBITION.

The Exhibition of Road Materials, Appliances, and Machinery used for the Construction, Maintenance and Improvements of Roads, which will be held at the Royal Horticultural Hall, Vincent-square, Victoria-street, London, S.W., in connection with the International Road Congress in London, in June, 1913, will be opened on Monday, June 23rd, by the Right Hon. Earl Beauchamp, First Commissioner of H.M. Office of Works, chairman of the Exhibition Committee, and closed on Saturday, June 28th.

The exhibition is to be international, and is open to all classes of machinery, apparatus, materials, models, drawings, plans and maps illustrative of road construction. A piece of ground adjoining the Royal Horticultural Hall will be completely roofed and walled in, and paved with wooden sleepers to form an exterior section of the exhibition, for the exhibiting of heavy machinery. A room, fitted up as a writing-room, will be available for the use of members of the congress and exhibitors, and at a marquee in the ground tea will be served to all members and exhibitors on production of their membership cards.

All the leading firms engaged in the industry have decided to exhibit. They are representative of all branches of the industry, and include:—

Tar-macadams, &c.—Messrs. Tarmac, Limited, Gas Light and Coke Company, Limited, Canadian Rubber Company, Limited, Roadamant, Limited, F. E. Bristowe & Co., Anglo-American Petrol Products Company, Limited, Taroads, Limited, Rocmac, Limited, Roadite, Limited, Lacmer Asphalte Company, Limited, Neuchatel Asphalt Company, Limited, Dussek Bitumen Company, Limited.

Machinery.—Messrs. J. & P. Hill, Limited, Batford & Perkins, T. Green & Sons, Aveling & Porter.

Quarries.—Messrs. Ellis & Everard, Enderby & Stoney Stanton Granite Company, Limited, London Granite Company, Limited.

Publishers, &c.—Messrs. Dirk & Sons, Limited, John Hutchinson, Road Improvement Association, Good Roads, Crompton & Co.

Mr. H. P. Maybury, county surveyor of Kent, is hon. secretary of the Exhibition Committee, which also includes Colonel R. E. Crompton, C.B., Major Fitzmaurice, R.E., Messrs. Alfred Dryland, Howard Humphreys, T. Richards, Wallace E. Riche, Gibson Thompson, J. Walker-Smith, John Williams, and Captain L. A. Kingston, assistant secretary.

The traders have also been invited to form an Exhibition Sub-Committee, and their assistance will add to the success of the exhibition. This committee is presided over by Mr. H. Pitts, and includes Messrs. F. E. Bristowe, D. C. Comyn, H. D. Blake, and W. Manuelle.

Royal Institute of British Architects.—The second examination of licentiates desiring to qualify for candidature as Fellows commences on January 13, 1913. Applications must be sent in on the official form on or before December 14th.

SURVEYORS' INSTITUTION.

PRESIDENT'S OPENING ADDRESS.

In his presidential address to the members of the Surveyors' Institution on Monday evening Mr. Edward Gerald Strutt took his audience "among the hedges and the fields," to quote his own words. His address was devoted to the subject with which he is most familiar—agriculture—and contained, therefore, little of interest to those engaged in other branches of the surveyor's business.

Discussing the problem of rural depopulation, Mr. Strutt insisted that before this could be overcome the difficulty connected with the question of housing would require to be removed. Much had been done by the larger and richer landowners in the building of healthy cottages on their estates, and though in most cases the smaller landowners had done their best with considerable self-sacrifice and pluck, it was difficult for those whose sole income was derived from land to face the cost of erecting cottages which would not return 2 per cent on the outlay. The problem, however, was one which must be faced in a serious spirit if anything was to be done materially to increase the numbers of those employed on the land. It was possible that something might be done to reduce the initial cost of erection by amendment of the building by-laws, permitting the use of a greater variety of materials, or by taking advantage of the public credit to provide loans to landowners or local authorities at a low rate of interest, while additional garden ground attached to cottages might enable higher rents to be paid in many instances. But where the difficulty could not be met in this manner it might become advisable to follow the example of Ireland under the Labourers Acts. There the district councils formulated schemes for the erection of houses and securing garden plots in accordance with the requirements of their districts, the Local Government Board being the department responsible for holding local inquiry into any schemes put forward, and for sanctioning them if satisfied that they were reasonable. If a scheme was sanctioned the necessary capital was advanced by the Land Commission, repayable in sixty-eight and-a-half years by equal payments. The interest was £3 5s. per cent—2¾ per cent representing interest and ½ per cent sinking fund. The number of houses authorised to March 31st last was roughly 49,000, of which 40,000 had been built and occupied, and 9,000 were in process of erection. Parliament voted £5,250,000 altogether in connection with these Acts, and it had all been earmarked for housing purposes. Some such scheme would surely be justified in this country even though it might necessitate a call upon the national purse, for it would do much to assist in the solution of the housing problem of rural England. If, however, such legislation were passed, it would be incumbent upon landlords to do their part by finding the necessary sites for the cottages at a low rate.

Sympathetic reference was made by Mr. Strutt, in the course of his address, to the recent death of the institution's past-president, Mr. Robert Vigers. "No surveyor in the United Kingdom," he observed, "was better known or stood higher in the estimation of his fellows than Mr. Vigers, who had probably settled more important cases as umpire than any other man in the profession. From its foundation he manifested a strong interest in the institution, and was until the last few months a constant attendant at the council meetings and the gatherings of members. Everyone with whom he came in contact regarded him with reverence and affection, and he left behind him a very high example of what professional conduct should be."

Reduction of Loan Indebtedness.—Lecturing on Wednesday at the Institute of Chartered Accountants, Mr. P. D. Leake, F.C.A., declared that the existence of a sinking fund gave a false sense of financial security, the danger of the method being that it lightened the financial burdens of the present by forestalling future income which might never be available. It would be far better to use the money now applied to building up sinking funds in reducing loan indebtedness, either by annual drawings and repayment, or by purchase in the open market and cancellation of the loan stock. Future temptation would thus be removed from the path of State, municipal, and commercial administrators, which, as matters stood might prove irresistible when the need of money for other purposes happened to become very pressing.

Correspondence.

"Be calm in arguing; for fierceness makes
Error a fault and truth discourtesie."
—Geo. Herbert, *"The Temple."*

WHAT IS A GARDEN CITY?

To the Editor of The Surveyor.

Sir,—I am afraid Mr. Culpin has read my letter very cursorily, for he either appears to be unable to quote them accurately, or attributes statements to me that I have never made. In your last issue he says that I have challenged his definition of a "garden city," but I can find no evidence in my previous letters of having done so, nor can I find that Mr. Culpin gave any such definition in the letter to which I replied.

I stated in my first letter, in speaking of competitions for so-called town planning schemes, that "the main feature of *most* of the garden 'city' or garden 'suburb' schemes is the effort to cheapen roadmaking," and that "these schemes are essentially promoted by building speculators." It is somewhat disingenuous for Mr. Culpin to apply these remarks as referring only, or chiefly, to the company of which he is secretary, especially as he says in his last letter that "many schemes are being dubbed 'garden city' which have no claim whatever to the name, except an attempt to delude the public." Probably this is not quite what he meant to have written, and is only one of those things which, as *Punch* would say, "might have been expressed differently"; for one can hardly expect him to mean that his company attempts to delude the public.

He appears terribly indignant at my calling these "garden city" schemes, but I was only giving them the name by which they are called by leaders of the movement for the restriction of the number of houses per acre, the provision of open spaces, &c. Instead of there being a number of garden cities, he now informs us that "there is only *one* in the world," and that one, presumably, Letchworth, of which he is the guiding spirit.

I believe that in America any collection of wooden shanties housing a thousand people is called a "city," but in England we have not come to this yet, though if it is open to anyone to dignify a village or district of some 8000 inhabitants with the name of "city," we may soon reach the Yankee level. Being a native of a city whose history dates from the Roman invasion, I can only wonder at Mr. Culpin's assurance, and am sorry I cannot congratulate him on his modesty in claiming that Letchworth is a city. A "city" in England must either be the seat of a bishop, a royal borough, or have the dignity conferred on it by royal patent; and if this definition is correct, I can only say that I must plead guilty of not having heard of the bishop, the palace, or the royal patent which has conferred this dignity on "city" on Letchworth. Again, I fail to see why Letchworth should be called a "city" and Ruislip-Northwood a "suburb." Ruislip-Northwood has an area at least 25 per cent larger than Letchworth, is self-contained, town planned, and will probably have a much larger population than Letchworth shortly.

If planning the district before laying out, with due regard to the convenience, health and amenities of the inhabitants, by restricting the number of houses per acre, providing open spaces, and preserving the natural beauties of the district, makes a "garden city," then the district in which I live, and the neighbouring town of St. Annes, probably have at least an equal claim to be considered "garden cities" as Letchworth, even though they owe their character to the enlightened self-interest of a single landlord and the experience and sound judgment of his agent, and not to a number of capitalists practising philanthropy with 5 per cent interest.

Mr. Culpin is very indignant because I do not subscribe to his opinion that the shareholders in his company are "entirely disinterested." Well, it appears to me that if the shareholders in this company, with a capital of £300,000 are so entirely disinterested as Mr. Culpin says, they would give a greater proof of their disinterestedness by foregoing their 5 per cent interest and letting it go to the relief of rents, or in providing greater pleasure or comforts for their lessees. I wonder what proportion of the capital would be left in the company if the directors declared that no more dividends would be paid, but shareholders would be allowed to withdraw their capital.

Everyone agrees that the "garden city" movement is doing good work and sympathises with its object, but it is neither wise nor desirable to claim for it virtues and a character it does not possess.

The majority of the building societies in this country were started from sociological motives, but good motives have not prevented them becoming highly speculative; and when directed by a Jabez Balfour, and religion is called in to aid philanthropy, the combination has frequently resulted in the ruin of the unfortunate shareholders.

The original point raised by Mr. Wilkes appears to have been lost sight of by Mr. Culpin, and I am sure many of your readers would be glad to know whether the lecturers on town planning sent out by Mr. Culpin are to be architects or engineers. If one might add to this, I should like to ask why we should be expected to take as our model town a country district of some 8,000 inhabitants with ambitions limited to providing for a future population of 30,000?—Yours, &c.,

A. J. Price.

Lytham.
November 12, 1912

THE INSTITUTIONS OF MUNICIPAL ENGINEERS.

To the Editor of The Surveyor.

Sir,—I trust that you will allow me the valuable services of your widely circulated columns to make the following appeal to the profession at large.

In your issue of the 25th ult. reports, comments and papers from the Institution of Municipal Engineers claimed the larger portion of your space, while previous issues have also devoted many columns from the same source. This being the case, surely no further proof is necessary that this young institution is now fully established, and receives full recognition from the technical press, the profession and the public generally.

Surely the time has now arrived when this institution and the Institution of Municipal and County Engineers should combine forces for the common good of the profession as a whole, and the members as single units of that profession. Undoubtedly there are minor difficulties and differences to be overcome, but these should not prevent the ultimate good to be derived by having one united institution using its influence for the cause of the profession.

The British Medical Association to the professions, and the Balkan States to the world, are both demonstrating, if such is still necessary, the value of unity and combined effort, and I trust we will no longer delay the acceptance of these forces in our cause.

The Society of Engineers and the Society of Civil and Mechanical Engineers joined forces some two years ago, with results beneficial to both societies. I trust that their example will now be followed by the above institutions in a similar manner. The fusion of our professional associations must not stop here, however, and I trust a continuation of a scheme for the general consolidation of the profession will be carried out. Surely it is not impossible for the following fusion of the professional societies:—

Group I. (Sanitary Section):—
Royal Sanitary Institute.
Institute of Sanitary Engineers.
Sanitary Association of Scotland.
Sanitary Inspectors' Association.
And various other similar associations.

Group II. (Engineering Section).—
Society of Engineers.
Junior Institution of Engineers.
Liverpool Engineering Society.
And various other local and similar societies.

Group III. (Municipal Section).—
Institution of Municipal and County Engineers.
Institution of Municipal Engineers.
County Surveyors' Association.
And similar societies

The above to be but as a preliminary effort, specifying a few of the many societies as an example, for further extension, so as to bring the profession as

a consolidated whole as one, or affiliated to one institution, such as the Institution of Civil Engineers.

Effort alone is required, and much may be accomplished. Let the seniors and juniors work hand in hand, and put their shoulders to the wheel, and success to the profession and its members is assured.

May I appeal to the members of the profession to make this effort—and history, so far as the profession is concerned?

I thank you, Mr. Editor, for this privilege of so extensively occupying your columns, which are always so freely open to the interests and subjects of the profession, and accordingly greatly appreciated by its members.—Yours, &c.,

A Member.

November 8, 1912.

PRIVATE STREET WORKS ACT, 1892: PUBLIC FOOTPATH WITH ADDED STRIP.

To the Editor of The Surveyor.

Sir,—Having regard to the number of queries appearing in your columns on this subject, and to the number of streets being dealt with annually by your readers under sec. 150 of the Public Health Act, 1875, or the Private Street Works Act, 1892, I think the following case, decided last week by the local bench of justices, may not be without interest:—

A footpath 4 ft. wide was awarded along the west side of an allotment, and the owner of that allotment was saddled with the upkeep. The owner of the adjoining property sold off his property for building purposes, but alleges that he reserved 18 in. next to the footpath before mentioned. The owner of the property on the eastern side of the footpath laid out a back street along the west side of his property, and by arrangements with the local authority made its width 10 ft. in addition to the 4-ft. footpath—i.e., 14 ft.

The reservation of 18 in. appears to a large extent to have been ignored, or absorbed, by purchasers from him. The 4-ft. footpath was never fenced off. The local authority, under the provisions of the above Act, which has been adopted by them, decided to do certain works in this street with a view to taking over the whole width of 14 ft. to 15 ft. 6 in. The apportionment was based on frontage, and the council resolved to bear one-third of the total cost under the provisions of sec. 15 of the Act, but, notwithstanding this resolution, the owners on the western side of the footpath objected. The principal grounds of objection were: (a) That the alleged street, or part of a street, is not, or does not form part of a street within the meaning of the Act; (b) that the alleged street, or part of a street, is in whole or in part repairable by the inhabitants at large; (c) That the provisional apportionment is incorrect in respect of some matter of fact, viz., that the said premises — do not front, abut, or abut upon the said alleged street.

At the hearing it was contended for the objectors that the cost of repairing that portion, being an ancient awarded public footpath, could not be included, and that the intervening reserved strip, 18 in. wide, precluded those properties from fronting, abutting, &c., upon the said street. On behalf of the council it was shown that the 18-in. strip was never fenced off, the public had full use of it, and therefore that it constituted part of the whole street. The decision of the justices was entirely in favour of the council, and was as follows: (1) That Frodingham footpath is not a street repairable by the inhabitants at large; (2) that the council's requirements are reasonable and sufficient. Yours, &c.,

C. Curtis Gray.
Council Offices, Engineer and Surveyor.
Scunthorpe,
Lincolnshire.
November 11, 1912.

MIXING CEMENT WITH "BITUMEN."

To the Editor of The Surveyor.

Sir,—After the protest in my previous letter against such a misquotation, I am not a little surprised that Mr. Cecil Nathan still persists in changing my query, "Is it a good thing to mix cement with 'bitumen'?" (*i.e.*, pitch and tar) into "Why a percentage of cement is employed in the manufacture of asphaltic paving mixtures." This is not only reprehensible, but stultifies his own preaching (March 5, 1912, p. 405) that "the word asphalt should never be applied to coal tar products."

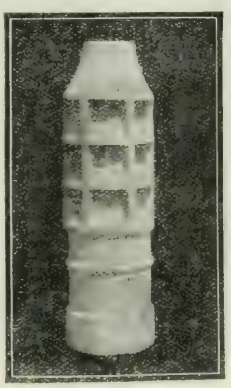
I am afraid Mr. Nathan is not able to render me much good service in this matter, for he does not appear to have comprehended the purpose and practical bearing of my simple words, "Is it a good thing?" &c. Surely it is not difficult to understand therefrom that what I am questioning is whether any practical purpose is served by mixing cement with tarry liquids. Mr. Nathan, in his first letter, said "the veriest tyro" could answer my query, but after having failed to do so himself in any of his three letters, he now says that to obtain the information one must pay 8d. for his patent specification. Is he quite sure I shall get my money's worth? If such information is only thus obtainable, he seems hardly justified in dubbing me an ignoramus for not being conversant with it. Merely to tell anyone they are ignorant without attempting to enlighten them is not a very gracious proceeding, to say the least. If, again, this information is of the simple character Mr. Nathan says—somewhat illogically—why not have given it at once, without making so much mystery about it? Others beside myself would doubtless find interest in any practical information upon the point in question, but like me, they may be chary of spending 8d. with no certainty that they will get value for their money.—Yours, &c.,

W. J. Howard-Smith.

Westminster.
November 12, 1912.

DOWN-DRAUGHT IN CHIMNEYS.

We illustrate herewith a device of an extremely simple character, which the makers, Messrs. J. H. Sankey & Son, Limited, Essex Wharf, Canning Town, E., strongly recommend for the prevention of the familiar trouble of down-draught in chimneys. It is well known that smoke issuing from a chimney shaft when a wind is blowing has a tendency to be drawn down the side of the shaft. The reason advanced for this is that a partial vacuum is formed by the wind



Sankey's Down-draught Preventing Pot.

rushing past the shaft, causing the smoke to be drawn down as stated. With Sankey's pot this partial vacuum is utilised to draw the smoke out of a chimney, the wind as it strikes the pot rushing up the louvre openings and forcing the smoke out, at the same time drawing it out of the other side. The simplicity of the pot, upon which we have already commented, is such that it can be swept in the ordinary way, while other advantages are that there are no small holes to block and no movable parts to get out of order.

London New County Hall.—The Establishment Committee of the London County Council report that they are now in a position to ask the council to proceed with the erection of the superstructure of the new county hall, and they will recommend that tenders be invited from selected firms.

Titanium Steel Tramrails.—Liverpool Corporation has ordered from Messrs. Walter Scott, Limited, Leeds Steel Works, a sample lot of 100 tons of titanium alloy steel tramrails. This is the first use in this country of this alloy steel for tramrails. In America its claimed advantages are being tested on several leading tramways.

Law Notes.

Edited by J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

In order that we may be pleased to answer any questions relating the practice, enactments and decisions to local authorities, queries both should be written clearly on foolscap paper, and should consist of one question only. The letter should be addressed to "The Law Note Editor," at the office of this newspaper, accompanied by the querist's name and address, but correspondents who do not wish their names to be published should write through a "nom de plume." Where necessary, copies of documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are observed we cannot undertake to reply to queries.

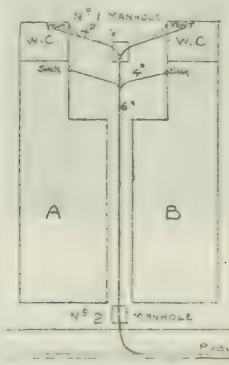
QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinguishing words as noms de plume. The letter X, combinations such as X Y Z, and words such as "engineer" and "surveyor," should never be used.

BY-LAWS. OPENING IN EXTERNAL WALL. EXTENT.—"W. M." writes: Recently I submitted plans of proposed extensions to the surveyor to an urban district council, who has advised his committee to disapprove the plans on the grounds that they do not comply with the by-laws in force in the district in that "the walls between the openings are not of sufficient thickness." The by-law to which he refers [illegible] is exactly the same as By-law 20 (pp. 197 and 198 in King's Annotated Model By-laws, 1898 edition)—viz., "Every person who shall erect a new building, and shall leave in any storey or storeys of such building an extent of opening in any external wall which shall be greater than one-half of the whole extent of the vertical face or elevation of the wall or walls of the storey or storeys in which the opening is left, shall construct—(*a*) sufficient piers of brickwork or other sufficient supports of incombustible material so disposed as to carry the superstructure, and (*b*) a sufficient pier or piers or other sufficient supports of that description at the corner or angle of any street on which the building abuts, or (*c*) such a pier or other support in each wall within 3 ft. of the corner or angle of the street." The point in question is whether the word "extent" in this case refers to the width of openings in relation to the length of external walls, or to the area of openings in relation to the area of external walls.

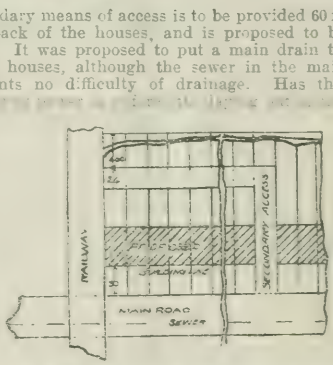
In my opinion "extent" means the area of the openings in relation to the area of external walls.

COMBINED DRAIN.—"W. R. A." writes: A and B are two houses, owned by two different people, draining down the passageway as shown in sketch. Would not the main length between manhole No. 1 and



[illegible] No. 2 manhole [illegible] from both houses?

[illegible] chased a parcel of land, divided it into thirty-two [illegible] on to a public main road, in which is laid water [illegible] pulling with the by-laws were submitted to the [illegible] Local Government Board, but could not receive [illegible] Town Planning Act. All the [illegible] the Act, and [illegible] the proposed [illegible] the Act. A secondary means of access is to be provided 60 ft. from the back of the houses, and is proposed to be 24 ft. wide. It was proposed to put a main drain to serve these houses, although the sewer in the main road presents no difficulty of drainage. Has the local [illegible] the Housing and Town Planning Act 1909, or any other Act, and to demand a 36 ft. roadway at the back? It may be added that the Public Health Act, 1875, is only in force, other Public Health Acts not having been adopted.



The local authority, if authorised by the Local Government Board, may prepare a town planning scheme, but the scheme has the effect until approved by the Board. It can be approved, and the plans comply with the existing by-laws, the authority are not justified in refusing to approve them.

REFUSE REMOVAL: "HOUSE REFUSE."—"G. J." writes: I have a garden at the back and side of my house, and have always placed cabbage stalks, creeper cuttings and refuse from it in the house refuse receptacle for collection by the urban district council, who [illegible] the collection of "house refuse" on condit on it is placed in the forecourt. The council now decline to collect the garden refuse, saying it is not "house refuse," whereas I contend that as the refuse referred to is not trade refuse it must be "house refuse" within the meaning of the Act. Can I force the district council to collect the refuse from my [illegible]

I am [illegible] assumed that everything that is not trade refuse must be house refuse, and that garden refuse is house refuse within the meaning of the Act.

URBAN DISTRICT COUNCILLOR. RESIGNATION.—"Interested" writes: I should be much obliged if you could tell me if a member of a council could take [illegible] the present time a member, supposing he resigned immediately and paid the usual fee. Could he take office at once, or does he have to resign at least twelve months beforehand?

A member of an urban district council can resign at any time by writing signed by him and delivered to the clerk on payment of the [illegible] Act, 1882, and the General Order and Rules as to the Election of [illegible] complete by the delivery of the writing and the payment of the fine [illegible]

[illegible]—"A M [illegible] I should like to know, *re* traction-engine hauling, the maximum [illegible] the latest Act or Order?

[illegible] (*i.e.*, of the same diameter on the inside as on the outside). By this [illegible] April 1st [illegible] of a borough or county council. And by sec. 1 (3) of the same Act the weights above mentioned do not apply to a wagon carrying one [illegible] article of greater weight than 16 tons if the tyres are 8 in. wide or upwards but any damage arising from the use of any such wagon [illegible] the Highways Act, Act 1878.

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
Appointments Vacant	680
Assistants' and Students' Section	678
Association of Managers of Sewage Disposal Works	680
Correspondence	674
Crystal Palace Old Students' Society	680
Detection of Waste Water	688
Housing in Ireland	663
Insanitary Rural Cottages	663
Institute of Sanitary Engineers	690
Institution of Municipal and County Engineers: Notices	680, 689
Institution of Municipal Engineers: Notices	690
Intercepting Traps in House Drains	661, 669
International Road Congress	674
Law Notes	676
Local Government Board Inquiries	679
Manchester Appointment	663
Mixing Cement with Bitumen	675
Money Wasted on the Roads: Who is to Blame	661, 685
Municipal Competitions Open	691
Municipal Contracts Open	691
Municipal Work in Progress and Projected	684
Officials as Architects	662, 668
Personal	683
Private Street Works Act, 1892: Public Footpath with Added Strip	675
Recent Publications	687
Road Efficiency	661, 685
Royal Sanitary Institute: Notices	689
Sea Wall Construction on the Florida Coast	686
Sewerage Construction in Sydney, New South Wales	663, 664
Surveyors' Institution	663, 673
The Institutions of Municipal Engineers	674
Village Water Supply in Lincolnshire	677
Water Supply in Canada	686
What is a Garden City?	674

VILLAGE WATER SUPPLY IN LINCOLNSHIRE.

FERRO-CONCRETE WATER TOWER AT SCOPWICK.

The Sleaford Rural District Council have again added to the large number of village water supplies inaugurated by them during the past fifteen years within the large area coming under their jurisdiction. The most recent undertaking of the kind is one for supplying the parishes of Scopwick and Kirkby Green, with probable extensions to the picturesque village of Blankney and to Blankney Hall, one of the seats of Lord Londesborough, the Lord of the Manor, who has contributed one-third of the total cost of the works.

The project comprises a deep bore well, 400 ft. in Lincolnshire oolite, a pumping station, pipe lines, and a ferro-concrete water tower. The first three items were executed by Messrs. W. Pattinson & Sons, Limited, contractors, of Ruskington and London, and the water tower by the Liverpol Ferro-Concrete Contracting Company, of Bixteth-street, Liverpool. The machinery for the pumping station was supplied by Messrs. R. Hornsby & Sons, Limited, of Grantham.

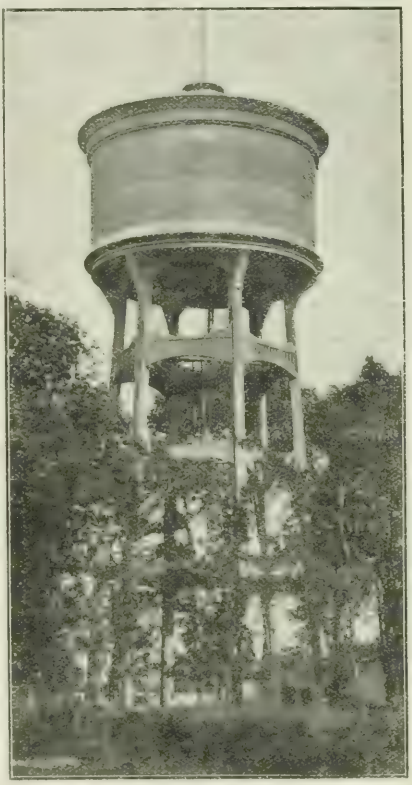
With the exception of the wrought-iron access ladders, the water tower is constructed entirely in ferro-concrete on the Hennebique system, even including the pole projecting some 14 ft. above the top of the cupola.

The elevated reservoir consists of a cylindrical chamber, 24 ft. in diameter inside, by 11 ft. 3 in. high from floor level to the under side of the roof, and has a capacity of 27,700 gallons. The outer shell of the reservoir is 5 in. thick, the bottom being of the same thickness. The roof is 4 in. thick, and is provided with an ornamental cornice about 2 ft. high, forming a parapet. At the centre of the reservoir is a ferro-concrete tube, 2 ft. 6 in. in diameter inside, affording accommodation for the ladder furnishing means of access to the roof, the top of the opening being covered by a cupola 8 ft. high. The reservoir is supported at the height of 50 ft. above ground level by a tower of hexagonal form, consisting of six inclined columns, braced laterally at five levels.

The footings of the columns are bedded on the rock occurring near the surface, and at ground level they are connected by a moulded plinth. The intermediate bracings are utilised for the support of the ladder and the landings in connection therewith. At the upper end the columns are connected with the bottom framework of the reservoir, and are additionally braced by a series of arches. Cast-iron brackets projecting from the columns provide for the support of the outer part of the cylindrical reservoir.

The ferro-concrete work is monolithic throughout, and reinforced in accordance with Hennebique standard practice, which is now so well known that detailed explanation is unnecessary. The tower, however, is somewhat unlike any of the very few ferro-concrete structures of the kind that have been constructed under a scheme granted by the Local Government Board. The interior face of the reservoir is rendered 1 in. thick in two coats of cement and Medusa waterproofing compound, and when under test the reservoir was found to be perfectly watertight, without sweating or condensation anywhere.

On the pole fixed at the top of the cupola is a spherical balance-weight, which will act as a water-level indicator, being attached to a copper float inside the reservoir, thus showing the depth of water to the



SCOPWICK WATER TOWER.

engines at the pumping station, situated 1,250 yards lower down the valley of Scopwick Beck.

As may be judged by the photograph reproduced, the tower, which is situated on the Lincoln-road, is a structure of pleasing appearance, in this respect forming a welcome contrast to some of the particularly ugly water towers erected in other parts of the country.

The whole of the works were designed and carried out under the personal supervision of Mr. W. B. Marsden, the engineer and surveyor to the Sleaford Rural District Council. Messrs. Mowlem & Partners being responsible for the ferro-concrete work. The reinforcing steel was supplied by the Whitehead Iron and Steel Company, Limited, of Tredegar, the Portland cement by Messrs. Martin Earle & Co., Limited, of Rochester, and the aggregate for the concrete by the Groby Granite Company, Limited.

Change of Address. — The Ransome-verMehr Machinery Company, Limited, announce that they have found it necessary to move to larger offices, and that from to-morrow (Saturday) their address will be Brunswick House, Matthew Parker-street, Westminster, S.W.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:—

283. Strength of Materials.—What is meant by the following terms: (a) Modulus of elasticity, (b) elastic limit, (c) permanent set, (d) plastic elongation, (e) ultimate elongation, (f) contraction of area? ("Inquirer.")

284. Wood Paving.—What are the comparative advantages and disadvantages of soft and hard wood for street paving? ("Suburban.")

285. Building Construction.—Explain, with sketches where necessary, the meaning of the following terms: (a) Larrying, (b) pugging, (c) gib and cotter joint, (d) lead soakers. ("Pupil.")

286. Hydraulics.—A hemispherical cistern is 20 ft. in diameter, and it is full of water. How long will it take to lower the depth of the water 5 ft., if the water escapes through a 3-in. diameter sharp-edged hole in the bottom of the cistern? The coefficient of discharge for the hole is 0·60. (H. V. O., *West Bromwich.*)

287. Street Culley.—Will some reader kindly supply a sketch of some form of street gulley, the grid of which is in the [illegible], the kerb and not in the channel of the roadway? ("Anxious.")

288. Mechanics.—Explain clearly the distinction between a vector, a scalar and a [illegible] quantity. ("Beginner.")

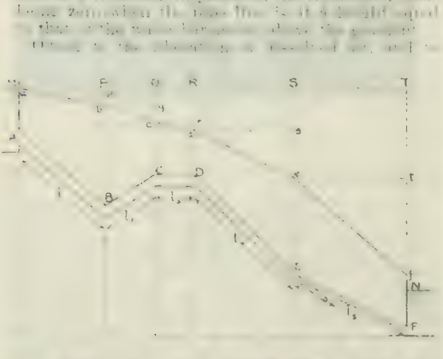
REPLIES TO QUESTIONS.

282. Hydraulics.—Explain simply what is meant by the "hydraulic gradient" of a pipe, and how this may be obtained in any given case. ("Pupil.")

The "hydraulic gradient," or "virtual slope" of a pipe is that gradient or slope on which the pipe must be laid if there is to be only atmospheric pressure throughout.

If the pipes are laid below this line there will be at any point an excess of pressure over atmospheric pressure equal to a head of water of height equal to the vertical distance between the pipe and hydraulic gradient at the point considered. Similarly, if the pipe line is above the hydraulic gradient [illegible] [illegible] the pressure [illegible] [illegible] when the pipe line is at a height equal [illegible]

[illegible]



[illegible] ... [illegible] flow [illegible] than 34 ft., unless [illegible] the air.

When water is flowing steadily in a pipe, the [illegible]

[illegible] the work done, measured in terms of feet-head of water, and divided by the length of the pipe gives the slope of the line or hydraulic gradient. Its position relative to the pipe line, either above or below, can only be determined by considering the system as a whole.

The hydraulic gradient in a particular case, such as a pipe line from an impounding reservoir to several service reservoirs, may be considered as follows:—

Let ABCDEF be an elevation of the pipe, and M and N the usual water levels in the reservoirs.

Let the diameter from A to D be d_1 and the velocity v_1
.. .. .. D to E be d_2 .. .. v_2
.. .. of the branch EF be d_3 .. .. v_3

Let the lengths of AB, BC . . . &c., be l_1, l_2 . . . l_5

As the flow is steady, the rate of discharge at all sections is constant, and the velocity will only vary with change of area.

Let f be the coefficient of resistance to flow, or coefficient of friction, and assume a bell-mouth entrance at A, so that there is no loss of head at entrance.

The loss of head due to friction is given by the expression:

$$4f\frac{l}{d}\frac{v^2}{2g}$$

The pressure at the point A is the static pressure due to head MA.

In passing from

A to B, loss of head due to friction $= 4f\frac{l_1}{d_1}\frac{v_1^2}{2g} = Tb$

B to C, ... $= 4f\frac{l_2}{d_1}\frac{v_1^2}{2g} = bc$

C to D, ... $= 4f\frac{l_3}{d_1}\frac{v_1^2}{2g} = cd$

D to E, ... $= 4f\frac{l_4}{d_2}\frac{v_2^2}{2g} = de$

E to F, ... $= 4f\frac{l_5}{d_3}\frac{v_3^2}{2g} = ef$

At F the kinetic energy dissipated in eddies

$$\frac{v_3^2}{2g} = fN$$

The pressure at the point F is the static pressure due to the head NF.

The total loss of head is the difference in level of the water surfaces, *i.e.*, TN.

$$\therefore TN = Tb + bc + cd + de + ef + fN.$$

The solution of these equations will enable the [illegible] values of Tb, bc, &c., to be found and the hydraulic gradient, a, b, c, d, e, f, N, to be drawn for flow from the upper to the lower reservoir.

The division of the portion ABCD into three separate lengths, owing to difference of slope, is seldom necessary in practice, as the difference in length of a pipe line in plan and elevation is rarely appreciable.

If tubes were inserted in the pipe, the top of the water in each would lie on the line ab . . . f, so that the hydraulic gradient may also be defined as the locus of the water levels in gauge tubes. (H. E. L., *[illegible]*.)

276. Roof Design.—It is found necessary in designing the steel trusses for a roof to adopt some system of wind bracing. Explain in detail how the cross-sectional area of the wind ties is determined. (H. F. W., *[illegible]*.)

There is no method of actually calculating the [illegible] [illegible] good practice [illegible] each particular case.

A [illegible] from the foot of each principal to the apex of the adjoining truss. Convenience [illegible] the shape of the cross-section, and for this form of bracing Prof. Henry Adams has suggested a diameter of ¼ in + ¼ in per 10 ft. of span.

An alternative method for a long roof is to connect the feet of the first truss with the apex of the fourth, and from that point to the feet of the seventh, and so on, the braces being fixed to the principal rafters crossed. A suggested size for a rectangular section is $\frac{3}{4}$ in. per 10 ft. span for width, and $\frac{1}{8}$ in. per 10 ft. span for thickness.

The attachment of a longitudinal tie connecting the feet of the king rods, if any, helps to stiffen the roof.

Fig. 1 shows an example of bracing (American practice) for a roof subject to vibration. The diagonal bracing shown is formed of 3-in. × 2½-in. × $\frac{3}{16}$-in. angles.

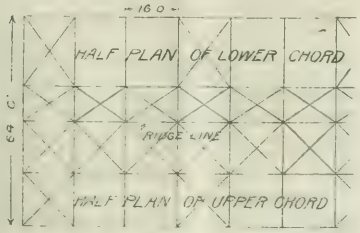


FIG. 1.

Fig. 2 is a cross-sectional elevation of a Continental railway station roof in an exposed situation.

The roof is of the bow-string form, span 120 ft., trusses 25 ft. centres, and is 300 ft. long. Each truss is divided into eight bays.

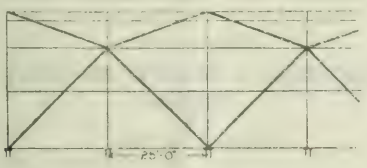


FIG. 2.

The wind-ties, shown by thick lines, are 4 in. × ½ in. wrought-iron bar, and are symmetrically placed in the roof. (H. E. L., *Islington*.)

Superannuation. At last week's monthly meeting of the East Molesey Urban District Council it was reported that a circular-letter had been received from the secretary of the Urban District Councils Association on the subject of the Local Government Officers' Superannuation Bill, which has been prepared by the National Association of Local Government Officers. It was pointed out that the Bill provided for superannuation allowances to the officers and servants of all local authorities, and for contributions towards such allowances by such officers and servants, and it was decided by the recent Chelsea Conference that, as the Bill was one which closely concerned all urban district councils, it would be desirable that the proposals of the Bill should be taken into consideration by the individual urban district councils. The principle of superannuation, it was further mentioned, had been applied repeatedly in the case of officers employed in the public service, and of those now entitled to superannuation might be mentioned Poor-law officers, asylum officers, teachers in elementary schools, certain officials of education authorities and Civil servants. The Urban District Councils Association, before taking any active steps in support of the Bill, wished to be assured that the urban district councils throughout the country approved the principles of the Bill, and desired that it should be introduced into Parliament. Mr. J. Ray, the chairman of the district council, said it was evident from the Bill that if there was any deficiency the councils would have to make it up, and he thought the better had better "lie on the table." It was, however, agreed to refer it for consideration to the General Purposes Committee.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Bath T.C. (November 4th. Mr. R. H. Bicknell).—£4,000 for the extension of the city refuse destructor.—The city surveyor, Mr. C. R. Fortune, stated that the present capacity of the destructor plant was 45 tons a day. The future capacity would be 80 tons a day. The daily collection averaged about 46 tons in the lightest season, and from 80 tons to 86 tons in the heaviest season. The inspector said he would require further particulars showing the amount of loan sanctioned on the destructor land to date, the area now occupied for destructor purposes, the area that would be occupied when the new works were put down, and the surplus that would then be remaining.

Chadderton U.D.C. (October 30th. Mr. Edgar Dudley).—£1,860 for street improvements and the provision of an open space.—The road work, it was explained, had become necessary in Foxdenton-lane owing to the increasing volume of traffic, and it was also proposed to widen Burnley-lane and reserve about 1 acre of land as an open space.

Darwen T.C. (October 31st. Mr. T. C. Ekin).—£37,000 for various works of improvement.—It was stated by the borough surveyor, Mr. R. W. Smith-Savile, that a sum of £20,000 is to be expended in making and sewering streets adjoining new property which has sprung up on the outskirts of the town in recent years. A second sum is for repairs to the main road, 90 per cent of the interest and sinking fund on which the county council are liable for under agreement. It is proposed to spend £10,000 on the main road in the near future, and it was stated that while some of this outlay would in the ordinary course of events have been imperative, it has been rendered more so and in a largely increased measure by the heavy motor traffic which has sprung into being with increasing force in recent years.

Goole U.D.C. (November 8th. Mr. W. O. E. Meade-King).—£1,550 for the purchase and laying out of land for a park. Mr. R. Tyson, clerk to the council, explained that the Aire and Calder Navigation, the largest ratepayers, acquired about 4½ acres of land with a frontage to the river Ouse for £1,000, and the Goole Council received 3 acres for £666. The navigation on the portion which faced the river had constructed a wide flood bank at a further cost of £1,000. On the remaining portion the council intended to provide a bowling green and shelter, and generally lay out the plot as a park. There was no opposition.

Lytham U.D.C. (November 7th. Mr. H. R. Hooper).—£8,959 for new carburetting plant at the gas-works.—The present plant, it was stated, has a maximum capacity of 3,000,000 cub. ft. per day, and the new installation will give 500,000 cub. ft. There was no opposition.

Morley T.C. (November 6th. Mr. W. O. E. Meade-King).—£3,300 for planting and fencing Lewisham Park.—The town clerk (Mr. Fred Thackray) said it was intended to lay one-third out as a pleasure resort for adults, and the remainder as recreation grounds for boys and girls respectively.

Oakengates U.D.C. (November 1st. Mr. F. O. Stanford).—£14,370 for works of sewerage and sewage disposal.—The clerk, Mr. J. A. Holmes, stated that at the present time about two-thirds of the urban district was already sewered, and the present application was in respect of the remaining one-third. The medical officer of health for the county had pointed out that more land should be brought under irrigation, and that was now being done. The farm land which had been previously let to a tenant had now been taken over by the council. Mr. R. E. W. Berrington explained the scheme, and evidence was also given by Mr. V. Wilson (surveyor to the council).

Southgate U.D.C. (October 22nd. Major J. Stewart). £4,350 for the improvement of Highfield-road, Greenlanes and Fox-lane; £2,532 for works of private street improvements in Haslemere-road, Chenies-avenue and Kelvin-avenue; and £2,350 for the construction of an open-air swimming bath at Barrowick Green: and also for consent to the appropriation for the purposes of the proposed swimming bath of certain land formerly used as a gravel pit.—The necessary evidence

was given by the Clerk, Mr. W. M. Elliston, and the surveyor, Mr. C. G. Lawson.

Totnes R.D.C. (October 27th. Mr. A. G. Drury).—£1,600 for works of water supply at Marldon.—It was stated that an arrangement had been come to with the Paignton Council to obtain a supply from their main.

APPLICATIONS FOR LOANS.

Bath R.D.C. £3,000 for works of drainage.

Cheltenham T.C. £4,000 for sewage disposal purposes.

Cuckfield U.D.C.—£2,200 for the provision of workmen's dwellings.

East Cowes U.D.C.—£550 for the repair of the seawall.

Glastonbury T.C.—£4,250 for the extension of the gas undertaking.

Harwich T.C.—£400 for auxiliary sewerage.

Llandrindod Wells U.D.C.—£4,250 for the extension of the water works.

Peterborough T.C.—£1,000 for electricity mains.

Sunbury U.D.C.—£2,500 for additional sewage plant.

Wellingborough U.D.C.—£1,700 for a drainage scheme.

LOANS SANCTIONED.

Ashbourne R.D.C.—£1,030 for a housing scheme.

Cannock U.D.C.—£4,240 for kerbing and channelling purposes.

Cookham R.D.C.—£350 for surface-water drainage works.

Dover T.C.—£600 for wood paving and other works.

Frome U.D.C.—£886, further loan in connection with the sewage scheme.

Kettering R.D.C.—£4,380 for a sewerage scheme.

Poole T.C.—£1,408 for public conveniences.

Queenstown U.D.C.—£12,500 for the provision of workmen's dwellings.

Quorn U.D.C.—£524 in connection with the provision of a village hall.

Silsden U.D.C.—£700 for street improvements.

Southgate U.D.C.—£2,400 for improvements at a public park.

Stoke T.C.—£3,380 for works of street improvement and surface-water drainage, and £350 for culverting.

Wallasey T.C.—£4,490 for the erection of a school at Egremont.

Walmer U.D.C.—£2,598 for sewerage purposes.

FORTHCOMING INQUIRIES.

NOVEMBER.

		£
19.	**Barking Town.** For hospital purposes (Dr. F. St. George Mivart)	2,27[illegible]
19.	**East Grinstead.** For works of paving, sewerage, and surface-water drainage (Mr. A. G. Drury)	1,000
19.	**Halifax.** For sewage disposal purposes (Mr. F. O. Stanford)	1,825
19.	**Harwich.** For the provision of a recreation ground (Mr. Edgar Dudley)	400
19.—**Newquay.** For private street works (Mr. E. Leonard)		110
19.—**Prestwich.** For works of street improvement (Mr. F. H. Tulloch)		14,000
19.	**Shoeburyness.** For gas-[illegible] ground purposes (Mr. T. C. Ekin)	[illegible]
19.	**South Westmorland.** For sewage disposal purposes (Mr. A. W. Brightmore)	[illegible]
19.	**Westhoughton.** For depot and water supply purposes (Mr. P. M. Cruickshank)	2,250
19.	**Willesden.** For private street works (Major J. Stewart)	1,150
20.	**Blackburn.** For works of sewage disposal (Mr. F. O. Stanford)	750
20.	**Brampton.** For water supply purposes (Mr. A. W. Brightmore)	720
20.	**Bromley.** For private street works (Major J. Stewart)	3,920
20.	**Devonport.** For the purchase of land for hospital purposes (Mr. W. W. E. Fowler)	4,500
20.—**Heysham.** For private street works (Mr. M. K. North)		792
20.—**Ipswich.** For works of sewerage (Mr. R. G. Hetherington)		440
20.	**Luton.** For works of sewerage (Mr. W. O. E. Meade-King)	7,684
20.—**St. Annes-on-the-Sea.** For works of sewerage (Mr. P. M. Crosthwaite)		38,000
20.—**Southwick.** For works of surface-water drainage (Mr. H. Shelford Bidwell)		450
20.—**Uckfield.** For sewage disposal purposes (Mr. A. G. Drury)		12,200
21.—**Lymington.** For the provision of water-pumping plant (Mr. H. Shelford Bidwell)		600
21.—**Runcorn.** For private street works (Mr. F. H. Tulloch)		788
21.—**Rye.** For works of water supply (Mr. W. O. E. Meade-King)		4,000
21.—**Stockton-on-Tees.** For the extension of the borough hall (Mr. W. H. Collin)		3,800
21.—**Truro.** For water supply purposes (Mr. E. Leonard)		600
21.—**Wirral.** For sewage disposal purposes (Mr. F. O. Stanford)		4,444
22.—**Cheadle.** For street and depot purposes (Mr. M. K. North)		1,129
22.—**Nantwich.** For sewage disposal purposes (Mr. F. O. Stanford)		12,500
22.—**Reigate.** For the purposes of the sewage farm (Mr. Courtenay Clifton)		550
22.—**Sandgate.** For water supply purposes (Mr. W. O. E. Meade-King)		5,500
23.—**Stourbridge.** For street and open space purposes (Mr. F. H. Tulloch)		1,200
26.—**Kettering.** For hospital purposes (Dr. Morgan J. Rees)		1,400

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

DISTRICT MEETINGS.

We have received from the secretary of the Institution of Municipal and County Engineers, Mr. Thomas Cole, notification of the following district meetings of that body which are to be held in the course of the next two months:—

North-Western at Blackpool, November 16th.
East Midland at Nottingham, November 16th.
South-Western at Taunton, November 16th.
Metropolitan at 11 Victoria-street, Westminster, S.W., November 20th.
West Midland at Birmingham, November 21st.
North-Eastern at York, November 30th.
Eastern at Westminster, S.W., December 7th.
South-Eastern at 11 Victoria-street, S.W., December 7th.
Metropolitan at 11 Victoria-street, Westminster, S.W., December 18th.
South-Eastern at Sidcup, and Dinner, January 8, 1913.

Public Slipper Baths. — The borough engineer of Chelmsford Mr. P. T. Harrison, would be glad to hear of other towns with a population of from 20,000 to 30,000 in which public slipper baths have been erected.

Motor Traffic and Maintenance of Highways.—The National Conference proposed by the Wood Green Council is receiving considerable support from all classes of road authorities. Up to the present about 150 authorities have promised the conference their support, and expressed their sympathy with its objects, and these include many county councils and most of the principal City and county borough councils, municipal corporations and urban district councils throughout the country. We understand that, as a result of this, the Urban District Councils Association is in communication with the County Councils Association, the Association of Municipal Corporations, and the Rural District Councils Association, the object being to arrange for their co-operation, so that the conference shall be convened under the auspices of the four organisations representing all classes of authorities in England and Wales.

Municipal Work In Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Durham £7,625; housing and town planning—Chelmsford, Southwick; roads and materials—Bermondsey £3,900, Carnarvonshire £3,000, East Sussex £27,744, Lancashire £50,000, Whitby £20,000; sewerage and sewage disposal—Bath £3,000 Dewsbury, Kendal, North Bromsgrove; water, gas and electricity—Chelmsford, Frieshire, Stourport; miscellaneous—Sheffield.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

BUILDINGS.

Ardsley (Yorks) U.D.C.—The local authority have instructed their surveyor to proceed without delay with the construction of a public mortuary.

Coalville U.D.C.—The surveyor, Mr. L. L. Baldwin, has been instructed to prepare plans and estimate for a mortuary.

Durham C.C.—The Ferryhill Station school is to be enlarged at an estimated cost of £3,025, and a new school for 400 scholars is to be erected at Fishburn, at a cost of £4,600.

East Cowes U.D.C.—It has been decided to repair the damage to the sea wall, at an estimated cost of £550.

East Molesey U.D.C.—It has been decided to apply to the county council to erect a much-needed bridge over the water-splash in Summer-road.

Kirkham (Lancs) U.D.C.—It is proposed to build a public bath in Station-road.

Lindsey (Lincs) C.C.—The county medical officer has been instructed to provide open-air shelters for the treatment of tuberculosis, to the amount of £250.

Llantarnam U.D.C.—It has been decided to purchase the Tennis Court Hotel buildings for the purpose of council offices at a cost of £1,250.

Lowestoft T.C.—The borough surveyor, Mr. G. H. Hamby, has prepared the sketch of a new concert pavilion at Sparrow's Nest.

Lurgan R.D.C.—Knock Bridge is to be rebuilt at an estimated cost of £450.

Wellingborough U.D.C. The surveyor to the council, Mr. E. Y. Harrison, has been instructed to prepare plans for a cart shed and steam-roller shed at the council's yard, Cannon-street.

HOUSING AND TOWN PLANNING.

Chelmsford T.C.—The Housing of the Working Classes Committee reported recently that the surveyor, Mr. P. T. Harrison, had submitted two alternative schemes for the erection of 104 or 98 cottages on the remainder of the site to complete the scheme. Before approving either of the schemes the council decided that steps should be taken to ascertain the demand for houses of the Class C type (4s. 3d. and 4s. 6d. per week). They therefore recommended that applications be invited by advertisement in the local newspapers for cottages of Class C type, the advertisement already issued having been for houses of Class A (rent 6s. 3d. and 6s. 6d. per week), and Class B (rent 5s. 3d. and 5s. 6d. per week).

Criccieth T.C.—The council have arranged terms for the purchase of land for the purpose of erecting workmen's dwellings, of which there is a great scarcity in the town.

Honiton T.C.—Inquiries are being made for a site on which to erect workmen's dwellings.

Okehampton R.D.C.—It has been decided to erect three dwelling-houses at Bratton Clovelly under Part 3 of the Housing of the Working Classes Act, to be let at rents of 3s. 6d. and 4s. weekly.

Pembroke (Co. Dublin) U.D.C.—Forty-nine cottages are to be erected at Irishtown, at an estimated cost of £12,000, subject to the sanction of the Local Government Board. The rent proposed is about 3s. 10d. per week.

Southwick U.D.C.—A special meeting will be convened to discuss the question of a town planning scheme, as to which a report has been prepared by the surveyor, Mr. Geo. W. Warr, together with a plan showing in detail the area for which the scheme should apply. It also shows the route of a suggested new through road into Hove and Brighton. He suggests that the county council and the neighbouring local authorities be approached in order to ascertain what extent of approval it would meet with.

St. Germans R.D.C.—The tender of Mr. W. Petherick, of Notter Mills, St. Stephen's, at £595, has been accepted for the erection of three cottages at St. Stephen's, and that of Mr. J. F. Ashton, of Burraton, at £436, for the erection of two cottages at Polbarder.

Ystradgynlais R.D.C.—Sixty workmen's dwellings are to be erected in three batches of twenty at Colbren, Abercrave, and Ystradgynlais.

PARKS AND OPEN SPACES.

Plymouth T.C.—Subject to departmental sanction, it is proposed to purchase portions of the West Hoe estate for the sum of £8,000. The land is required for the purposes of swimming baths, and of a place of winter shelter and entertainment and for the further embellishment and improvement of the western part of the Hoe.

Swindon T.C.—The borough surveyor, Mr. H. J. Hamp, has received instructions to proceed with the construction of bowling greens in the Town Gardens and Rodbourne Recreation Ground, at an estimated cost of £50 each.

REFUSE COLLECTION AND DISPOSAL.

Horsham U.D.C.—The tender of Messrs. Heenan & Froude, at £1,450, has been accepted for the erection of a refuse destructor.

Lincoln T.C.—Approval has been given to a draft contract for the purchase for £7,673 of 30 acres of land at Canwick for refuse disposal purposes.

ROADS AND MATERIALS.

Ashburton U.D.C. The tender of the Devon Traction Company, at 22s. 6d. per day, has been accepted for steam rolling.

Bermondsey B.C.—It has been decided to repave with hard wood, on new concrete foundations, the carriageway (outside the tramway area) of Tooley-street, from Bermondsey-street to Duke-street, at a cost of £3,900.

Bristol T.C.—West-street, St. Philip's, is to be widened, at an estimated cost of £675.

Carnarvonshire C.C.—A road improvement scheme, estimated to cost £3,000, has been approved.

Cheriton (Kent) U.D.C.—The scheme of the surveyor, Mr. O. A. Sherren, has been adopted for the improvement of High-street and Risborough-lane.

East Sussex C.C.—The Roads and Bridges Committee have adopted a scheme for the improvement of the Lewes to Newhaven road, the cost of which is estimated at £27,744. This, it is stated, will provide a highway 30 ft. wide from bank to bank, with macadam 18 ft. wide. The cost will be defrayed by the Road Board, who will contribute £11,700, the Newhaven Rural Council, whose contribution is given as £8,000, and the East Sussex County Council, who will find the remaining £8,044.

Faversham T.C.—The tender of the Faversham Gas Company, at 3½d. per gallon, has been accepted for next season's tar supply.

Greenwich B.C.—Application has been made to the Road Board for a loan to cover the cost of laying improved paving in the main roads.

Hampstead B.C.—The sum of £2,000 has been set aside for snow clearing and gritting roads during the ensuing winter season.

Lancashire C.C.—The Main Roads Committee are spending £50,000 on the improvement of the diverted main road from Preston to the sea at Blackpool. Recognising the growing cost of road repairs, the committee do not intend to increase the council's liabilities in this direction, either in the Fylde or elsewhere.

Lurgan R.D.C.—The portion of the main road between Lurgan and Portadown is to be treated with "Rocmac."

Northumberland C.C.—Seven motor cycles have been purchased for the use of the surveyors, at £53 each.

St. Germans R.D.C.—It has been decided to recommend the county council to discontinue tar spraying in the St. Germans district, owing to its alleged danger to horses and its costliness.

Shoreham U.D.C.—The tender of the Penlee and St. Ives Stone Quarries, Limited, has been accepted for the supply of 700 tons of granite quartzite or elvan stone, at 10s. per ton (delivered).

Southwick U.D.C.—The tender of Messrs. Parsons & Sons, of Hove, has been accepted for steam rolling, at 24s. per day.

Teignmouth U.D.C.—Plans providing for the widening of Bishopsteignton and Mill-lane, at an estimated cost of £1,630 and £470 respectively, have been approved by the council.

Uckfield R.D.C.—Certain road constructions are to be carried out, and the Easons Green-road is to be widened from 13 ft. to 15 ft., at an estimated cost of £1,115.

Whitby U.D.C.—An extensive improvement scheme at Whitby Spa has been under consideration. The proposal would involve the placing back of the top railings to the edge of the cliff, and the laying out of the "reclaimed" portion for the public use; the construction of two or three good shelters on the top, along the front, also for the public use; a new concrete pavilion in place of the present "conservatory," with a continuation of the promenade in front of it; and an easier drive down to it. These, it is believed, are the main features of a scheme involving a cost of something like £20,000.

SEWERAGE AND SEWAGE DISPOSAL.

Ballymena R.D.C.—The consideration has been adjourned of a report by Messrs. Patterson & Graham stating that, in company with a committee of the council, they had inspected the sewerage arrangements of the town of Kells, and found the existing system very defective and obsolete, causing the town to be in a highly insanitary condition, and, in their opinion, endangering the health of the inhabitants. They recommended certain work which, if carried out, would greatly improve the sanitary condition of the town.

Bath R.D.C.—It is proposed to expend a sum of £3,000 in connection with the sewerage of Freshford.

Bristol T.C.—At a meeting last week of the Sanitary Committee, the city engineer, Mr. L. S. Mackenzie, drew attention to a circular-letter which had been received from the Ossett Town Council with regard to the admission of trade effluents into sewers, and asking Bristol to support a resolution declaring the urgent necessity of amending the law, as recommended by the Royal Commission on Sewage Disposal, so as to ensure effectual preliminary treatment of the refuse on the payment of a reasonable charge to the local authority, and asking the President of the Local Government Board to introduce legislation on these lines in the next session of Parliament. It was agreed to support the resolution.

Dewsbury T.C.—Approval has been given to a scheme for extending the sewage farm and erecting pumping stations.

Kendal T.C.—The Sewerage Committee have approved the scheme of the borough engineer, Mr. F. W. Oxberry, for an improvement at the sewage disposal works, and plans and estimates of the following additional plant: Screening chamber, storm-water tanks, additions to septic tanks, humus tanks, sludge beds and sewers, £2,893; pumping plant, pump-house and pipe lines, £993; three filters, £5,136; contingencies (5 per cent.), £451; clerk of works, £325.

Neath T.C.—The tender of Messrs. Waring, Cole & Waring, at £23, has been accepted for carrying out the sewerage work at Llantwit Lower.

North Bromsgrove U.D.C.—The engineer, Mr. Robert Green, M.Inst.C.E., has been instructed to prepare a scheme for submission to the Local Government Board for the sewering of the Rednall portion of the district, and to make arrangements with the adjoining district for the disposal of the sewage.

St. Columb R.D.C.—The tender of Mr. James Budge, of St. Columb, at £236, has been accepted for carrying out improvements at the sewage farm.

Sunbury U.D.C.—At its monthly meeting last week the council decided to apply to the Local Government Board for sanction to a loan for the provision of additional engine power at the sewage works and for installing a pair of ejectors. Mr. H. F. Coales, the surveyor, explained that the approximate cost of the two 500-gallon ejectors would probably be £1,650, the sewage and air mains being already provided for. As to the nature of the additional power, he had made careful inquiries of neighbouring councils, and it would appear that engines working on suction gas were the most economical. They were cheaper in the first cost, and with the oil market in such an uncertain state, it would probably be better to rely upon coal, especially seeing that a few months ago crude oil as used by the Diesel engines was 40s. a ton, and was now nearly 70s. To compete with suction gas made from anthracite at 33s. per ton, town gas would have to be supplied at from 8d. to 1s. per 1,000 cub. ft. Steam plant could not be entertained on the score of cost. He suggested that in the first instance one 40 b.h.p. engine and compressor should be put down in the engine-house, and that oil engine No. 2 (12½ b.h.p.) should be taken out and disposed of to make room for it. This would be establishing a gas plant of rather more than half the power required at its maximum. The producer plant could be installed in a corrugated-iron shed attached to the present building. The approximate cost of one 40-b.h.p. engine with producer plant, compressor and erection would be about £580, and the cost of foundations, engine bed and corrugated-iron shed for producer plant would be approximately £150, making a total of, say, £730. The annual cost of the vaporising oil used at the works during the last six years ranged from £400 per annum in 1907-8 to £231 in 1911-12, the average being £306. A 1d. rate (½d. each half-year) would meet the loan charges for the work, assuming that the loan was for fifteen years as before.

Swindon T.C.—After considering a report on the subject by the borough engineer, Mr. H. J. Hamp, and the electrical engineer, the council have decided to adopt steam plant for the purpose of pumping the sewage at the sewage disposal works. The capital cost of the system is £1,456, and maintenance £544.

Wellingborough U.D.C.—The surveyor, Mr. E. Y. Harrison, has presented alternative schemes for the storm-water drainage of the Park-road district, and the General Purposes Committee have recommended the adoption of the second scheme, at an estimated cost of £1,700. The scheme provides for the interception of the storm water from an additional 5 acres of paved streets, footways, forecourts and roofs of houses, which at present finds its way into the foul-water sewers, and there will therefore be a proportionate decrease in the amount to be dealt with at the sewage farm pumping station, and also upon the sewage farm itself. The committee also recommend the council to apply to the Local Government Board for a loan of £1,700.

Witham (Essex) U.D.C.—The surveyor, Mr. W. P. Perkins, has reported to the council that the annual sale of mangold on the sewage farm realised £157, which was about £7 10s. per acre, against £15 an acre last year.

WATER, GAS, AND ELECTRICITY.

Chelmsford T.C.—It is proposed to spend £1,000 in sinking a borehole.

Cleveden U.D.C.—At the last meeting the surveyor, Mr. G. W. Knowles, presented a report of the Lighting Committee, which dealt with the lighting of the main thoroughfares. Incandescent gas lighting will generally take the place of the now prevalent flat-flame burners, from which it is hoped a better system of lighting will result. The report was adopted.

Cwmamman U.D.C.—The council are being urged to proceed with the adoption of electricity for street lighting.

Dunfermline T.C.—It has been decided to promote a private Bill or a Provisional Order to obtain a supply of water from the river Devon and its tributaries, and to provide the necessary reservoirs for such supply.

Fifeshire C.C.—The Local Government Board have written to the Cupar District Committee emphasising that a gravitation water supply should be introduced to Strathmiglo, adding that, in their opinion, the mere fact that a majority of the ratepayers of Strathmiglo had voted in a plebiscite against the introduction of a supply of wholesome water should not be allowed to override the interests of the public health.

Halstead R.D.C.—The scheme of Messrs. Sands & Walker for extensions of the Earls Colne water supply

has been approved as follows: Engineer's cottage, £270; main along Coggeshall-road, a distance of 1,166 yds., £260; main along Station-road, as far as the station, 1,030 yds., £230. This brings up the amount of the loan to be obtained to £6,460.

Hinckley R.D.C.—The new water supply for Barwell and East Shilton was opened last week. The supply is taken from the Hinckley Urban District Council's Snarestone Waterworks, and the scheme will eventually cost over £11,000.

Mid-Lothian C.C.—It was reported at the Lasswade District Committee that arrangements have been made for the introduction of a gravitation water supply to Carberry, Wallyford, and the intervening district.

Perth T.C.—Additional gas plant is to be provided, at a cost of £2,800.

Stourport U.D.C.—The council have approved of the plans and estimates of Mr. W. Fiddian, of Stourbridge, for the waterworks scheme, and have decided to send the document to the Local Government Board. The proposal is to obtain a supply from Bewdley.

MISCELLANEOUS.

Lincoln T.C.—Authority has been given for the purchase of an additional 50-ft. fire escape.

Newcastle-on-Tyne T.C.—The Tramways Committee recommend the council to accept the tender of an English firm for the supply of steel rails of German manufacture, at a cost of £3,660, being £500 less than that of a Leeds firm.

Sheffield T.C.—The Fire Brigade Committee suggest that in place of a motor first turn-out machine, to cost £700, a motor fire engine should be purchased, at a cost of £1,050.

PERSONAL.

Mr. Michael Irwin, of Feenagh, Kilmeedy, has been appointed assistant county surveyor of Limerick.

Mr. E. M. Bate, surveyor to the Frinton-on-Sea Urban District Council, has been elected a Fellow of the Surveyors' Institution.

Mr. H. J. Godfrey, surveyor to the Cricklade and Wootton Basset (Wilts) Rural District Council, has had his salary increased by £40 a year.

Mr. Edmund Jeeves, surveyor to the Melton Mowbray Urban District Council, has been granted a month's leave of absence owing to illness.

Mr. F. J. Wood, county surveyor of East Sussex, has had his salary increased from £650 to £750 per annum, rising by annual increments of £25 to a maximum of £850.

Mr. A. C. Wallingford, district surveyor under the Sussex County Council, has been appointed county surveyor and draughtsman to the Soke of Peterborough County Council.

Mr. G. A. Taylor, F.A.S.I., assistant surveyor of Frome, has been selected from a list of ninety applicants to a similar post in the surveyor's department at Wath-on-Dearne.

Mr. A. McArthur, surveyor to the Cuckfield (Sussex) Rural District Council, has been authorised to attend the International Road Conference in June next on behalf of the council.

Mr. Edward Blakeway I'Anson, F.R.I.B.A., a well-known architect and surveyor, practising in the City of London, and a vice-president of the Surveyors' Institution, died on Sunday last, we regret to learn, at his residence in Kensington.

Mr. H. A. Clarke, surveyor to the Briton Ferry Urban District Council, has been complimented in open council upon the fact that the Local Government Board, in sanctioning a loan of £16,368 for a housing scheme, had approved his plans without suggesting any alteration.

Mr. W. Plant, borough engineer of Stafford, was last week the recipient of a souvenir album from the members of the Waterworks Committee in recognition of his services in connection with extensions and alterations at the Milford pumping station. The chairman of the committee, Councillor T. Dunn, in making the presentation, spoke of the excellent way in which Mr. Plant had carried out a complicated work, and Mr. Plant, in reply acknowledged the loyal assistance he had received from his staff.

SEA WALL CONSTRUCTION ON THE FIFESHIRE COAST.

In a paper describing a new dock at Methil, on the east coast of Scotland, Mr. B. Hall Blyth, junr., ASSOC.M.INST.C.E., at the Institution of Civil Engineers on Tuesday evening, supplied some interesting particulars with regard to the construction of a sea wall which, running along and outside low-water mark, encloses the dock and entrance channel.

The wall is nearly 1 mile long; it is built for three-fourths of its length of concrete, and continues with a pitched slope, where it is well above high-water mark. It was the first work started, the idea being to build the wall and use it as a cofferdam to enable all the works inside to be done in the dry. The wall was constructed on a bag-work foundation up to 2 ft. 6 in. above low water, and from that point to quay-level of block-work and mass concrete *in situ*. The width of the wall was originally 8 ft. at the top—*i.e.*, quay-level—with counterforts every 25 ft., and a backing of 20 ft. of rubble from the excavations. This, however, was not carried out, as no suitable rubble was found in the excavations, and the wall was built of concrete, 17 ft. thick. The height of the wall varied according to the level of the bottom. At the north end it is about 20 ft. high to quay-level, and at the south end the maximum height is 40 ft. Quay-level is 5 ft. above high water, and the parapet on the wall is 10 ft. above that level. For the first 400 yds. from the south end the side wall of the entrance channel and the sea-wall run parallel, and they were built together, making the wall in all 27 ft. wide at quay-level.

Two and a-half years were required for the building of the wall. During the first two years very bad weather was experienced and very little progress was made. Frequent storms and rough seas delayed the work, and often washed away the temporary stagings and roads. Difficulty was also experienced in shifting the sand overlying the rock. This was in some cases as much as 11 ft. deep, and all of it had to be removed before the bag-work could be put in. The bag-work was all put in position by divers. Goliath cranes were employed for building the wall at the north or shallow end, and derrick cranes at the south end.

After two bad years a very fine summer in 1910 enabled the wall to be finished, more than 800 lin. yds. being constructed in six months. The wall was closed in October, 1910, and after the parapet was erected and a bank of soft material was put in along the inside, the water was pumped out, and the wall was found to be practically watertight.

Along the front of the old breakwater and the south end of the old sea-wall 50-ton concrete blocks had been thrown in pell-mell to break up the seas and protect the walls. Some of these had to be moved to allow the new wall to be built, and were then replaced outside the new wall. After the completion of the new sea-wall more of these blocks were made and placed along the front where the wall is on a curve concave to the sea, so that now the wall is protected in this way practically from the south end to opposite the dock gates.

Messrs. Blyth & Westland, of Edinburgh, were the engineers for the works, the contractors being Messrs. Robert McAlpine & Sons, of Glasgow.

Motor Traffic over Richmond Bridge.—At a Local Government Board inquiry held at Richmond (Surrey) on Thursday of last week, as to a joint application by the Richmond Town Council and the Middlesex County Council (for the Twickenham Urban District Council) for an Order imposing a 5-mile speed limit for heavy motor vehicles on Richmond Bridge, the growing extent of London's suburban automobile traffic was brought out by Mr. J. H. Brierley, the Richmond borough surveyor, who gave the measurements of the bridge and the gradients, and put in a census which showed that on August Bank Holiday motor vehicles numbered 2,096, of which 1,286 were motor omnibuses. Horse-drawn vehicles numbered 667. On Sunday, September 22nd, motor vehicles numbered 2,177, of which 1,317 were motor omnibuses. The figures for Tuesday, November 5th (a wet day), were motor vehicles 1,401, 822 of these being motor omnibuses, and horse-drawn vehicles 862. Mr. Brierley emphasised the danger of motor omnibuses mounting the pavement. Mr. F. W. Pearce, surveyor to the Twickenham Urban District Council, also dwelt upon the danger, pointing out that the footways were narrow, and low above the carriageway.

FOR OTHER ADVERTISEMENTS

See End of Paper.

THE WOODBRIDGE RURAL DISTRICT Council invite Tenders for Road Material delivered as under:—

Granite or Basalt, broken to pass through a 2½-in. and to be rejected by a 1½-in. gauge. Whole Chalk Flint, Washmill Flint, Kentish Rag, and any other Road Material.

(1) The Council's Wharf at Wilford Bridge, or at Melton (G.E.R.) Station.
(2) Levington Creek and Nacton Hard, or at Orwell (G.E.R.) Station.
(3) Westerfield (G.E.R.) Station.
(4) Boyton Dock and Hollesley Bay Labour Colony Wharf.
(5) Waldringfield.

Granite will only be required at 1, 2 and 3, and not at 4 and 5.

All materials to be delivered between the 1st day of April and the 1st day of October, 1913, at such times and in such quantities as the Surveyor may direct, and will be subject to his approval. Any materials rejected by the Surveyor will remain at the Contractor's risk and expense.

The Council do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to accept any part of a Tender, not being less than a barge freight.

Tenders, accompanied by Samples, to be delivered (carriage paid) to Mr. H. E. Kell Council Office, Newstreet, Woodbridge, endorsed "Tender for ——," on or before 10 a.m. on Wednesday, the 20th day of November, 1912.

No Form of Tender will be supplied.

Any further information may be obtained of the District Surveyor by enclosed stamped envelope.

GEORGE COOK.
District Surveyor.

Ipswich-road, Woodbridge.
November 12, 1912.

TWICKENHAM URBAN DISTRICT COUNCIL.

STONE PITCHED EMBANKMENT.

The above Council hereby invite Tenders for the Construction of a length of about 650 ft. of Stone Pitched Inclined Embankment along the river frontage at Radnor House Pleasure Ground, Cross Deep, Twickenham.

Plan and Specification may be seen, and further particulars obtained, on application at the Office of Mr. Fred W. Pearce, F.S.I., Surveyor to the Council, Town Hall, Twickenham.

Sealed Tenders, endorsed "Tender for Radnor House Embankment," to be delivered to the undersigned not later than noon on Wednesday, the 27th day of November, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
H. JASON SAUNDERS,
Clerk to the Council.

Town Hall, Twickenham.
November 13, 1912.

EAST SUSSEX COUNTY COUNCIL.

APPOINTMENT OF DISTRICT SURVEYOR OF MAIN ROADS.

The Roads and Bridges Committee of this Council are prepared to receive Applications for the Office of District Surveyor of Main Roads for the No. 1 or West District, containing at present about 91 miles of main road.

The District Surveyor, who will be under the direction and control of the County Surveyor, will be required to devote his whole time to his duties and to reside in such place as may be fixed by the Committee, and will receive an annual salary of £160, rising by yearly increments of £5 to £200 per annum, payable quarterly, exclusive of such travelling expenses as may be allowed by the Committee.

Canvassing for the office will be considered a disqualification.

Candidates must be between the ages of 25 and 35 years and have had practical experience in the maintenance and improvement of roads. Preference will be given to those who are Members or Associate Members of the Institute of Municipal and County Engineers.

Applications for the appointment, accompanied by copies of not more than three recent testimonials, marked on the outside "District Surveyor," to be sent in on or before Tuesday, the 3rd December, 1912, addressed to the Clerk of the County Council, County Hall, Lewes, from whom further particulars can be obtained on application by letter.

F. MERRIFIELD.
Clerk of the County Council.

November 12, 1912.

RUISLIP-NORTHWOOD URBAN DISTRICT COUNCIL.

CLERK OF WORKS.

SHORT NOTICE.

The above Council invite applications for Clerk of Works for a period of about six weeks to supervise the construction of three lengths of Sewers at Eastcote and Ruislip.

The salary will be at the rate of £3 3s. per week, and the successful applicant will be required to commence his duties on or about Monday, the 2nd December next.

Applications, accompanied by copies of not more than three recent testimonials—which will not be returned—must be endorsed "Clerk of Works," and be in the hands of the undersigned not later than the first post on Monday, the 25th instant.

Selected candidates will receive an intimation on the 26th instant, but no intimation will be given to unsuccessful applicants.

EDMUND R. ABBOTT,
Clerk to the Council.

Council Offices,
Oaklands Gate,
Northwood,
Middlesex.
November 14, 1912.

BRACKLEY RURAL DISTRICT COUNCIL.

HIGHWAY SURVEYOR.

The Council invite applications for the Office of Surveyor of Highways. Salary £110 per annum.

The person appointed will be required to devote the whole of his time to the duties of the office.

Applications, in candidate's own handwriting giving particulars of age and previous experience, accompanied by not more than five recent testimonials, and stating when the candidate could commence work if appointed, must reach me not later than the 25th of November, 1912, marked "Surveyor."

Canvassing in any manner will disqualify applicants.

Full particulars can be obtained on application to me.

C. E. BARNES (Solicitor),
Clerk to the Council.

Brackley.
November 14, 1912.

THEORY OF ENGINEERING CONSTRUCTION. A reference-book for Civil Engineers and Students. By Ernest H. Essex, A.M.I.C.E. 8¾ in. by 5¾ in. 216 pp. Cloth gilt, 5s. Post free, 5s. 3d. Comprising a selection of Notes and Formulæ on the Theory of Construction, arranged in the form of Answers to the Questions set at Examinations for the Election of Associate Members of the Institution of Civil Engineers.

"Students of engineering construction are indebted to Mr. Essex for his book. . . . The book will have its use for students who are preparing for examinations, and to go through it will be found an excellent exercise for all who have to follow construction as a business."—*The Architect.*

"The examples chosen refer to problems of general professional interest, and the solutions are well reasoned and lucidly expressed. As an adjunct to scientific text-books the volume ought to be useful, and it may also be serviceable as a guide to candidates for examination."—*The Builder.*

London: St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, E.C.

LAND SURVEYING. Private practical FIELD INSTRUCTION for APPOINTMENTS ABROAD, by ex-Australian Government Surveyor. Traversing, Closing, and Plotting by Latitude and Departure, Triangulation, Areas by double Longitudes, Setting Out Railway Curves, Levelling, Astronomical Observations for Latitude Time and True Meridian, &c. No class work, INDIVIDUAL INSTRUCTION ONLY, entailing rapid progress.

M The Bungalow,
Pevensey Bay, Sussex.

Road Efficiency.

IS MUCH OF THE ANTAGONISM TO THE ROAD BOARD DUE TO A DISTURBANCE OF CORRUPT METHODS?

By THE EDITOR of *The Commercial Motor*.

[The following article by Mr. E. Shrapnell Smith, the well-known Editor of *The Commercial Motor* appeared in the issue of that journal for October 31st, and is here reprinted by permission. Some comments upon it appear in our "Minutes" pages.]

King George has asked for efficiency in all national affairs, and it has been pointed out by more than one able writer that this request from the throne must be cordially supported by workers in all branches of commercial and public activity if it is to be of real and lasting effect.

The Road Board and its advisers are popular in some counties. In other counties they are extremely unpopular. The same divergence of attitudes is also noticeable in respect of the pose that is adopted by many London borough councils towards the Road Board. London's local bodies, it is true, have so far failed to get any financial aid from the board, so our references to them can be held more particularly to concern degrees of unreadiness in respect of new methods of road construction which do not involve the use of proprietary articles. They nearly all still dearly love wooden blocks and asphalt, and use one or other where modern tar or bituminous systems might well be laid.

CLEANER THAN THE U.S.A.

Municipal life in the United Kingdom is usually reckoned to be conducted upon clean lines. Lapses are occasional, not systematic. The subtlety and extent of American graft, while that curse is not unknown, has no parallel over here at least so we persuade ourselves as a nation. That view is the opinion of competent observers, is based upon fact and practice. Experience bears it out. In spite of this, in certain ranks of civic employment connected with road construction and maintenance there appear to be good grounds for believing that all is not as it should be. Thus, in part, is progress hindered. There is not that free accommodation to expedient change which is needed.

Chief officials and heads of departments are seldom, we have every confidence in asserting, involved in transactions which transgress the laws of bribing and the provisions of the several Acts that are now in force for the prevention of corruption. It is their underlings, in those cases where results are governed by considerations other than merit and efficiency, who take the harmful courses which we have in mind.

WHY RESIST NEW METHODS?

Why is it at the present time, that there is so much resistance from the departments of some road surveyors against changes in methods of road construction and maintenance? Why was it that the use of tarry and bituminous binders was adopted so tardily, and why are these systems still regarded with disapproval in many districts? Why do municipal authorities even in London continue to lay waterbound roads with high percentages of useless dust in them? Why do so many surveyors fail to patch macadamised roads when embryonic potholes appear, in spite of methods and economies which are shown to be possible of achievement in other counties which do not so neglect to give a stitch in time?

Three fundamental explanations have been tendered to us by those who know much more about the subject than we do, and we give them for what they are worth in the first instance, and then add some comment of our own.

The first is that the delinquent surveyors are handicapped by the directions of corrupt or inefficient committees; the second is that the surveyors themselves, in the areas where the changes of methods which ought to have taken place have not been adopted, are either incompetent or negligently lazy, or suffer from a combination of the two faults; the third is that some surveyors, try as they may, are the victims of corrupt methods which suborn their foremen.

In no case have we heard it asserted that the surveyors themselves, or even individual surveyors, are guilty of being influenced by bribes, and we are glad, in that many road surveyors are personally well known to us and are personal friends of many years' standing, to add our unreserved endorsement to the view that such probity is one of their outstanding characteristics. We scout any such general aspersion with indignation. It remains a fact, none the less, that new methods, even when satisfactorily proved in other counties, are not welcomed as they might be, and that modern traffic requirements are allowed to be prejudiced in consequence. This result, from the standpoint of a journal which is devoted to the interests of commercial motoring, clearly justifies our action in giving a measure of publicity to possibilities and suggestions regarding the true causes. What is the reason for this ultra-conservatism?

We find, in addition to the above-mentioned three possible explanations, yet another. It is, that surveyors have too often made mistakes in the past by showing undue readiness to move forward on a large scale solely upon the apparent success of a small-scale experiment in a particular locality. There is no doubt that such an explanation deserves to be recognised, for road surveyors, as technical advisers to their committees, are the men who really have in the end to bear the blame or the credit for any big change of system.

THE PLEA THAT IT IS PREMATURE.

We wish that we could conscientiously state that all cases of adherence to old methods of construction were to be explained on the score of its being premature to change, but we fail to see how the use of badly-laid water-bound macadam can be so justified under many traffic conditions where that class of metalling is still being laid, or where it has been laid within the last three years. Poor and badly-laid water-bound macadam is still used in London highways which bear much traffic. That is indefensible.

LOCAL COUNCILLORS AND LOCAL LABOUR.

Systems which are not patented, and which it is open to the surveyors of the country to adopt, do not, of course, include the desirable or undesirable factor of "a turn" for parties who are not really entitled to any financial benefit. We refer both to trading deals and arrangements with contractors. With both of these the more serious problem affects upon labour and the labour vote must be coupled. That efficiency for which so many road surveyors have to be content merely to contend in the abstract is often sacrificed to the dictates of the Labour party.

Councillors who vote in favour of changes of road construction methods which will reduce annual outgo upon maintenance do so at imminent risk of the loss of their seats at the next election. For pride of place in the local council, which counts for much with many a tradesman who has to make his social mark according to his own lights, the method which requires a road to be remetalled for its whole width, say, once in two years, is retained, in preference to the newer method which would give it a life of six or more years. For the same reason, the destructive pothole, destructive alike to the road and to the traffic which rolls upon it, is allowed to form and to grow unchecked. The surveyor, with reluctance and true regret, finds it better to pretend that his organisation does not permit of his doing patching work. He, a slave to his small-minded committee—knows full well that it is to his best interests to let the road get into such a bad state that stone will be required to resurface it, and necessary labour, so much the sooner.

Most surveyors simply ignore potholes, or have loose stones dropped into them. Few do the essential patching and ramming there and then.

It is against laggard and unprogressive handicaps such as the foregoing that the road surveyors of this country are struggling. We decline to believe that there is any direct corruption. There is jealousy, we know, and we have frequently wondered how some county surveyors can have the effrontery to raise their voices in support of their own system, or lack of system, when other counties, at no greater expense, have done so much better than they in all respects.

Can this apathy last? Will not the slower men

stand condemned on comparison with those who have been wasteful and assumptive."

Our sub-heading to this article has been deliberately chosen. The Road Board and its officials, with their indirect right to look into detail, arising from the legal obligation upon them to grant money only for purposes of improvement, are stirring up the mud of not a few monstrous examples of wasted public money. They possess at the moment, and they will do so increasingly in the near future, a collection of data which for the first time in history enables a central office to put its finger upon the county and other authorities in which negligent or wasteful methods are pursued.

The next step will be, we opine, to get down to the root cause of the bad returns per pound spent per annum, and it is then that certain corrupt factors will probably for the first time be forced to disappear, and that many local councils who now approve courses which they know full well to be out of date and wrong in relation to altered conditions, will be provided with a much-needed and satisfactory excuse to put before their Labour constituents. They can say: The Road Board insists upon efficiency, and we, the local people, really are not to blame. At present many of them are pandering to the uninformed mob—to the type of men whose intellect does not permit them to appreciate the wisdom of higher first cost in order to secure lower annual cost.

WATER SUPPLY IN CANADA.

WASTE AND POLLUTION AT TORONTO.

It appears from a statement of the deputy city engineer, Mr. C. L. Fellowes, which accompanies the report for 1911 of Mr. C. H. Rust, the late city engineer, that an inspection has been made of the water mains and services of Toronto in order to ascertain the cause of the waste which has been going on there. The results show that practically 95 per cent of the leakage is in the houses, and is due to leaky fixtures, wilful waste or carelessness, and about 5 per cent in mains and services to stop-cocks.

Mr. Fellowes remarks: "That by far the greater part of this waste in houses can only be stopped by the installation of meters is the opinion of all waterworks men who have given the subject consideration. No amount of inspection can put a stop to wilful waste; and, in addition, any sounding of stop-cocks on the street is practically impossible in a climate such as ours where the stop-cock boxes are covered with snow and ice a great part of the time. With the enormous yearly increase in the consumption, it is imperative that proper means should be taken to stop waste, otherwise the city must be prepared to go into very large expenditures for improvements if the supply and pressure is to be kept up in all sections."

In January of last year the city engineer reported in favour of duplicating the existing 6-ft. steel conduit into Lake Ontario, the intake to be situated at a point about 1,000 ft. west of the existing intake. This recommendation was made for the reason that the existing conduit could only be depended upon to deliver about 90,000,000 gallons per twenty-four hours during low stages of the lake, and as the maximum rate of pumpage during the busy hours of the day was 45,000,000 to 47,000,000 gallons per twenty-four hours, the capacity of the existing intake and conduit would no doubt be taxed to its utmost extent by the time the duplicate intake was constructed and ready for use. This recommendation was not acted upon till June of the same year. In the meantime a violent storm occurred on the said lake beneath the existing intake to a depth of 6 ft., and for a distance of 600 ft., causing the conduit to drop, shearing off the bolts connecting the several lengths, blocking the mouth of the pipe with sand, and cutting off the supply to the city. Steps were immediately taken to provide a duplicate intake, a tender of $51,900 being accepted for the carrying out of the work. A contract was also let for the construction of the 6 ft. steel conduit, the total length of pipe being about 3,000 ft., made up in lengths of 150 ft. each approximately.

The report of the city's chemist and bacteriologist on his examination of the water supply shows that there is strong evidence of sewage pollution on the north shore of Toronto Island. One series of samples taken indicated considerable contamination at 7 miles out and at a depth of 50 ft., and this is considered by the investigator to condemn as a fallacy the contention that the great body of the lake is pure, and that the present difficulty is merely the engineering one of reaching it. The report adds: "If the lake is contaminated 7½ miles south of Toronto, there is no reason why it should be much purer at greater distances, and it is possible, if not probable, that it is less pure. It is well known that the water on the south shore of Lake Erie is far from satisfactory, and this condition is aggravated by the discharge of the sewage of the City of Buffalo. This quantity is estimated at 160,000,000 gallons per day, and during flood times the Buffalo river, draining a well-populated area, discharges as much as 20,000 cub. ft. per second. The quality of the water at the entrance to the Niagara river is therefore very unsatisfactory, and any purification that may be effected by oxidation in the Niagara river is nullified by the pollution that is caused by the sewages of the Tonawanda, Lockport and Niagara Falls. These towns obtain their water supply from the river, and the typhoid rate shows clearly the dangerous condition of this water. . . . All the bacteriological studies that have been made show that, although dilution and oxidation are fairly complete, traces of matter of fæcal origin can still be detected, and that the water is, in its raw state, unfit for alimentation. This being the case, it is highly desirable that Toronto, before undertaking the responsibility of sewage sterilisation, should have guarantees that other cities on the lakes will adopt similar methods. Even if this were adopted, Toronto would still require purification works, to guard against uncontrollable pollution, and to remove the excessive turbidity that is occasionally found in the lake supply."

The great progress made in the growth of Toronto, and the addition of new territories and the consequent demand for municipal improvements, resulted in the expenditure in the department of the late city engineer during the last year being the heaviest on record. Work on the main drainage scheme has progressed very satisfactorily, and it was expected that the low-level intercepting sewer would be completed by the present autumn. The sewage disposal works are practically finished, and the outfall sewer has been entirely laid with the exception of expansion joints. Work on the substructure of the pumping station was carried out departmentally by day labour. The plans for the superstructure were prepared by the city architect, and work is progressing very satisfactorily. Mr. Rust's report states that there are now 412 miles of streets and 120 miles of lanes in the city, 129 miles of streets being unpaved. A modern and complete system of street cleaning, watering and scavenging is operated by the city, the area of which, excluding land covered by water, is 28 square miles. The population is over 425,000.

Cincinnati Road Congress and Exhibition. The American Road Builders' Association will hold its annual convention at Cincinnati on December 3rd, 4th, 5th and 6th next. Papers on the practical questions relating to highway work will be read and discussed, and there will also be an exhibition of road-building and street-paving machinery, materials and appliances. In addition to the exhibits of manufacturers, a number of the principal cities will be assigned spaces in which to illustrate their road systems, kind and extent of pavements, and materials used.

A Local Government Board Inspector on Loans.—In the course of an equity recently into an application of Wembley Urban District Council for sanction to borrow £7,000 for gasworks extensions, Mr. R. H. Hooper, the Local Government Board Inspector, called attention to the fact that the works were producing an annual profit of £2,400, the surplus of which was handed to the relief of the rates, but he failed to see how the gas works were benefited when the council were borrowing money at interest. The £7,000 that the council required would ultimately cost them something like £16,000. A far better way was to keep those moneys in hand as they went along, by paying for improvements out of revenue. The clerk to the council, Mr. P. M. Walker, pleaded that considerable sums had been spent on the undertaking out of revenue without going to the Local Government Board, but this was considered a big thing, and the council thought the future generation as well as the present should bear their share of the burden.

Some Recent Publications.*

RAIL CORRUGATION. Interim Report of Special Committee appointed by the Municipal Tramways Association. Price 10s. 6d. Bradford: Mr. G. Spencer, 7 Hall Ings, Hon. Secretary.

The phenomena of corrugation on tramway and railway rails—but more especially the former—has for the past ten or twelve years been a prominent subject of discussion throughout the tramway world, and continues to excite deep interest among engineers and others concerned in tramways in every part of the globe.

And well it may, for the economic loss alone imposed by corrugated rails is a matter of much gravity. This is emphasised in a recent official statement that this item involves an expense of about £10,000 a year to systems like Manchester and Glasgow, and a proportionate sum to other systems. The aggregate cost involved by corrugation to tramway authorities in this country is computed at not far short of £100,000 a year.

The cause or causes that produce these troublesome effects have been vainly sought by expert investigators in every country. On the Continent and in America a number of committees have been at work for some years in trying to unravel the mystery. In England three special committees have undertaken a similar purpose, respectively appointed by the Institution of Municipal and County Engineers, the Tramways and Light Railways Association, and the Municipal Tramways Association. The last-named association has now issued an interim report upon the results of the investigations of its "Corrugation Committee."

The work of this committee was initiated as far back as 1906, when a number of the managers of the principal tramways in this country were appointed to deal with the question, but it was not until 1909 when the services of Mr. A. C. King, formerly permanent-way engineer to the Glasgow tramways, were secured by his appointment as their advisory engineer, that systematic work was entered upon.

The first procedure of that gentleman was to formulate and circulate a list of queries comprising about 100 questions, covering what appeared to him the more pertinent points involved. Over 6,000 replies were received and tabulated, the summarised data being classified in three divisions, (1) Permanent way, (2) rolling stock, (3) general. It is remarked that noteworthy features of these replies were the remarkable diversity and vagaries of occurrence, and, in some instances, the quite contradictory character of the phenomena reported.

It is the astonishment of the perplexity as to the subject that the great majority, it is said, entered no reply to the query, Have you arrived at any conclusion as to the cause of corrugation? Even some who a few years since confidently expressed their opinions now admitted their inability to assign the cause.

When the highly technical nature of these replies was seen, and the abstruse character the inquiry would take was realised, it was deemed advisable to form a sub-committee of technical experts and the permanent-way engineers of Glasgow, Manchester, Sheffield and Leeds undertook, in connection with Mr. King, the detailed investigations and practical work that form the main subject-matter of this report.

It has rarely happened that a comprehensive study of a technical subject has been undertaken under equally favourable conditions. Not only has financial assistance been willingly rendered by tramway authorities, both company and municipal, throughout the country, but the technical officers of many authorities have readily afforded all the information and assistance desired of them.

Again, the fact that foreign commissions were at work with the same object, and that their professional findings had in several instances been made public, no doubt gave additional zest and incentive, as well as provided valuable data whereon to compare results.

The German Committee which has been at work considerable period engaged in making an exhaustive inquiry into the subject is, we understand, expected to present its report early next year.

That in the report we are at present dealing with the committee have to acknowledge that success has not yet attended their endeavours to ferret out the trouble to its root cause is undoubtedly a misfortune, but, at the same time, it is only fair to say that we gather that this report has in a manner been obtained from them against their inclination at an intermediate stage in their labours by the pressure of the general anxiety to know what had been accomplished. It is scarcely to be hoped that before long their labours will be crowned with complete success.

That they have done excellent work is undeniable, and not only the extraordinary complexity of the problem and the immensity of the trouble involved by its investigation are evidenced in this report, but also the scientific, systematic and painstaking manner in which their inquiry has proceeded.

One very wise preliminary was to prepare a glossary of the terms employed in connection with corrugation, and to give a clear definition to each.

A definite mode of procedure was mapped out, the first objective being to study the replies *re* the "Occurrence and Characteristics of Corrugation," with regard to which the report contains much interesting information, accompanied by a number of photographs.

Difficulties were, however, immediately experienced from the absence of reliable data wherewith properly to analyse and probe the statements received. Special experiments were accordingly devised and made, not only on tracks and their details, but on rolling stock and equipments, and included numerous intricate tests, the co-operation of Prof. Carpenter, of Victoria University, being enlisted in making the experiments upon metallurgical factors.

The reliable data thus evolved enabled the drawing of some important general conclusions which should assist materially to the final solution of the problem.

In particular, the committee were able to arrive at certain definite "findings," and at the same time this data served to dispose in a clear view of a number of theories as to the probable producing cause of the mischief.

From the circumstance that the effect of corrugation becomes visible on the rail, it is perhaps not surprising that the latter has been very generally suspected as somehow or other embodying in itself the predisposing cause.

The committee, however, exonerate the rail from this charge; they say definitely that "corrugation does not exist on tramway rails as received from the rolling mills," and that "the cause of corrugation is external to the rail." It is gratifying to learn that, though their tests covered some 30,000 tons of rails of various English makes, no instance of permanent corrugation was found.

This is perhaps the most outstanding feature in the report, and is the more noticeable as being directly contrary to the views expressed by Continental Committees that "corrugation is inherent in the rail."

That English-made rails should be found exempt from corrugation when new, and that, on the contrary, Continental-made rails are pronounced to have corrugation when received from the makers, is especially satisfactory from the circumstance that foreign rails have been sometimes extolled as being much superior to English-made rails in this respect.

Corrugation has been ascribed by many to "cold rolling." A number of facts are set forth in this report to combat this view, one being that "Bradford, with the softest rails by composition, has comparatively little corrugation." Incidentally this also upsets the idea that the softer the rail the more the corrugation.

Another pronouncement in this report is that "no one class of paving has more effect that another on corrugation," and there are a number of other valuable and interesting "findings" and "tentative conclusions."

While frankly admitting their inability to assign a definite cause to the phenomenon, the committee append a list of "further experiments recommended." Included in these is a suggestion that the cinematograph should be employed.

Concurrently with their investigations the committee have conducted "researches into the mitigation of corrugation," among these being the possibility of obtaining rails of a more durable character than those now generally used, better able to resist corrugating forces.

They claim that to overcome the evil [illegible]

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride Press, Ltd., on receipt of published price.

does not suffice for this purpose. "The steel should be tough as well as hard;" but they admit that "they realise the impossibility of attempting to prescribe a standard analysis" for obtaining such a steel. They think, however, that "it should be relatively high in manganese, carbon and silicon" (a somewhat vague stipulation), and should comply with certain tests which are prescribed.

It is perhaps open to doubt whether they are on entirely safe ground here. An admixture with high silicon has been generally found to induce brittleness in rail steel made by ordinary processes (i.e., other than the Sandberg patent process), and the use of the latter is apparently not contemplated.

An appendix contains a brief bibliography (in which, however, there are some notable omissions) of papers and reports on corrugation and a number of diagrams and photographs illustrate various references.

All who read this valuable report must appreciate that those responsible for its contents have done an immensity of solid practical spade work which has at least had the advantage of clearing the way for a further assault, and it is hoped to a final solution of this complex question.

Though a lengthy document, it certainly merits most careful study. Tramway engineers who have been puzzling themselves for years over the intricacies of the problem will find many of their doubts and difficulties explained and much original information of technical interest given. The thanks of all are due to the committee for making this report generally available.

The Cheap Cottage and Small House. By J. Gordon Allen, A.R.I.B.A. Price 1s. 6d. paper, 2s. 6d. cloth. Letchworth: Garden City Press, Limited.

In this book the author attempts—and with considerable success—to throw light on the subject of cheap building. The importance of this may be realised in a moment by reflecting upon the close connection which exists between rural depopulation and overcrowding, and the possibility of providing cheap cottages which can be let at a rent which is at once remunerative to the landlord and economically possible for the tenant. Mr. Allen has studied the subject of cheap building systematically, and in this book he deals with it in considerable detail, commencing with the site and water supply, and dealing in turn with the design, both exterior and interior, materials, fittings and furniture. The book is copiously illustrated with excellent designs, and it will be valuable to all who are concerned, either as land-owners, members or officers of local authorities, or social reformers, with the provision of cheap and healthy dwellings for our rural population.

Engineering and Metallurgical Books 1907-1911. By R. A. Peddle. Price 7s. 6d. net. London: Grafton & Co.

This exceedingly useful compendium is a complete catalogue, arranged alphabetically under subject headings, of all British and American books on engineering metallurgy and allied subjects which have been published during the period indicated. A classified list of subject headings and an index of authors facilitate reference. The value of a book of this kind is obvious, inasmuch as it enables anyone who consults it to see at a glance the titles and authors of all the recent books on any given subject, and to select that which is most likely to suit his immediate requirements. It should be on the shelves of every engineer. We ought to mention that the subjects include, among many others, Hydraulics, Pipes and Piping, Bridges, Roofs, Roads and Pavements, Sanitary and Municipal Engineering, Heating and Ventilation.

National Insurance Questions and their Answers. By Gilbert Stone, B.A., LL.B., Barrister-at-Law. Price 1s. net. London: Butterworth & Co. and Shaw & Sons.

In this book the author has sought to expound the National Insurance Act by propounding concrete questions and providing their answers. The Act is one which affects people of all classes, and a simple yet accurate explanation is a necessity for the layman. Mr. Stone's work fulfils the requirements of the ordinary man admirably in this respect, inasmuch as his well-selected questions cover the ground thoroughly, and he has in the answers managed to give a complete and simple exposition of a long and complicated statute. Among the many books for laymen which the National Insurance Act has brought forth, this should take a high place.

"Eason's Diaries" (London Dublin and Belfast: Eason & Son, Limited).—Messrs. Eason have ready for the coming year their usual assortment of indexed diaries "for people who know the value of time." Among them we notice the "Every Hour" Diary (price 1s. 6d.), stoutly bound in a thick terra-cotta cover, with a roomy pocket for loose memoranda, a pad of blotting sheets, and another good practical feature in a diary arranged for a week's engagements on the facing pages of one opening, each day being further ruled off for engagements for the hours of the day. The "Swift Diary" (price 1s.) is of waistcoat-pocket size, in leather-cloth case with rubber band, back-loop pencil and two pockets. "Eason's Penny Diary," cheap as it is, is quite a serviceable little memory aid to carry about with one.

Vol. iv., Part 2, of the "Transactions of the Concrete Institute" contains, in addition to much matter of "domestic" interest, papers by Mr. Reginald Ryves, Assoc.M.Inst.C.E. ("High Dams of Great Length"), and Mr. Maurice Béhar ("The True Bending Moments of Beams with Various Degrees of Fixity"), together with the discussions thereon. The volume also includes the Report of the Tests Standing Committee on the Testing of Reinforced Concrete Structures on Completion. Its interest is such as to appeal to all who are concerned with concrete construction, whether members of the Institute or not.

DETECTION OF WATER WASTE.

ST. AUSTELL SURVEYOR'S REPORT.

In a report on the consumption of water in St. Austell since meters were adopted by the urban district council with the view of detecting waste, Mr. E. D. Groves, the surveyor, says:—

"The work of house-to-house inspection carried out during July, August and September had good results. The inspector made 1,980 visits, and discovered 239 leaks, the majority of which were repaired on request, while there were others which caused several visits to be made and requests sent before having the matter attended to. Such consumers are those who will not realise that the water is theirs to use and not to waste, and as long as it is available will waste it.

"A general idea prevails among consumers that waste, although bad for the waterworks, is good for the drains and sewers; but that is not true, because if the waste is due to defective fittings it goes on in the day time, plus the consumption, which in itself is, or ought to be, enough flushing for all purposes. A short, sudden rush at intervals has a good effect in flushing drains, but a continual dribble has none.

"Although not generally the case, many householders are indifferent to the waste of water. It is therefore a matter of indifference to them whether, for example, a tap is running the whole night or not. Although the average consumption has been reduced considerably, we lose every night, between the hours of midnight and 6 a.m., 7,000 to 8,000 gallons of water. The major portion of this must be waste, part of which could be prevented by the consumers.

"The average consumption per head for twenty-four hours for the months of April to September inclusive was 30·2 gallons, which, even taking into consideration the reduction made during the winter months, is too high considering the wet season that has been experienced. This is largely due to the old fittings that exist. If consumers would only realise the economy of up-to-date fittings, the consumption would be still further reduced. Every consumer should realise that it is his duty to prevent waste, as by so doing he is effecting a saving in the council's expenditure. This is most important, because the town is growing, and each year means additional demands on the supply."

Commenting at a recent meeting of the council on the satisfactory character of Mr. Groves' report, Councillor Smith said he considered the expenditure in this connection had been amply justified, having regard to the enormous amount of waste that had been stopped, and Councillor Hodge emphasised the importance of impressing the significance of the last paragraph of the report, for in preventing the misuse of water consumers were saving their own pockets.

CRYSTAL PALACE OLD STUDENTS' SOCIETY.

EIGHTEENTH ANNUAL DINNER.

The eighteenth annual dinner of the Crystal Palace Old Students' Society was held at the Connaught Rooms, Kingsway, on Thursday of last week, Mr. Sidney R. Lowcock, M.INST.C.E., M.I.MECH.E., the president, being in the chair. The dinner was very well attended, several of the honorary members and many guests being present. These included the Rt. Hon. the Earl of Plymouth, Colonel Sir Edward Raban, late Director of Works of the Admiralty, Lady Raban, and Mr. and Mrs. J. W. Wilson.

The loyal toasts were proposed by the president. Mr. Percy Griffith proposed the toast of "The Crystal Palace School of Practical Engineering," which was responded to by the principal, Mr. J. W. Wilson.

The Earl of Plymouth, in proposing the toast of "The Old Students' Society," very naturally referred also to the Crystal Palace, the home of the school, towards the future existence of which he has already done so much. That Lord Plymouth's public-spirited act in saving the Palace and its 200 acres of grounds from being sold and built over will ultimately lead to a satisfactory result is clear. In his speech his lordship definitely stated that the original high ideals upon which the Palace was started would be maintained, and that, even if a new building had to take the place of the old one, it was to be of such a character that the unique sculptures and objects of art would be preserved, and the best traditions of art, science, literature and music upheld. The great work of education undertaken and fulfilled by the Palace in the past would be continued, and in particular the School of Practical Engineering would continue its present work with unabated energy. Lord Plymouth also stated that he had been asked to become one of the honorary members of the Old Students' Society, and that he had accepted the position, a statement which was greeted with acclamation.

The president, in responding to this toast, announced that not only had Lord Plymouth accepted the position of honorary member, but that Rear-Admiral Gordon Wilson-Moore, Third Lord of the Admiralty and Comptroller of the Navy, had also accepted the position of honorary member. He referred to the fact that the Engineering School started in the year 1875 with seven students, and that since then 2,041 students had passed through the school. Mr. Lowcock stated that he had entered the school in the year 76, and that Mr. Jacomb Hood, the present chief engineer of the London and South-Western Railway, was a fellow-student in the same year with him. Keen rivalry had existed between the two students in their work. The present membership of the society was 330, or about one-sixth of those who passed through the school, which was not a bad percentage, seeing that the members were scattered throughout the world. Among the old students there were 15 chief engineers of railways, 10 borough engineers, and many others who had held responsible positions upon almost every large work that had been in progress within recent years. It was impossible to keep in touch with all the members, but it was known that there were 648 old students actively employed in Europe, 251 in Asia, 147 in Africa, 111 in America, and 56 in Australia.

Mr. Robert J. Simpson proposed the toast of "H.M. Forces," which was responded to by Colonel Sir Edward Raban.

The speech of Sir Edward Raban was particularly impressive. The colonel, during his twenty-two years of service as Director of Works at the Admiralty, employed many old students, to whom he has endeared himself by his unfailing kindness. He therefore spoke not only as a newly elected honorary member, but as a very old friend, for whom many of the members have an affectionate regard. Having shown that the Army and the Navy were now under the control of civilians, he emphasised the great responsibility which rests upon the shoulders of the people. What is done and what is left undone for the Army and the Navy depends upon the popular vote. He referred to a touching incident in the Boer War, where a private soldier was found carving an epitaph on the wooden cross marking the grave of a friend. This man, having small knowledge, and probably little religious training, nevertheless felt that things would not go amiss with the man who had died for his country, and carved the words "Pass, friend, and all's well." Sir Edward said that the work of the soldier or the engineer should be so done that at the close of an honourable career the words "Pass, friend, and all's well" might be said truly.

The toast of "The Visitors" was proposed by Mr. Maurice Wilson, and was responded to by Mr. J. A. Botham.

An excellent musical entertainment, under the direction of Mr. James Chilcott, formed part of the proceedings.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. THOMAS, M.INST.C.E., County Surveyor, Buckinghamshire.

The council of the Institution of Municipal and County Engineers are offering premiums to members, associate members and students of the institution amounting to twenty-eight guineas for the best plans for laying out a seaside pleasure resort.

The drawings are to be delivered prior to the annual meeting in July next at a date to be fixed hereafter. Further particulars will be issued shortly.

THOMAS COLE,
Secretary.
11 Victoria-street, S.W.

ROYAL SANITARY INSTITUTE.

PROVINCIAL SESSIONAL MEETING, DONCASTER.

A sessional meeting of the Royal Sanitary Institute will be held on Saturday, November 23rd, in the Mansion House, Doncaster, at 11 a.m., when a discussion will take place on "Town Planning in Relation to the Development of the South Yorkshire Coalfield," to be opened by Dr. A. B. Dunne, medical officer of health, Doncaster Rural District Council.

Among those whom it is hoped will take part in the discussion are Messrs. R. A. MacBrair, M.INST.C.E., city engineer and surveyor, Lincoln; R. G. Whitley, surveyor, Bentley Urban District Council; C. F. Wike, M.INST.C.E., city engineer and surveyor, Sheffield; and John W. Wilson, surveyor, Bolton-upon-Dearne Urban District Council.

The chair will be taken by Mr. H. Percy Boulnois, M.INST.C.E., chairman of council of the institute.

Tickets for admission of visitors may be had on application to Dr. A. B. Dunne, medical officer of health, Doncaster Rural District Council, 7 St. Georgegate, Doncaster, who is acting as the local hon. secretary of the meeting; and of Mr. E. White Wallis, secretary of the institute, 90 Buckingham Palace-road, S.W.

The members will be entertained at lunch by the Corporation of Doncaster, and later in the day will proceed on a visit to the Woodlands Model Colliery Village.

An adjourned sessional meeting will be held at the Royal Sanitary Institute, 90 Buckingham Palace-road, S.W., on Tuesday, November 19th, at 8 p.m., for the purpose of continuing the discussion on "The Report of the Departmental Committee on Intercepting Traps in House Drains," opened by Mr. H. Percy Boulnois, M.INST.C.E.

E. WHITE WALLIS,
Secretary.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

President—Mr. JOHN D. WATSON, M.INST.C.E., F.R.S.N.E.

ANNUAL GENERAL MEETING AND DINNER.

The eleventh annual general meeting and dinner of the Association of Managers of Sewage Disposal Works will take place on Thursday, December 12th, at the Holborn Restaurant, London.

PROGRAMME.

11 a.m.—Council meeting.
2 p.m.—Annual general meeting; chairman's annual report; balance-sheet; reading of papers; discussion.
6.30 p.m.—Reception.
7 p.m. Annual dinner

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. Frank Latham, M.Inst.C.E.I., F.S.E., Borough Engineer and Surveyor, Penzance.

NORTH-WESTERN DISTRICT COMMITTEE.

A meeting of the above will be held at the Victoria Hotel, Manchester, on the 20th inst., at 7.30 p.m.

Business.

Sub-Committee's proposals re "social" to be held at the Victoria Hotel, Manchester at 6 p.m. on Saturday, December 7th; arrangements for year 1913; discussion on "The Merits of the Intercepting Trap."

J. W. Gleave.
Hon. District Secretary.

JOINT SOUTHERN AND SOUTH-EASTERN DISTRICT MEETING.

A Joint Southern and South-Eastern District meeting will be held in the council chamber, No. 4 Southampton-row, London, W.C., on Wednesday, November 27th, 1912, at 8 o'clock, when a paper, "The Effect of Recent Decisions upon the Arbitration Clause," by Mr. W. Valentine Ball, M.A., barrister-at-law, author of "The Law Affecting Engineers," joint editor of "Emden's Building Contracts," 4th edition, will be read.

The subject of Mr. Valentine Ball's paper is of wide importance to engineers and others engaged in municipal work, and it is hoped that each member will, where possible, bring to the meeting his town clerk, chairmen of committees, and others interested in the matter. The discussion will be an open one, and an advance copy of the paper may be had upon application.

The building, No 4 Southampton-row, is almost opposite the Holborn Station of the Great Northern and Piccadilly Tube, and within a minute of the British Museum Station of the Central London Railway. Omnibuses from all parts practically pass the door.

Arthur Palmer.
J. Woolford Brook,
Joint Hon. District Secretaries.

JOINT WESTERN AND SOUTH-WESTERN DISTRICT MEETING.

A Joint Western and South-Western District Meeting will be held at Gloucester and Exeter on Friday and Saturday, November 29th and 30th.

Programme.

Gloucester Meeting, Friday, November 29th.

3 p.m.—Meet at the New Inn, Gloucester.
Business meeting of the Western District.
Short address by the president.
4 p.m.—Discussion on Mr. A. Winter Gray's paper, "Superannuation and Security of Tenure," which will be taken as read.
5 p.m.—Adjourn for tea.
6 p.m.—Informal meeting at which Mr. Latham will preside.

Exeter Meeting, Saturday, November 30th.

10 a.m.—Meet at the Bude Hotel, Exeter.
Business meeting of the South-Western District.
Short address by the president.
11 a.m.—Discussion on Mr. A. Winter Gray's paper, "Superannuation and Security of Tenure," which will be taken as read.
Discussion on the question of "Workmen's Cheap Housing," when two or three short papers will be presented. Members are requested to contribute what information they can on the question, in order that it may be fully discussed with a view to [illegible] experience.
1 p.m.—Adjourn for tea.
7 p.m.—Social evening with musical programme, at the Bude Hotel, to which members and their friends are invited.

Members are requested to make every effort to attend on at least one of the above days. As stated, Mr. Latham will be present on both days, and would be glad to meet as many members as possible.

Louis Brook
C. Owen Baines,
Joint Hon. District Secretaries.

November 11, 1912.

B. Wyand,
39 Victoria street, S.W. *Secretary.*

INSTITUTE OF SANITARY ENGINEERS.

President—Mr. A. J. Martin, M.Inst.C.E., F.G.S., F.R.San.I.

SESSIONAL MEETING.

At Caxton Hall, Westminster, on Monday, the 18th inst., Mr. Ernest Van Putten, M.Inst.C.E., borough engineer and surveyor of Lewisham, will open a discussion on the subject of intercepting traps in house drains.

The chair will be taken by the president, Mr. A. J. Martin, at 8 p.m.

FOUR BOOKS FOR MUNICIPAL ENGINEERS.—There is a field for enterprising local authorities to lead the way by providing municipal crematoria. Mr. Albert C. Freeman's book—"Crematoria in Great Britain and Abroad," with 70 illustrative plans and designs, price 5s. (post-free 5s. 4d.)—is the standard work on the subject. Mr. Freeman is also the author of "The Planning of Poor-Law Buildings and Mortuaries," price 7s. 6d. (post-free 7s. 10d.), a companion work in which the illustrations are again a valuable feature. "Roofs and Floors of New Buildings: their Structure and Stability," by Ernest H. Essex, Assoc.M.Inst.C.E., price 2s. 6d. (post-free 2s. 8d.), embodies in a most concise manner the calculations necessary for the strengths of timbers in floors and roofs. "The Housing of the Labouring Classes and Back-to-Back Houses," by H. Percy Boulnois, M.Inst.C.E., price 1s. (post-free 1s. 1d.), contains 41 diagrams, and comprises, says "The Architect," "valuable information on one of the most embarrassing of social problems." The above four works are all published by the St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, London, E.C.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, but those responsible for their despatch are recommended to arrange that they shall reach The Surveyor office by noon on Wednesdays to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.

SURVEYOR'S ASSISTANT.—November 16th.—East Suffolk County Council. £90—£120.—Mr. A. Townshend Cobbold, clerk, County Hall, Ipswich. Applications to be endorsed "Surveyor's Assistant."

ASSISTANT SANITARY INSPECTORS.—November 18th.—Corporation of Burnley. £78 per annum each.—Mr. P. Thomas, town clerk.

CLERK OF WORKS.—November 18th.—Dartford Rural District Council. £2 10s. per week.—The Clerk.

SURVEYOR.—November 19th.—Upper Brue District Drainage Board. £115 per annum.—Mr. R. Bath, clerk, 11 Chilkwell-street, Glastonbury. Applications to be endorsed "Eastern District."

CLERK OF WORKS.—November 20th.—Hackney Borough Council. £4 4s. per week.—Mr. W. A. Williams, town clerk.

SURVEYOR. — November 20th. — Newtownards Urban District Council. £100 per annum.—Mr. H. McCartney, clerk. Applications to be endorsed "Town Surveyorship."

MUNICIPAL ENGINEER.—November 21st.—Municipal Board of Cawnpore. Rs. 800—1,000 per mensem.—Mr. C. E. Goument, C.S.I., M.Inst.C.E., c/o Messrs. Thos. Cook & Son, Ludgate-circus, London.

SURVEYOR OF HIGHWAYS.—November 23rd.—Southwell Rural District Council. £100 per annum.—Mr. John Ellis, clerk.

ENGINEER AND SURVEYOR.—November 25th.—Rawmarsh Urban District Council. £200 per annum.—Mr. J. W. Bellamy, clerk. Letters to be endorsed "Engineer and Surveyor."

SURVEYOR AND INSPECTOR OF NUISANCES.—November 26th.—Eton Urban District Council. £150.—Mr. J. E. Gale, clerk, 3 Sheet-street, Windsor. Envelopes to be endorsed "Surveyor, Eton."

CLERK OF WORKS.—November 29th.—Queenstown Urban District Council. £2 10s. per week.—Mr. J. H. Campbell, clerk.

INSPECTOR OF NUISANCES.—November 30th.—Newquay Urban District Council.—Mr. G. F. Nicholls, clerk.

DEPUTY CITY SURVEYOR.—November 30th.—Corporation of Manchester. £750 per annum.—Mr. Thos. Hudson, town clerk.

DRAUGHTSMAN (Temporary). — Corporation of Hertford. £3 3s. per week.—Mr. John H. Jevons, borough engineer.

MUNICIPAL COMPETITIONS OPEN.

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RHYL.—November 18th.—Plans, specifications and estimates for strengthening Rhyl pier, for the urban district council.—Mr. A. Rowlands, clerk.

BELFAST.—January 1st.—Designs for 126 houses of two apartments each, and 126 houses of three apartments each, for the corporation. Premiums are offered of £25, £15, and £10.—Mr. R. Meyer, town clerk.

ORSETT (Essex).—January 1st.—For the construction of a sewerage and sewage disposal scheme in the parish of South Ockendon, for the Orsett Rural District Council. Premiums of £50 and £25 are offered.—Mr. James Beck, clerk, 2 Orsett-road, Grays.

DUBLIN.—January 1st.—Designs for municipal buildings for the corporation. The proposed expenditure is £50,000, and the author of the design placed first will be appointed to carry out the scheme on a 5 per cent basis. Premiums of £150 and £100 are offered. The assessor is Mr. Albert E. Murray, F.R.I.B.A. —The Town Clerk.

HARROGATE.—February 3rd.—Designs for a council school, for 675 children.—Mr. C. E. Rivers, ASSOC.M. INST.C.E., borough engineer.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1369 Holborn), subject to later confirmation by letter.*

Buildings.

BIRMINGHAM.—November 18th.—For the erection of a school, for the Education Committee.—Mr. J. Arthur Palmer, secretary, Council House.

DURHAM.—November 18th.—For alterations at a school, for the county council.—Mr. J. A. L. Robson, Shire Hall, Durham.

CHELMSFORD.—November 18th.—For the erection of an engine-house, for the corporation.—Mr. G. Melvin, town clerk.

SALOP.—November 18th.—For the reconstruction of a school, for the county council.—Mr. H. E. Wale, secretary, Elementary Education Department, County Buildings, Shrewsbury.

STAINES.—November 18th.—For the erection of a public convenience, for the urban district council.—Mr. E. J. Barrett, engineer and surveyor.

PORTSMOUTH.—November 19th.—For the erection of stores, for the corporation.—Borough Engineer.

CHESHUNT.—November 19th.—For carrying out structural alterations, for the urban district council. —Mr. J. E. Sharpe, engineer and surveyor.

CARDIFF.—November 20th.—For the construction of a live stock market, for the corporation.—Town Clerk.

OLDHAM.—November 20th.—For the erection of shops for the corporation.—Mr. I. H. Hallsworth, town clerk.

BLACKPOOL.—November 20th.—For extensions to car shed and additions to stores, for the corporation. —Mr. J. S. Brodie, borough engineer.

CHORLEY.—November 20th.—For the erection of a slate-cleaning room at the public slaughter-house, for the corporation.—Borough Surveyor.

HACKNEY.—November 21st.—For the erection of a branch library, for the borough council.—Mr. W. A. Williams, town clerk.

BEBINGTON.—November 21st.—For the erection of a school, for the Administrative Sub-Committee.—Mr. J. Harding, clerk, Library Cottage, Bebington, near Birkenhead.

LINDSEY (Lincs).—November 21st.—For the erection of a school, for the Education Committee.—Mr. S. Maudson Grant, secretary, 286 High-street, Lincoln.

CAISTOR.—November 21st.—For the erection of cottages, for the rural district council.—Mr. A. A. Padley, clerk.

ROMFORD.—November 21st.—For the erection of cart shed and paving stable-yard, for the urban district council.—Mr. Charles T. King, clerk.

NORWICH.—November 22nd.—For the erection of a shelter at the cemetery, for the corporation.—Mr. A. E. Collins, city engineer.

WEST RIDING.—November 22nd.—For alterations to a school, for the Education Committee.—Mr. Francis Alvey Darwin, clerk, County Hall, Wakefield.

PORTSMOUTH.—November 22nd.—For the construction of cabmen's shelter and public convenience, for the corporation.—Borough Engineer.

HERTS.—November 25th.—For the erection of a school, for the county council.—Mr. Urban A. Smith, county surveyor, Hatfield.

PORTSMOUTH.—November 26th.—For the erection of forty-three houses, with wall and iron fence, for the corporation.—Mr. G. Hammond Etherton, town clerk.

HULL.—November 27th.—For alterations at the power station, for the corporation.—City Engineer.

MANCHESTER.—November 27th.—For alterations to boiler-house and reconstruction of main flue at generating station, for the corporation.—Mr. Thomas Hudson, town clerk.

LANCS.—December 3rd.—For the erection of an elementary school, for the Education Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

HUNSTANTON.—December 4th.—For the erection of shelters, for the urban district council.—Mr. J. S. B. Glasier, clerk.

Iron and Steel.

BIRMINGHAM.—November 16th.—For the supply of cast-iron pipes and special castings, for the Water Department.—Mr. E. Antony Lees, secretary, 44 Broad-street, Birmingham.

EGREMONT.—November 18th.—For the supply of materials for and construction of water supply, for the urban district council.—Mr. John Nelson, clerk.

DEPTFORD.—November 19th.—For the supply of two water supply tanks at the town hall, for the borough council.—Mr. Vivian Orchard, town clerk.

NEWMARKET.—November 25th.—For carting, excavating for and laying 5 miles of 3-in. cast-iron pipes, including fixing valves and hydrants, and erection of brick water tower, for the rural district council.—Mr. S. J. Ennion solicitor.

COVENTRY.—November 25th.—For the supply of manhole covers, gullies, pavement channels, and step irons, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

NEWMARKET.—November 25th.—Supply of 163 tons of 3-in. cast-iron pipes and specials, the erection of cast-iron tank and other works, for the rural district council.—Mr. S. J. Ennion, solicitor.

GOOLE.—November 26th.—For the supply of cast-iron pipes, for the rural district council.—Mr. G. England, clerk.

LEYTON.—November 26th.—For the supply of unclimbable cast-iron fencing, for the urban district council.—Mr. E. H. Essex, surveyor.

SOUTHWARK.—November 27th.—For the supply of fifty cast-iron street orderly bins, for the borough council.—Borough Engineer.

Roads.

METHLEY.—November 16th.—For works of flagging and kerbing, for the urban district council.—Mr. T. Thompson, surveyor.

NELSON.—November 16th.—For private street works, for the corporation.—Mr. J. H. Baldwick, town clerk.

SITTINGBOURNE.—November 18th.—For the supply of Guernsey granite and granite chippings, for the urban district council.—Mr. W. L. Grant, surveyor.

DOVER.—November 18th.—For making up two roads, for the corporation.—Mr. R. E. Knocker, town clerk.

GLAMORGAN.—November 18th.—For the diversion of a road, for the county council.—County Surveyor, County Hall, Cardiff.

BLACKBURN.—November 18th.—For works of making up and asphalting, for the corporation.—Mr. W. Stubbs, borough engineer.

REIGATE.—November 19th.—For the supply of four slop carts, two rotary horse brooms, and four hand trucks, for the corporation.—Mr. Alfred Smith, town clerk.

CLEETHORPES.—November 19th.—For the supply of 350 tons of broken granite, for the urban district council.—Mr. B. Greaves, clerk.

TRING.—November 20th.—For street and sewerage works, for the urban district council.—Mr. A. W. Vaisey, clerk.

MIDDLESBROUGH.—November 20th.—For making up a certain street, for the corporation.—Mr. S. E. Burgess, borough engineer.

LUTON.—November 21st.—For works of private street improvement, for the corporation.—Borough Engineer.

ARGYLL.—November 21st.—For works of road repair, for the county council.—Messrs. W. & W. Disselduff, district clerks, 160 Argyll-street, Dunoon.

ROMSEY.—November 21st.—For work of steam rolling and scarifying, for the corporation.—Mr. B. W. Atlee, town clerk.

BERKS.—November 21st.—For the haulage of materials, for the county council.—Mr. J. Fred Hawkins, county surveyor, Reading.

SOUTHEND.—November 21st.—For making-up work, for the corporation.—Mr. E. J. Elford, borough engineer and surveyor.

EAST SUSSEX.—November 22nd.—For the supply of materials, cartage and team labour, for the county council.—Mr. F. J. Wood, county surveyor.

HETTON.—November 22nd.—For work of making up, for the urban district council.—Mr. Gordon Young, clerk.

KNUTSFORD.—November 23rd.—For making up a certain street, for the urban district council.—Mr. R. W. Marshall, surveyor.

ROMFORD.—November 23rd.—For the supply of best blue Guernsey granite, for the rural district council.—Mr. George Lapwood, highway surveyor, Victoria Chambers, Romford.

FRIERN BARNET.—November 26th.—For work of making up, for the urban district council.—Mr. E. J. Reynolds, engineer and surveyor.

SWANSEA.—November 25th.—For carrying out private street works, for the corporation.—Mr. H. Laing Coath, town clerk.

LEWISHAM.—November 26th.—For making up main roads, for the borough council.—Borough Surveyor.

SOUTHGATE.—November 26th.—For carrying out private street works, for the urban district council.—Mr. W. M. Ellenor, clerk, Council Offices, Palmer's Green, N.

WOODFORD.—November 26th.—For making up certain roads, for the urban district council.—Mr. W. Farrington, surveyor.

WARWICKSHIRE.—November 27th.—For the supply of road material (broken and unbroken), for the county council.—Mr. John Willmot, county surveyor.

CANNOCK.—November 29th.—For the supply of road tar, to be used in accordance with the specification of the Road Board, for the urban districts.—Mr. C. A. Laxton, clerk.

PORTHCAWL.—November 29th.—For carrying out private street works, for the urban district council.—Mr. W. Chesher, clerk.

SEAFORD.—November 30th.—For the supply of granite flake and broken granite, for the urban district council.—Mr. W. H. Pawson, clerk.

HITCHIN.—December 2nd.—For the supply of broken granite, for the urban district council.—Mr. W. Onslow Times, clerk.

SOUTHAMPTON.—December 9th.—For the supply of Guernsey basalt, Clee Hill basalt, Welsh granite, setts, or similar setts, quartzite and tarred macadam, for the county council.—Mr. H. Barber, clerk, The Castle, Winchester.

Sanitary.

HALIFAX.—November 16th.—For the construction of earthenware pipe sewers, for the corporation.—Mr. J. Lord, borough engineer.

YEOVIL.—November 16th.—For laying glazed sewer pipe, and constructing manholes, sewage tanks, and fencing, for the rural district council.—Mr. J. E. Rodber, clerk.

WIRRAL.—November 16th.—For the construction of 9-in. sewer, with manholes, for the rural district council.—Mr. J. E. S. Olive, clerk, 54 Hamilton-street, Birkenhead.

STONE.—November 18th.—For the removal of house refuse, for the rural district council.—Mr. W. W. Wynne, clerk.

TAMWORTH.—November 18th.—For the construction of pipe sewers, for the rural district council.—Mr. H. J. Clarson, engineer and surveyor.

BELFAST.—November 19th.—For the construction of an outlet sewer, for the corporation.—Mr. R. Meyer, town clerk.

LEWES.—November 19th.—For the construction of sewage disposal works, including screen chambers, buildings, settlement and storm tanks, tidal storage tanks, and sludge drying beds, for the corporation.—Mr. Montague S. Blaker, town clerk.

LEWES.—November 19th.—For the construction of the low-level pumping station and contingent works, for the corporation.—Mr. Montague S. Blaker, town clerk.

MIRFIELD.—November 22nd.—For laying pipe sewer and manholes, for the urban district council.—The Clerk.

SOUTHOWRAM.—November 25th.—For work of scavenging, for the urban district council.—Mr. J. E. Oates, surveyor.

GLOUCESTER.—November 26th.—For the construction of a main outfall sewer, for the corporation.—Town Clerk.

CHEPPING WYCOMBE.—December 3rd.—For the supply of stoneware pipes and coal, for the corporation.—Mr. T. J. Rushbrooke, borough surveyor.

NANTWICH.—December 14th.—For the construction of sewage disposal works, comprising detritus, settling, storm-water and stand-by tanks, filter-beds, humus tanks, and laying sewers and manholes, for the rural district council.—Mr. Charles E. Davenport, engineer.

Stores.

WOKING.—November 16th.—For the supply of oil, sludge press-cloth, galley frames and gratings, brooms, shovels, mud scrapers, pickshafts, fagging hooks, pennant kerb, tar paving, dust skips, coke, coal, lamp standards and lanterns, Izal disinfecting fluid, Izal empty pint tins, Izal soft soap, Izal sulphur candles, Sanitas No. 2. hard soap, gummed rolls for disinfecting, disinfecting powder, lime and oats, for the urban district council.—Mr. Robert Mossop, clerk.

MANCHESTER.—November 19th.—For the supply of tramway rail bonds, block tin, and Karri or Jarrah wood paving blocks, for the Tramways Committee.—Mr. Thomas Hudson, town clerk.

HULL.—November 20th.—For the supply of scavenging and watering, cartage, iron and steel, castings, cement, lime, salt glazed pipes, tar, pitch, bituminous dust compound, paint, oils, brushes, lead, glass, plumbers' goods, slater's work and ironmongery, for the corporation.—Mr. A. E. White, city engineer.

NOTTINGHAM.—December 5th.—For the supply of cement, blue lias lime, red bricks, timber, earthenware pipes, iron castings, gulleys, Yorkshire flags, kerb, granite setts, broken granite, ironstone slag, chippings, river gravel, coal, picks, shovels, scoops, ironmongery, scavenging and other brushes, disinfectants, refined tar, pitch, and creosote oil, for the corporation.—Mr. W. J. Board, town clerk.

Miscellaneous.

COVENTRY.—November 25th.—For the supply of earthenware or stoneware pipes, bends and junction pipes, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

COVENTRY.—November 25th.—For the supply of cast-iron manhole covers, gullies, pavement channels, and stop irons, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

The Surveyor

And Municipal and County Engineer.

Vol. XLII. NOVEMBER 22, 1912. No. 1,088.

Minutes of Proceedings.

Birmingham Sewage Disposal.

The committee of the Birmingham Tame and Rea District Drainage Board early in this year instructed their engineer to prepare a description of the works of the board and of the system of purification obtaining on their works. In carrying out these instructions Mr. J. D. Watson, M.Inst.C.E., took into consideration the fact that several members of the board were unfamiliar with the history of the undertaking and the vicissitudes through which it had passed, and that such a description would be very acceptable to many of those who visit the works for inspection and study. The result is now before us in the form of a very able monograph presented in admirable form and of unexceptionable appearance. From a small farm of 260 acres in 1877 the area of the property of the board has grown to its present enormous dimensions of 2,956 acres, upon which the sewage from a population of close on 1,000,000 is now satisfactorily treated. The original method of treatment was by land filtration, but if that had been continued up to the present time it would probably have been necessary to secure nearly 40,000 acres of land in all in order to produce a satisfactory effluent at all times without causing a nuisance. The purchase of the additional 7,000 acres of land has been avoided by the construction of works for treatment of the sewage upon biological methods, including 54 acres of bacteria beds, storm-water tanks, sludge disposal and other works at an actual total cost, exclusive of land, of £386,350. This is probably much less than would have had to be expended if land treatment had been adhered to, but apart from the question of cost there are the enormous difficulties of reaching the ideal in the treatment of sewage on a farm of large size. These difficulties are set forth very clearly by Mr. Watson, and they probably explain the reasons for the failure of many other sewage farms, both large and small, in this country.

Two tables are given which indicate clearly the causes of some of the difficulties which arise in the disposal of the Birmingham sewage. In one table it is shown that the sewage is in most respects the strongest of all the large towns, the nearest being that of Bradford. The oxygen-consumed figure is actually far higher than that of all the other large towns, while the chlorine figure is exceeded only by that of South London. From the other table we learn that the rate of flow of the sewage exceeded the average daily dry-weather flow of about 25,000,000 gallons, which reaches the Saltley outfall, on 82 occasions in the year for a total period of 395 hours; that it exceeded six times the dry-weather flow on 39 occasions, and was over ten times the dry-weather flow on 19 occasions, and this in spite of the fact that there are many storm-water overflow weirs in the sewers arranged to relieve them when the flow exceeds six times the dry-weather flow. In this connection it is interesting to note that 10 acres of excess flow bacteria beds are in course of construction and a storm-water stand-by tank of 7,000,000 gallons, which is larger in capacity than the Royal Commission on Sewage Disposal recommends authorities to provide. Full descriptions, with illustrations, are given of the various sedimentation, sludge digesting, silt and separating tanks, also of the bacteria beds or percolating filters, but these have already appeared in one form or another in these columns on previous occasions, and need not be referred to here. In view, however, of the question which has been raised on several occasions as to the possibility of danger from the spraying of sewage in the air, it is only just to quote Mr. Watson's statement on this point. He reminds his readers that Dr. Bostock Hill, the county medical officer of health, stated his objection to the method of distributing the sewage over the filters by means of fixed sprays, but he was equally frank in stating that he had striven to find evidence in the neighbourhood of the filters of typhoid or other diseases likely to be produced by pathogenic organisms, and was bound to say that he had failed. In a final paragraph Mr. Watson admits that the work of sewage purification is not carried as far as science is capable of carrying it, but he points out that a purification equal to 93 per cent on the oxygen-absorbed basis is effected, and adds that, in his opinion, the cost of removing the remaining 7 per cent of impurity "would be absolutely prohibitive; indeed the cost of increasing the purification figure from 93 per cent to even 98 per cent would be out of all proportion to the benefits to be obtained, and under the present conditions would be an unwarrantable expenditure of public money."

* * *

The Intercepting Trap.

The second part of the discussion of the paper of Mr. H. Percy Boulnois upon the report of the Departmental Committee of the Local Government Board on Intercepting Traps in House Drains took place on Tuesday evening last as arranged. This discussion has been notable for the number of persons taking part in it, and for the strong differences of opinion expressed. If the evidence given in the discussion were added to that contained in the report it would prove nothing, for, while half the speakers were in favour of the continued use of the trap, the other half were in favour of its abolition. There were, however, some speakers, and notably

those who spoke towards the end and who had therefore learnt something from the preceding discussion, who considered that, while the Local Government Board ought to withdraw the by-law demanding the use of intercepting traps, this should not mean their total abolition, but rather permission to use traps or do without them, according to the special conditions of each locality or house. Mr. A. J. Martin, for instance, while of opinion that the trap is generally merely a "useless thing which panders to the prejudices of an ignorant public," considered that engineers would do wrong and stultify their previous practice if they forthwith removed the intercepting traps from all house drains. Householders should have the option of having their traps removed, and future practice would take account of the advance of knowledge.

The suggestion that the Royal Sanitary Institute should obtain the views of all local authorities throughout the country as to the merits and defects of the intercepting trap would, as Mr. Boulnois very justly observed, merely lead to the accumulation of a mass of evidence half of which would be in favour of abolition and half in favour of the retention of the trap. The wisdom of Mr. Boulnois' remarks at the conclusion of the discussion is evident. The evidence of the report is sufficient, and the intercepting trap must ultimately go; but in making this change we must remember that sewers must be properly constructed, maintained and ventilated, the drains must be connected to the sewers at a proper level so as to avoid splashing, they must be carefully laid, soil pipes must be carefully constructed and connected to the drains, all sinks, baths and rain-water pipes must be carefully disconnected, iron pipes with closed inspection boxes in the chambers should be used in place of stoneware pipes for house drains, and flushing cisterns must be larger, the use of 2-gallon cisterns being retrograde and uneconomical, seeing that several 2-gallon flushes are often required in place of one 3-gallon flush. Further, all water-closets should have double traps. Mr. H. C. H. Shenton drew attention to the fact, also mentioned in these pages last week, that whereas all other sanitary fittings such as sinks, baths and lavatory basins were trapped twice, the water-closet had only one trap, and if the intercepting trap were removed some additional safeguard would be required. Mr. Boulnois supported the idea strongly.

It appears, therefore, that while the abolition of the intercepting trap in the future is fairly well assured, the practical application of the principle will involve other changes for the better. An advance in knowledge has been made, and it remains for engineers to apply that knowledge with care and thoughtfulness. The old by-law of the Local Government Board will probably be withdrawn, and a new by-law permitting without demanding the omission of intercepting traps substituted. Local conditions and the judgment of the engineer in each case will decide the rest. We congratulate Mr. Boulnois and the Royal Sanitary Institute upon the practical result of the discussion, which should materially strengthen the hand of the Local Government Board.

* * *

The Concrete Institute.

The presidential address recently delivered before the Concrete Institute by Mr. E. P. Wells may conveniently be considered in two parts. He first dealt with certain matters of a domestic character, and then proceeded to offer some very practical observations on reinforced concrete construction. Taking into consideration its comparative youthfulness, the Concrete Institute certainly displays a very healthy vigour. The general adoption of the standard notation for reinforced concrete calculations, which was drafted by the Science Committee of the Institute, affords an excellent example of the influence which it already commands; and the enlargement of its scope so as to include structural engineering should operate still further to widen its possibilities. Various committees are at work on questions directly affecting the user of reinforced concrete—for example, testing, matters of practice, and investigation of failures, while the coming session is to be characterised not only by more frequent meetings but also by the inauguration of a course of educational lectures.

Turning now to the practical side of Mr. Wells' address (a full report of which will be found elsewhere), it will be seen that attention is directed at the outset to the deleterious effect on cement of over-aëration. Dealing next with the aggregate, Mr. Wells pointed out the danger of an excess of sand being present in some of the more ordinary ballasts, and, further, to the unsuitability of broken Fletton bricks (especially those with purple markings) for use in concrete, owing to the disrupting action of the lime which they contain. As regards the actual operation of mixing, every one who has practical acquaintance with the work will agree with Mr. Wells that none but experienced men should be allowed to take any part in this process. Even if this precaution be strictly observed, it is by no means an easy matter to obtain results which are thoroughly satisfactory. Perhaps the most interesting part of Mr. Wells' address, however, was that in which he dealt with the causes of failure, and advocated a strict and impartial investigation of the circumstances under which failures occur. These investigations would not, of course, be intended for the fixing or apportioning of blame, but merely for educational purposes, so that the practitioners of the future may learn from the errors of the past. As Mr. Wells himself said, it is advisable in all cases that the principal causes of failures should be known, in order that specifications may be made so rigid that there is little likelihood of these mishaps. It is the fear of failure that debars to a certain extent reinforced concrete from being used by many clients, and therefore it should be the object of all concerned with this matter, from a professional as well as from a commercial standpoint, to see that such care is exercised in the whole of the work, both as to designing, checking, and construction, that no one, for one single instant, should have any doubt that reinforced concrete is for certain classes of work the best that can be employed.

Bituminous Road Materials in the United States.

In a paper read before the American Road Congress at Atlantic City last month Prof. A. H. Blanchard, M.AM.SOC.C.E., reviewed typical current practice in the use of bituminous materials for highway work in the United States, and drew attention to some of the chief causes of the failure of road crusts or road surfaces of the different classes which he described. Prof. Blanchard's paper, a copy of which he kindly sent us, was reproduced in our issue of the 8th inst. It will be seen that "bituminous surfaces" corresponds to our "surface tarring" and "bituminous macadam" and "bituminous gravel" to our "pitch-grouted" road crusts. The remaining class does not, as our readers have doubtless perceived, correspond to our "tar-macadam." The American "bituminous-concrete" is made much as ordinary concrete is made, the graded aggregate being mixed with the cementing material. Our "tar-macadam," on the other hand, is usually made by coating the metal (often ungraded, but now usually graded to some extent) with the tar, rolling it down when the tar has become tacky, and adding binder in the form of chips only in so far as it penetrates when rolled in on the surface. We believe that we were the first to draw attention to the necessity for finding a middle course or adopting a compromise between a crust which is unstable, by reason of its lack of filling material, and a crust which is too dense and rigid. The methods of construction described by Prof. Blanchard do not seem to aim at maximum

rigidity, but while it is remarked that "variation in size of the aggregate produces a more stable pavement," we find no reference to the possibility of carrying this principle too far and obtaining a pavement which is too hard and rigid and, if made with hard road metal, too slippery. We should be glad to know if any engineer has, after drawing up his specification, laid down trial lengths in each of which the material of the crust contained a larger proportion of, in some cases, voids, in other cases mineral matter. It is really a question of what proportion of the voids in the stone above, say, 1 in. size shall be occupied by mineral matter, what by tarry matter, and what by air; and these proportions may depend partly upon the physical character of the stone itself. The part played by the air spaces in various road crusts and street pavings is discussed by Mr. Francis Wood, M.INST.C.E., F.G.S., in his recently-published book, "Modern Road Construction," and the success of several different kinds of paving is credited in part to the existence of cellular spaces. Mr. Wood is no doubt perfectly justified in the conclusions at which he arrives in this matter. Reverting to Prof. Blanchard's paper, from which we have somewhat strayed, we conclude by drawing attention to two references to stone which is too large or too uniform in size as a cause of failure of bituminous-bound road crusts.

The Motor 'Bus. The advent of the motor omnibus has caused considerable anxiety to many of the suburban highway authorities, and on more than one occasion it has been suggested that it might be possible to recover from the proprietors of these vehicles as "extraordinary expenses" the cost of repairing the roads which they use. The latest authority to move in this direction is the Hampstead Borough Council, whose General Purposes Committee have instructed the clerk to report as to whether any steps could be taken to recover from the omnibus companies, under the heading of extraordinary traffic, expenses towards the upkeep of the roadways recently used by them; while the borough engineer, Mr. O. E. Winter, will at the same time keep observation on the new routes being used by the companies with a view to the whole matter being considered. As we pointed out at the beginning of the present year, the question is quite novel as regards extraordinary traffic cases. The most appropriate judicial dictum appears to be that of Mr. Justice Wills in *Hemsworth Rural District Council* v. *Wakefield-thwaite* (1904), 68 J.P., 345: "Traffic must of necessity, as time goes on, vary in its character, according to the development of the various industries in the neighbourhood; and traffic which in one year or at one given time may be extraordinary traffic will, in the course of time and it may be in the course of a comparatively short time, become ordinary traffic. Therefore I think that, in considering whether traffic is extraordinary or not, it is not sufficient to take simply the year to which the question relates and compare other traffic on the road during that year with the traffic complained of. That would be a fallacious test. The test is whether the particular traffic in question has, by the usage of trade and of society, and by the varying circumstances applicable to the case, by that time become such as can fairly be called ordinary traffic."

Water Supply in the United States. The problem of water supply in the United States, which was discussed by Mr. Allen Hazen, of New York, in a paper before the Eighth International Congress of Applied Chemistry, is in certain respects similar to that in Great Britain, while in other particulars it is essentially different. The vast natural resources of the United States render the water question comparatively easy of solution in many districts. Indeed the water supply resources of the country are so great that it is impossible accurately to estimate or adequately to realise how vast they are. As Mr. Hazen said, the available supply is generally so great in comparison with the requirements of domestic use that it may be considered as practically unlimited. The importance of conservation is therefore not so great as it is here. Nevertheless, the situation in America has in some of its aspects a very close parallel in Great Britain. For example, there are cases of conflict of interest between cities where a source of supply selected by one municipality is also physically well adapted for use by another. Special legislation has been found necessary to deal with this matter even under American conditions. Much more would it appear desirable that in a country like Great Britain, small and densely populated, and possessing sources of supply which are certainly not unlimited, there should be some central control over the apportionment of available supplies. Some portions of Mr. Hazen's paper are reproduced in another column in this issue, and his observations will be found of special interest as affording a reliable basis for a comparison between British and American conditions and practice in regard to water supply.

The Institution of Municipal and County Engineers. We have frequently observed that the Institution of Municipal and County Engineers can only claim to speak with authority in the name of the profession on those occasions when representative utterance is required in proportion as the members of the profession support it by membership. The Institution has something to offer to municipal engineers of all grades, from the chief official in a large city to the humblest assistant or pupil; and we are glad to notice that an attempt is being made to secure that the claims of the Institution shall be clearly placed before all those who might appropriately join it. In order that this very laudable object may be achieved, a circular-letter has been addressed from headquarters to chief engineers and surveyors throughout the country asking for information as to the personnel of their staffs. It is to be hoped that the information which is asked for may readily be given, and that those who occupy positions of authority will bring to the notice of their technical staffs the claims of the Institution and the benefits which it is capable of conferring upon those within its ranks. As stated above, the membership qualification is very wide, the class of full member being open to all who occupy leading positions of staff responsibility; the class of associate member to all who fill positions of minor staff responsibility, while pupils, improvers, and other junior members of a technical staff may enrol themselves as students. We cordially hope that the enterprise to which we refer may be the means of considerably extending the membership and thus increasing the influence of the Institution.

A Town Planning Competition. We venture to direct the special attention of our readers to the competition in town planning which is being organised by the Institution of Municipal and County Engineers. A full announcement of it will be found in another column. Premiums—which a letter in our correspondence pages, it will be seen, suggests might be made more attractive—are offered for the designs which are ultimately adjudged the best, and two of these have been specially set apart for students. The conditions laid down for the guidance of intending competitors are such as will allow the greatest possible scope for originality or novelty of idea; and it is hardly necessary to say that rules have been devised to secure that the assessors (whose names will be announced in due course) will only know the candidates by a *nom-de-plume*. The competition affords an opportunity for a fascinating exercise in free design—with an object in view—and we hope that it will prove as popular as it deserves to be.

Intercepting Traps in House Drains.

ROYAL SANITARY INSTITUTE DISCUSSION OF DEPARTMENTAL COMMITTEE'S REPORT.

In our last issue we gave a synopsis of the papers and the discussion which followed the presentation at a meeting of the Royal Sanitary Institute in London, on the 12th inst., of a paper by Mr. H. Percy Boulnois, M.INST.C.E., on the subject of the recently published report of the Departmental Committee of the Local Government Board on "Intercepting Traps in House Drains." We now print a full report of the speeches delivered up to the time when it was found necessary to adjourn the meeting—which was presided over by Sir Maurice Fitzmaurice, C.M.G., M.INST.C.E., chief engineer to the London County Council—and next week will publish an account of the concluding proceedings on Tuesday last, when a further two hours were devoted to the consideration of the question.

The CHAIRMAN, in opening the proceedings, said they had a large number of speakers, and they had a very important subject to discuss. There were many who could speak upon it probably better than he could, so he proposed that the chairman's opening remarks should be conspicuous by their absence.

Mr. R. READ, city surveyor of Gloucester, said he was sorry his old friend Mr. Boulnois was not entirely convinced by the report of the Departmental Committee. The intercepting trap was patented in a panic in 1872, and the Model by-laws framed in 1877. These legalised the trap, and it was taken for granted by everybody. But defects began to show themselves very soon, and between 1879 and 1882 he was making experiments in sewer ventilation, and came to the conclusion that the trap was a useless, dangerous obstruction, and he had seen no reason to alter that opinion. It paralysed the action of the drain, and rendered it filthy throughout. Thirty-five years' tinkering had failed to remedy these defects, because the trap was wrong in principle, and the detective Mr. Boulnois mentioned, the so-called flushing inlet, showed that something was wrong, and that something was the presence of the trap itself. If a sanitary inspector or a building inspector, upon inspecting a drain discovered that one pipe had a back fall of ¼ in. he would have it relaid, and rightly so; but the same inspector cheerfully and legally allowed an intercepting trap which created an obstruction from 6 in. to 8 in. deep below the invert of the flattest length of the drain, and the flush was at the lower end of the drain. He had a childlike faith in the trap, but he had an utter unbelief in a similar trap placed between the water-closet and the ventilating shaft, which was an absolutely impregnable position. For nearly thirty years he had been like one crying in the wilderness with few supporters. These had gradually increased until Dr. Butler, in 1906, read a paper before the institute with the title "Is the Intercepting Trap a Failure?" Since then, in 1908, the Local Government Board had appointed the Departmental Committee, and they had conducted a thorough investigation, examined fifty-two witnesses, and had obtained statistics from all parts of the United Kingdom, and also from America and Germany. Numerous special experiments were conducted by themselves and a score other experts, and the result was a condemnation of the trap on every count of the indictment. It was true they gave it the benefit of the doubt on one claim —viz., that it cut off the sewer air from the house drain. The committee could not discover any pressure on the sewer side of the trap until the mouth of the connection was covered by sewage, but between the sewer connection and the trap there was at least 20 ft. of drain containing something like 5 cubic ft. of the most stagnant sewer air, and this air was forced through the water seal, and in many cases the stopper was blown out of the raking arm. The stopper could not fall out of itself, but when it did it fell into the sewage, and then the sewer gas was quite free. The intercepting chamber was flooded up to the entrance, and free communication was established through the raking arm to sewage and sewer. Now, here was the arrangement—let's at the bottom of the intercepting trap. The stopper was not replaced and the sewer gas came out in that condition. The advocates of the trap were hard pressed for arguments when they fell back upon rats. The rat [illegible] animal and could leap through an intercepting trap at a jump. He [illegible] was a good take-off and a good landing on each side of the trap, but he defied any rat to get through a gulley trap with a grid on. A 6-in. gulley trap with a 4-in. outlet was 10¼ in. from the top to the bottom of the trap, and the rat would have to stiffen his tail, stand on the top of it, tread water with his feet, and raise a grid weighing 3 lb. with his nose. The primary object of all drains and sewers was the quick delivery of the sewage before decomposition. A trap contained the whole of its contents for at least eight or ten hours every night, and at shorter intervals during the day. The drains were in the proportion of at least 4 to 1 of the sewers, for every yard of sewer there were 5 yds. of drains connected with it. It was like a man's hand, the fingers representing the drains and the hand the sewer, and one was no use without the other. The flow through the drain was intermittent, while the flow through the sewer was continuous, on account of the numerous drains flowing into it. The sewer was what the drains made it. Their friend Mr. Boulnois mentioned some experiments twenty years ago of drains without traps, and said he had difficulty in clearing them with an ordinary flush. He presumed he used the flushing box with the ordinary valve outlet. They did not get an efficient flush with that, as it only flushed as long as the chain was held; but with the modern syphon action box they got a discharge of 2 gallons of water at once, which would fill 4 ft. of a 4-in. pipe and 2 ft. of a 6-in. pipe, and his experience was that it very thoroughly and very rapidly cleared it. The removal of the trap made the drains and sewers cleaner; therefore there must be less risk, and not more. This was proved by experiments made at East Grinstead by Dr. Andrewes, which appeared in the report. Some people were so sensitive and fastidious that they would require a separate closet for each individual, which was manifestly absurd. The average householder knew nothing about drains or traps, and cared less until a stoppage occurred which showed on the surface, when he kicked up a row. The committee were not asked to report on sewer ventilation, but had gone out of their way to express what he should call a pious opinion on the subject, probably in consequence of their visit to Bristol. There was no such thing as an unventilated sewer; it was an impossibility. A system of sewers was a breathing machine, just the same as a man, and if they attempted to stop the breathing they created disease or choked him. There were two points to consider, one external, the other internal. The external was the force of the wind, and the internal the gravitation of the sewage down the drain into the sewer. The experiments of Mr. Mawbey, of Leicester, and Mr. de Courcy Meade, of Manchester, with ventilating shafts showed that they may act alternately as inlets and outlets, but it did not follow that therefore the air currents in the sewer were also reversed. If the shaft was acting as an outlet it meant that it was drawing in air at some shaft or other point, probably within 100 yds. above it up the gradient of the sewer, and if the shaft was acting as an inlet it meant that the air was finding an outlet probably within 100 yds. below it down the gradient of the sewer, the current of air in the sewer itself flowing continuously down the gradient in either case. If the Local Government Board would withdraw their by-law referring to the intercepting trap, and sanitary inspectors displayed as much zeal in removing them as they had done in the past in inserting them, the trap will soon be abolished and they would get rid [illegible] of sham.

Dr. PHILIP BOOBBYER, medical officer of health, Nottingham, remarked that he did not propose to review at any length the report of the Departmental Committee, for that had already been done sufficiently and ably by Mr. Boulnois, but he wished to say at once that he unhesitatingly accepted the general results of the committee's inquiry. With some of the [illegible] in the report they were all more or less acquainted through the work of Mr. Harrison some years ago. The report confirmed what they had been told about the danger of splashing, and emphasised the information they already had to a considerable extent. He only demurred to the general application of the results at which the committee had arrived,

for cases were essentially different from each other. There was a difference of construction and a difference of position. Sewers laid on a high gradient did not require the same treatment as sewers on a low gradient. In low-gradient sewers and drains there was often much deposit, and in high-gradient sewers they had almost violent movement of air. In the sewers of London and Paris one had no feeling of discomfort because there one was breathing sewer air, but there were other sewers in many provincial towns which received the drainage of slaughter-houses and other offensive trades. In London there were no such risks, but in many provincial towns they had most offensive materials discharged in the sewer, very often at a fairly high temperature. One argument used in the report they must demur to; he was sorry it appeared under such a name. They knew definitely, and were continually preaching it to their *clientèle* in the large provincial towns, that so far as they knew there was no relation between sewer air and diphtheria. In the report the inference appeared to be in a contrary direction, and it had been quoted to him by a member of his council. It seemed to him that many of the experiments had been made with badly constructed apparatus in very large drains. He favoured generally the retention of the intercepting trap, for the principal reason that the trap when acting efficiently, as in his experience it usually did, prevented the access of undiluted sewer air to the atmosphere in and around the dwelling. The sewer air in most of the places with which he was acquainted, both on account of its quality and quantity, was much more liable to create a serious nuisance than the drain air of the dwelling when allowed to escape in the vicinity of the latter. He did not allude to injury to health, but to what the public said was a nuisance. Those of them who had to do with health work in provincial towns knew how difficult it was to convince a person that a bad smell was not necessarily associated with corresponding injury to health. He had often gone into gatherings of ratepayers and had seen members of the Health Committee rendered almost sick by the smell, and who could not dissociate the offensiveness of the smell from injury to their health. He had known several instances in which an intolerable nuisance had been abolished through the ventilation of a public sewer by means of a high tubular ventilator carried up by the outer wall of the house, the sewer air being directed by air currents and air eddies into the interior of houses in the vicinity by windows and chimneys. He had in his mind the instance of an 8-in. sewer ventilator which the city engineer put at the top of the street where the gradient averaged 1 in 6 for nearly ¼ mile. It was erected at the special request of the then vicar of the parish. He died a few months afterwards, not from the behaviour of the ventilator, but, he believed, from old age. His successor was a young, active person, who, although well educated, had an ineradicable belief in the injurious effects of sewer air. He said the house was continually filled with horrible odours. He made changes that cost him a lot of money, and insisted upon the removal of the tubular ventilator. The air was, of course, specially liable to get into the houses in hilly districts. In the absence of the intercepting trap any sudden movement of the sewer atmosphere was under various circumstances exceedingly likely to occur, and frequently forced water-closet and other traps—especially when these were connected with long or obstructed soil pipes. In the absence of the intercepting trap any unoccupied dwelling-house was liable to be flooded with sewer air as soon as the closet and other traps had become unsealed by evaporation. At Nottingham Park, a residential district with large houses which became empty from time to time, it was not an uncommon thing for the houses to be almost unapproachable on account of being flooded with sewer air, owing to the evaporation of the water in the water-closet pans. As to the proportion of the traps which one found to be obstructed with excrement, the number was, in his experience, exceedingly small, and this tended to prove what he had already drawn attention to—namely, that in a large number of cases the experiments were made on defective traps. Only that evening he had been calling attention to the radical alterations which had taken place in the views held by experts as to what should be the form of the trap, and to the changes in the trap during the last twenty years. There were three large hospitals in his district, each having more than six of these traps, and one having sixteen. He had had occasion to examine the drainage system during the last twelve years, and only twice had he found the traps completely obstructed. He had frequently found cases of gross misuse and mismanagement, but these would occur anywhere. If an occasional choking or breakdown was to be considered sufficient to do away with the intercepting trap many things must go to the wall, including the water-closet itself.

Mr. T. DE COURCY MEADE, city surveyor of Manchester, said it had not been his intention to take part in the discussion. He contemplated attending as a listener only, accompanied by Alderman Wilson, who was a sanitary engineer, and was the chairman of both

INTERCEPTING TRAPS: TABLE SHOWING COMPARATIVE RESULTS OBTAINED BY THREE INDEPENDENT INVESTIGATIONS.

Name of observer.	Average percentage of total materials retained			Average percentage cleared.	Length of drain.	Inclination of drain.	Diameter of drain.	Quantity of flushing water.	Number of experiments.	Remarks.
	in w.c. trap.	in drain.	in intercepting trap.							
Field	5	14	35	46	50 ft.	1 in 40	6 in.	2 gal's.	120	Table B, page 242, vol. 24, Trans. San. Institute.
Barber	—	—	78	22	80 ft.	1 in 60	6 in.	2 gal's.	10	Table 16, page 71, Report Depart. Com., 1912.
Meade (*a*)	10	45	30	25	58 ft.	1 in 36	6 in.	2 gal's.	24	Stable manure, paper, cut oranges, &c.
Meade (*b*)	7	31	37	25	58 ft.	1 in 36	6 in.	2 gal's.	60	
Meade (*c*)	6	22	39	33	58 ft.	1 in 36	6 in.	2 gal's.	18 daily observations	In use by workmen.
Meade (*d*)	1 oz.*	11½ oz.†	8 oz.‡		64 ft.	1 in 52	6 in.	2 gal's.	3 months' observations	House drain in use under normal conditions, two w.c.'s, one bath, one sink.

* Caught on gauge scoop in sewer side of trap. † Fæcal matter, paper, grease, &c., remained on scoop during bath flush. ‡ Do. removed from both sides of trap fixed in centre of chamber § Could not be ascertained. ‖ Average length measured to midway between w.c. and scullery sink.

the Town Planning Committee and the Improvement and Buildings Committee of the Manchester City Council. He discovered, however, that his friend Mr. White Wallis had included his name in the list of those who were expected to expound their views. The report of the Departmental Committee had taken some 3½ years to mature. It no doubt required some ingenuity to frame a report reversing the settled policy of the Local Government Board. The authors (whom he had not the pleasure of knowing personally) appeared to have carefully performed their task. He was invited by the secretary, Mr. Hardwick Terry, to give evidence, and in pursuance of a resolution of the Manchester City Council, he prepared for the Departmental Committee facts and figures which were supplied to Mr. Terry on April 27, 1909, together with a *précis* of the evidence he was prepared to offer. Those documents were duly acknowledged by the secretary. The statistics showed that at that time (1909) there were 23,248 intercepting traps in use in the city of Manchester. The ascertained average number of stoppages per year amounted to 150, or ·64 per cent per annum. He did not know whether facts showing a like result were received from other large towns; if they were it would be interesting to know how they were dealt with by the Departmental Committee. He held quite an open mind on this question of the intercepting trap, but he felt bound to tell them that the facts relating to Manchester showed pretty conclusively that intercepting traps of proper construction, in conjunction with properly laid drains, did not give the trouble found in other places. The Departmental Committee's report contained particulars of some interesting experiments conducted for the committee by Mr. Patten Barber at Islington. With their per-

mission he proposed to compare these experiments with those carried out by the council of that institute under the immediate direction of Mr. Rogers Field in 1892, reported in vol. 14 of the "Transactions." He would also compare them with the results of investigations of a similar nature made by him (the speaker) many years ago. The table [reproduced herewith] showed the results of the three sets of experiments. The weak point in all those investigations was the use of artificial material, or "artificial excreta" as it was termed in the report of the council of the institute. The material used by Mr. Rogers Field was composed of a mixture of soft soap, cocoa fibre, clay, and pieces of newspaper. That at Islington consisted of clay, tow, Russian tallow, and pieces of toilet paper. That used by himself was composed of stable manure with a small percentage of cow dung, granulated cork, sliced oranges, and pieces of newspaper. His first series of experiments were made with a 6-in. stoneware drain, 58 ft. in length, with a fall of 1 in. to the yard. The experiments were particularly directed to different kinds of closets and waste-preventing cisterns, as well as to the condition of the drain and trap. In the third series of tests (c) two closets used by workmen were employed, and the observations were made without the knowledge of the men using the closets. The materials found in the traps and drain were at times instructive. The closet-traps usually retained a small quantity of excreta and paper, but occasionally large wads composed of sheets of newspaper rolled up, pieces of clay-pipe, matches, empty matchboxes, and other articles were found in the traps or in the drain. The latter always contained a considerable amount of deposit, which was gradually moved forward each time a closet was used. The intercepting trap was never quite free from deposit. In those experiments with appliances in actual use it was, of course, impossible to determine with strict accuracy the proportional quantities of material left in the drain and traps, as the total amount had to be ascertained after instead of before admission to the drain. The results were, however, carefully checked, and were believed to be accurate. Those experiments were followed by observations on closets and traps in actual use in a dwelling-house, the fittings and drain being specially prepared for that purpose. They generally confirmed the accuracy of the tests last referred to, but the results in that case could not be stated by percentages, as it was not possible under the circumstances to ascertain the total amount of matter passed into the drain. A glance at the table would show how largely the results obtained by each observer varied. That he believed might be accounted for by the difference in the character of the material, the methods of applying the tests, and in the artificial and actual use of the closets. It was in consequence of the variations in this latter respect that he did not publish the results, although he had gone so far as to photograph the appliances and prepare the manuscript. For the same reasons he did not consider that the results obtained at Islington could be accepted as conclusive, although the thanks were due to Mr. Patton Barber for the time he had expended and the trouble he had taken.

Mr. Frank Sumner, engineer to the Corporation of the City of London, said he thought every municipal official throughout the country was greatly indebted to the Willesden Urban District Council and to Dr. Butler and his old friend and chief, Mr. O. Claude Rolleston, for persuading upon the Local Government Board to make their inquiry. Personally, he was strongly against intercepting traps where the distance between the trap and the [illegible] was very great. In Willesden the majority of houses were small, and the distance was probably 100 ft. away from the interceptor. Having been in the district for [illegible] years, he found that many of the interceptors were continually being choked, that being due entirely, he considered, to the fact that the amount of water by the time it got into the interceptor was small, leaving no [illegible] of the latter being cleared. He thought the report would end the death knell of these traps, and had also proved the fallacy of the danger of sewer air. It was a good thing the question of [illegible] had come up, because everyone could admit that the most perfect in the world were possible, the healthiest one could find. Fourteen or fifteen years ago the Medical Officer of Health inspected the district of the [illegible] in the Metropolis and came to the conclusion that they were about the healthiest [illegible] London, as every [illegible] was well aged. Some eight years ago Mr. Vaux Patterson [illegible] council to urge on local authorities the advisability of removing these traps, and he (the speaker) reported to his council that he was entirely at one with the suggestion to remove the trap from small houses; at the same time, as regarded larger houses, where baths were used, and where a large number of people were employed, he thought it should be optional on the occupier as to whether the trap should be continued. He still held that view, and thought that was the proper way to look at it. So long as they found they had sufficient water and sufficient people using the drain to cleanse the interceptor, he thought it was a matter entirely for the option of the individual. They would have to overcome the prejudices of the medical officer, the architect who designed the house, and the person who used it, but he had no doubt that in a few years' time the whole of the houses would be disconnected when the fallacy of the value of the trap had been explained. In the City of London premises were each drained by a single drain, but everyone of the premises had its interceptor, and during last year they only had about three complaints of the interceptor becoming choked. It might be said that that was a point in favour of continuing interceptors, but his view was that it had no value, so far as the interceptor in suburban districts was concerned. In the City they would have twenty or thirty, or even more, water-closets connected to one drain; consequently the flush was sufficient to keep the trap clear. He was, therefore, not prepared to recommend the City to abolish the interceptor; but, at the same time, he would offer no objection to the removal if the owner desired it. As regarded house drains, he strongly recommended that they should be made of iron, and he thought he was quite outside the mark when he said that the additional expense in a reasonably sized house would not be more than 20 per cent. That was one of the cures for the whole thing, and in that case they might well dispense with the trap.

Dr. Wm. Butler, assistant medical officer of health, London County Council, said he had been struck by the scientific attitude adopted by Mr. Boulnois in his paper, for the committee obviously had reported in a manner contrary to the views he had previously held. It was an attitude of mind which might be well generally adopted. To approach that question in a partisan spirit was not to arrive at the truth, and it was astonishing how much feeling arose as soon as the usefulness of the trap was questioned. He was brought up in the orthodox faith that the intercepting trap was a revered institution not to be questioned, and it was only because of the facts that were brought before one that one was forced to question that dogma. It was not the number of complaints that raised the question, and that must be recognised from the beginning. They had been told that in Manchester only 6 per cent of the drains had been the subject of complaints, but that to his mind was a very high percentage. In Willesden the complaints of choked drains were comparatively few, but what he found was that if for any purpose they had to examine manholes, in a large proportion of cases the rags were choked, or the cap of the raking arm was missing. It was that which caused him first to make a systematic inspection of the manholes, with the result that they discovered that, although the complaints were few, 10 per cent of the caps of the raking arms were missing, and from 5 to 6 per cent of the interceptors were choked, which with some thousands of interceptors was a very serious matter. He found it was the fashion now to say that that was Willesden, and that the Willesden drains had not been laid as metropolitan drains were laid. That, however, was not so, and they found that Willesden compared extremely favourably with the other districts examined by the Departmental Committee. The percentage of choked drains was higher outside Willesden than within. He remembered how struck the chairman of the committee was by one fact. An inspector was once sent to examine the manholes to see if he could find any choking—and he might say they could always rely on finding that anywhere. They went to one house where there was a choked drain. The manhole was full of [illegible] sewage to a depth of several feet, the smell being that of the kind usually associated with sewage in a septic tank. The people in the house were asked if they were aware there was anything the matter, but they stated that they were not. That drain had probably been choked for [illegible]. People did not know when drains became choked and it was one of the things that the Departmental Committee recommended that in future, whether they had interceptors or not, drains should

be made in such a manner that there should be an early indication of any choking. At present people did not become aware of it because the brickwork of the manhole permitted percolation, and there might thus be a grossly insanitary condition of things without people knowing anything about it. They had heard Dr. Boobbyer say that without an interceptor there was great nuisance, but if every house drain were ventilated they would not have to face the sewer air which existed at present, because of the inadequate ventilation of sewers. They would do away with it as soon as they did away with the intercepting trap. Above all things what they wanted to recognise was that the reason for doing away with the intercepting trap was not because they despised sewer air, or were indifferent as to its admission to their houses, but because it was the only effective way in which they could safeguard themselves from that undesirable thing. It was because the presence of the intercepting trap really led more to the pollution of houses by sewer and drain air than its absence that one desired to see it removed. The trap necessitated a fresh-air inlet, and that in nine out of ten cases was placed in close proximity to the house. If by any mechanical device they could find that a drain deep in the clay permitted of a channel of smoke showing itself, the drain had to be reconstructed, and yet they allowed a 5-in. opening immediately below the sill of a window direct into a house, and nothing was thought about it. It was amusing how indoctrinated they had become as to close their eyes to obvious facts of that kind. The point which had been most constantly urged against the abolition of the intercepting trap was that of rats. He was not really concerned as to whether the trap prevented rats entering a drain or not, but he believed it did not. What they had to consider was the possibility of the rat getting out of the drain into the house, and that only happened when the drain was defective. If they did away with the interceptor the corollary was that the drains should be made gastight and airtight, and there was no question that that could be effected by having the drains of iron. A condition of the abolition of the trap might be the provision of drains of that kind, and that they should be cut off from manholes, so that as soon as a blockage took place it would become apparent at once at the nearest gulley.

Dr. Louis C. Parkes, medical officer of health, Chelsea, said he did not desire it to be thought that because he criticised the report he did not value it, for he regarded it as an admirable one, and one which threw fresh light on the subject, and fixed their views on this particular point in a very desirable manner. The main point was the stoppage of the intercepting traps, and he desired to ask how much of that stoppage was due to faulty laying of drains—drains not laid with true or sufficient gradients, to the bad form of trap formerly so much in use, to the use of too large a trap—as, for example, a 6-in. trap where a 4-in. one would have served—and, more important than anything, to faulty connections of the trap with the sewer. They all knew that where new drains were put into houses it was frequently the fashion not to renew the frontage. The old drain was taken out and the old frontage was generally considered to be sufficient, which meant very often that the connection to the sewer was not well laid, and a stoppage very often did occur. It had been his experience in Chelsea that a great many choked drains had been due to that. The question of experiments with artificial fæces had been raised by Mr. de Courcy Meade. The artificial fæces used by Mr. Patten Barber consisted of clay, tow and Russian tallow. Natural fæcal matter, as they knew, was approximately of the same specific gravity as water, sometimes lighter and sometimes heavier, according to the condition of the bowel; but what fæcal matter, he would ask, had ever been known to issue from a human bowel which contained clay in it? If they had matter of that sort to deal with they would have to do away with traps altogether. With respect to the infected drain, and air passing from one house to another, where there was no intercepting trap, he had had a talk with Colonel Horrocks, who had carried out the experiment at Gibraltar which shed such light on the matter. Colonel Horrocks told him he thought the Departmental Committee had misunderstood his work. The object of his work was to show that in a drain the air would become infected owing to splashing. That was accepted, but what he (the Colonel) wished to point out was that where there was no intercepting trap or where the raking arm was open such air would pass readily into the sewer and up the house drains. He did not consider sufficient attention had been given to that fact by the Departmental Committee, but it was quite easy to see how it could happen if there were no intercepting traps. Infected air would pass readily above owing to friction in the sewer, and if it were only a small sewer it would pass into the nearest house. If all the drains were connected directly with the sewer some acted as inlets and some as outlets, or it might happen that on one side of the road the exhaust shafts were acting as inlets and on the other side as outlets, so that it was quite possible for the infected drain air of a particular house to be carried to adjacent ones. That was a very important thing in towns where one might be living next door to a case of typhoid, or be in close proximity to a nursing home or hospital from which infected excreta was continually being passed into the drains. Therefore, if it were possible for drain air to carry infection, and they had no intercepting traps, there was no reliable safeguard against their drain air becoming infected. Where sewers were of a large size there was not the same possibility of infected air being carried from one house to another, for the reason that in a 3-ft. or 4-ft. sewer they had a sort of reservoir which acted after the fashion of a buffer and prevented the air travelling. In old sewers, however, they had what was probably as bad from the practical point of view—sewage deposits. These sewers were often not laid with proper gradients, and were sometimes much too large for the volume of sewage they had to carry, the result being the accumulation of deposits which gave off foul gases. If these were allowed to escape from the exhaust pipes complaints were made and the openings were stopped up, with the result that the sewer gas went into the house. Another thing suggested in the report was the abolition of fresh-air inlets on the drains where intercepting traps were used. That he considered would be a great mistake, for, although in certain cases they might be a source of danger, he thought they assisted in keeping the drains sweet. Dr. Butler looked upon the rat as quite a wholesome animal, but although that might be so in this country, they had always to keep in mind the danger of plague, an important matter in seaport towns. It was quite possible that the people in the East-end of London and in Glasgow and Liverpool owed their immunity from Oriental plague to the fact that rats had not been able to get into the drains. His experience was that intercepting traps did keep out rats. He had never found rats in a drain when the raking arm was on, but he had seen them when the raking arm was off, and he thought it was important to keep rats out, not only on account of the plague, but also because they were exceedingly destructive, for though they would not break through iron, they would soon break through a stoneware drain, and cause dangers to health to arise in that way. Although he felt bound to criticise the report of the committee, he did not wish them to think he did not value it. His belief as an individual was that the intercepting trap was a good thing which they should not give up lightly. When they came to consider the pioneers of hygienic science, and the reasons that influenced them in introducing the trap they were bound to respect them. While they recognised that sewer air in ordinary circumstances would not produce scarlet fever, diphtheria and other infectious diseases, they knew that when it got into a house it was liable to develop illness, such as anæmia in children, diarrhœa and sickness, and he did not care what bacteriologists or physiologists said, where sewer air got into a house there was a likelihood that sickness attacked the occupants.

Mr. E. van Putten, borough engineer of Lewisham, observed that for years he had been arguing against the use of the interceptor, and therefore welcomed the report of the committee, whose conclusions had been amply borne out by the evidence given. Sewer air had been found to be of better condition than drain air, and when that was once acknowledged he did not see what argument could be left for the use of the interceptor. Dr. Parkes had said that the introduction of sewer or drain air into a house was likely to produce illness, but the abolition of the interceptor did not make the drains airtight. If sewer air were less harmful than drain air, he did not see why it should not come in as much as drain air. In London, if they did not have trades which were quite as offensive as some in the provinces, there were industries carried on which produced an objectionable condition of things in the sewers. Large quantities of hot water and other matter were dis-

charged by breweries and other works, and but for ventilation very offensive smells would be created. His chief reason for desiring the abolition of the interceptor was to secure better ventilation, and if they got ventilation for the sewers through the house drains, he did not see why they should not have it, the house drains being, after all, the chief offenders in causing smells in the sewers. As to rats, he was perfectly convinced that these would not find their way out of a drain unless the latter were defective, and where the drains were not defective the rats acted more or less as scavengers. In Lewisham they had eighty-nine sewer ventilators attached to the houses, and in a period of over thirty years they had never been called upon to remove one of these. He thought much depended on the care taken in fixing the ventilator, and if it were placed a good distance from the chimneys or from windows they would never experience any trouble. In his opinion the number of stopped interceptors was no indication of the total number which became stopped during the year and which freed themselves by an extra pressure of water. Some years ago Dr. Andrewes, in a report to the Local Government Board, gave some statistics of the number which the water level in the manholes showed to have been stopped, but which had freed themselves by additional pressure afterwards. Mr. Sumner suggested that the use of the trap should be optional; he (the speaker) did not object to that, but thought it should never be compulsory on anyone.

Mr. A. J. Dickinson, engineer and surveyor to the Redditch Urban District Council, said he had attended the meeting for the purpose of supporting Mr. Read in the attitude he had so consistently adopted for many years. He had had a long experience of intercepting traps at Sheffield, Birmingham, and now at Redditch. He had seen interceptors put in under the supervision and control of the local authorities which became choked. Their thanks were due to the Departmental Committee for the impartial and thorough way they had set about a very difficult task, and he hoped they would all be as much open to conviction as the author of the paper, who, in 1903, said: "I shall take care that I will never live in a house which has not got an interceptor." From what he had said, he thought Mr. Boulnois very likely would live in such a house now.

Mr. Boulnois: No, I would not; I would see it put in myself.

Mr. Dickinson said the chief question they had to consider was as to the effect the report would have on their future policy with regard to interceptors. His own council on his advice had issued the following circular to architects and builders: "In view of the report of the Departmental Committee of the Local Government Board, the council feel that they cannot enforce their by-law requiring interceptor traps and fresh-air inlets to be provided on the drains of new buildings. In future plans will be approved if they show all drain openings to be properly trapped, and if a 4-in. vent shaft be provided at the highest point of the drains." As regarded existing interceptors, he would like to see them all abolished, but perhaps the wiser course would be to block up the air inlets that caused a nuisance, and remove the interceptors when they became choked. He did not wish it to be thought that he did not value the usefulness of traps in general, but he regarded it as an axiom that they were placed where they received the flush of a volume of sewage before it was dispersed in the drain, so that the solids were carried away. In this connection he was glad the committee drew attention to the necessity of trapping the waste pipes of sinks and lavatories discharging into the open air, as they were a serious nuisance when they acted as ventilator inlets to the house.

Mr. G. Bertram Harterre, surveyor to the Alton Urban District Council, remarked that he attended with the object of championing the cause of the intercepting trap, and so far he had heard nothing to cause him to change his views. Some years ago he introduced the Rojers Field pattern in a town where they had been rarely used previously, and as there were several cases of choking soon after he was for the time being in a difficult position. He went very carefully into the cases, and found among the obstructions bath towels, a scrubbing brush, a child's doll, house-flannel, chamois leather, rags and stiff brown paper. If these were legitimate articles to pass down a drain then the intercepting trap must stand condemned. Other causes of blockage he found to be a trap fixed with the outlet higher than the inlet; defective drains which allowed the liquid to escape, and only the solids to reach the trap; and—this being a common defect—a projecting ridge of cement inside the joint of the trap and the pipe below. The mason who laid the pipe used a badger or swab which he drew horizontally through the pipe, and this was right enough till it came to the interceptor, where the British workman did his best, but instead of drawing the badger horizontally, he drew it obliquely, with the result that there was a ridge of cement left standing up and which led to an obstruction. The indictments against the intercepting trap might be classified: (1) It rendered ventilation of the sewers more difficult and costly. If they considered for a moment, natural methods of sewer ventilation left much to be desired, and he suggested a system of extraction with cremation of gases. The effect of sewer gas, about which a great deal had been said, was a matter for medical men. Personally he had had two attacks from a germ called streptococci, or staphlicocci, and found in sewer gas. As to the eye of the raking arm being blown out, he should say it was a question of the sewer requiring better ventilation. (2) The fresh-air inlet, it was stated, often acted as an outlet for foul air, and created a nuisance. Fresh-air inlets were not enforced in his district, and there had been no bad results. Sometimes he advised that there should be two shafts, one higher than the other. If a mica flap was fixed he would suggest that it be fixed tipping slightly forward. The open-grate type of flap he regarded as a nuisance. (3) It was charged that the trap increased the cost. He agreed it did, but so did all sanitary improvements. (4) Finally, it was alleged that the intercepting trap acted as an impediment to the passage of sewage from the house drain to the sewer. The cause, he thought, would be found to be leaky drains, which allowed liquids to escape into the surrounding soil, the solids only reaching the trap. The result was partially choked drains, and the soil was converted to sludge by septic action, and slowly slipped like a glacier to the sewer and stopped at the trap. Whether they had a trap or not, the trouble was caused before they got so far. Traps were improperly fixed, and owing to the shape there were difficulties in fixing them. Inspectors should see water flowing through before passing new work. A great objection to the common interceptors was that there was no provision for a clean joint between the trap and the pipe below. He considered intercepting traps should be made with long spigots, provided with access-eye to insure a clean invert. A suitable levelling cradle was required when fixing. Instead of being so strong on the abolition of the intercepting trap, he thought the objectors would be better advised to insist strongly on ventilating sewers and sterilising the gases arising from the same. If traps were abolished it might be asked if every house drain would take an equal share in the ventilation of sewers. He thought not. The shafts at the low levels would be inlets, and those at the top levels would be outlets. Then they would have cross-currents, and leaky drains admit to houses a greater quantity of foul gases.

The proceedings were then adjourned.

DISCUSSION AT THE INSTITUTE OF SANITARY ENGINEERS.

A discussion on the subject of the intercepting trap was opened by Mr Ernest van Putten, M.Inst.C.E., borough engineer of Lewisham, at a meeting of the Institute of Sanitary Engineers held on Monday evening at Caxton Hall, Westminster. Mr. A. J. Martin, the president of the institute, occupied the chair during the proceedings.

Mr van Putten said I must apologise for the unorthodox views I hold on this question, although I am glad to say that, whereas I was looked upon as a crank some twenty or more years ago, when I first commenced my crusade against interceptors, I am now somewhat justified by the report of the Departmental Committee of the Local Government Board.

So far as I am aware, the earliest form of interceptor was the mason's or dip trap. This was formed, as you no doubt know, by building a brick pit on the drain, the bottom of the pit being from 6 in. to 9 in. lower than the invert of the drain; across the pit a stone was fixed vertically below the level of the outlet, and another stone was fixed on the top of this

horizontally, closing the area of the pit between the dip stone and the wall on the outlet side of the pit. Of course, this was an exceedingly primitive arrangement, as more often than not the bottom of the pit was quite flat, and, there being no scour, the 6 in. to 9 in. at the bottom of the pit was a veritable cesspool. Although I thought at one time that these arrangements were of a very ancient date, I was surprised some fifteen years ago to find that there was one on the drain of our town hall, which was built as recently as 1874, and was designed by a very eminent architect.

These traps were succeeded by the bent pipe (usually termed the running syphon). This at first was buried without any means of access. The next improvement was similar in shape, but with a means of access in the middle of the dip. This took the form of an upright junction, and was continued up to the surface by pipes, and covered with a stone. It was possible by this means to stir up the deposit in the bottom of the trap and free the stoppage when one occurred, provided that the position of the inspection eye was known. I am afraid that our rum-hard ancestors were too sensitive in most cases to allow the stone cover to be seen, and after it had been covered up for some time no one knew its position.

The Public Health Act, 1875, and the late Sir Robert Rawlinson about the same date, assisted to bring the interceptor into general use, and with its use came improvements in its construction; it was found that stoppages occurred, and with a view to preventing this the inlet was made higher than the outlet in order, by means of the siphonic action, to induce an additional scour through the trap. The rodding eye was also fixed so that the portion of the drain between the interceptor and the sewer might be rodded. Some rodding eyes were turned up vertically and sealed with thin glass, which could be broken from the surface when the interceptor was choked and the manhole full of sewage. Another cover to the vertical rodding eye was a dead weight with a rubber sealing, the weight being attached to a chain which terminated just under the manhole cover; this, of course, enabled the weight to be lifted when the manhole was full. Both these contrivances were designed because the interceptors were so often blocked, and their utility depends on the failure of the interceptor in one very important point—viz., its ability to keep unstopped.

I should like to call attention to another form of interceptor—viz., Sykes' patent. It consists of what is practically the running syphon, with the addition of three screw-stoppered arms, and is built in the middle of the manhole or inspection chamber. In the event of it becoming blocked, the arm nearest the sewer is opened first, and from this opening the trap can be cleared, any back water then in the drain can at once escape down the sewer. The arm on the house side of the trap can, of course, be used for rodding the house drain.

It seems to me a pity that this interceptor is not more used where interceptors are necessary. I have suggested from time to time that if an ordinary interceptor is used it should be immediately above the manhole. Should it become blocked the drain will fill up more quickly, and it is quite easy to unscrew an interceptor from a manhole below it, whereas it is practically impossible to get a manhole above it until all the accumulated sewage has been baled or pumped out.

There are, so far as I am aware, two principal reasons put forth for the use of the interceptor—the chief one being to exclude sewer air from drains, the other to keep out rats.

I have contended for many years, but, of course, it was only the contention of an engineer, and was not at that time backed by bacteriologists—that drain air was more impure than sewer air. My chief reasons for saying this were that only a small proportion of the soil from each discharge of the water-closet was washed into the sewer, and that between each use of the drain a large quantity of soil was always lying in the drain uncovered by water, and consequently giving off more smell than that in the sewers, where the soil is submerged in water, and also the decomposing contents of the interceptor have more effect on the drain than the sewer.

In 1893 the Royal Sanitary Institute conducted a series of experiments (vol. xiv., page 237) with open channel pipes of various sizes and at varying gradients. As I do not wish to bother you with a multitude of figures, I will merely give the average of their results. This was that, with a 2-gallon flush, only 30 per cent of the solid found its way through the interceptor into the sewer. There are other reasons for the superiority of sewer air; sewers are flushed periodically, and, in my borough, cleansed. By this I mean that all sewers 3 ft. high and over are swept out, including side walls, by sewermen who go through them; and all the pipe sewers are brushed out, not by the ridiculous thing supplied with a bundle of sewer rods, but by brushes specially made for me in which the brush is about 18 in. long, and of a diameter to suit the pipe. . . .

The report of the Departmental Committee gives the quantity of solid material which remains in the interceptor as varying from 40 to 79 per cent. This report gives another reason for the less pure state of the drain air—viz., that it is caused by the splashing which occurs in drains to a greater extent than it does in sewers. This opinion is also held by Dr. Andrewes, who reported to the Local Government Board in 1906-7 (page 185) and 1907-8 (page 266) on sewer and drain air, and I am of opinion that it is a very important factor in the case. At all events, the Departmental Committee's report disposes entirely of the question of the sewer air being more harmful than drain air. It therefore appears to me that the only claim remaining for the use of the interceptor is to exclude rats from the house drain. Now I cannot see what harm rats do in a drain; if the drain is so defective that the rats can work their way out, I think that rats are rather a blessing than otherwise, as they will show the necessity for relaying the drain. But if the drain is properly jointed in cement the rats can do no possible harm, and perhaps a little good, by acting as scavengers.

The following are some of the disadvantages, in my opinion, of the interceptor:—

DISADVANTAGES OF INTERCEPTORS.

Their Liability to Blocking.—In 6,492 examined by the Departmental Committee 23 per cent were blocked, or showed signs that they had previously been blocked (par. 24 of the report). I know this has been stated in some of the recent papers and speeches to be greater than the proportion found in the experience of other people. Unfortunately, I have no statistics on the matter, but I have no reason to doubt its accuracy with regard to all interceptors. The number of times interceptors become blocked and clear themselves by the weight of water accumulated in the drain behind them would, I think, astonish us if we had a record of it.

The Necessity for a Fresh-air Inlet.—These are usually fitted with a mica flap to prevent them being foul-air outlets. The mica flap is, in about nine cases out of ten, broken or jambed either open or shut: if the former, it is probably acting as a foul-air outlet; if the latter, there is no ventilation in the drain. It has been suggested that the fresh-air inlet should be carried up high, but then the balance of air in the drain would be equal and the air would be stagnant.

Interceptors as a Source of Foul Smell.—Each interceptor contains from 4 to 10 pints of sewage, which is standing stagnant for a considerable time during each day, and for about eight or nine hours during each night. This is a great deal longer than the time it takes sewage to travel from my borough to the London County Council outfall at Crossness, a distance of about 11 miles, which I calculate is covered in five and a-half hours.

The Interceptor Prevents the Ventilation of the Sewer through the Drains.—I have left this till the last of my reasons for the abolition of the interceptor although I consider it the most important, and now that sewer air has been shown to be less harmful than drain air, I cannot see one reason to urge against the use of the ventilator on the house drain for sewer ventilation. Once I was met with the argument that the sewers were the property of the council and the drains of the individual. This, surely, is absurd. The council does not own the sewers. They only act as the trustees or agents of the individuals, and any money they have to spend on the ventilation of the sewers comes out of the pockets of the ratepayers.

In concluding, I should like to state that in Lewisham our death-rate last year was 11·4 per 1,000—the second lowest in London; and we have held this record for about thirty years to my knowledge, notwithstanding the fact that prior to June, 1901, when the London County Council's by-law making the use of the interceptor compulsory in London came into operation, only about 1 per cent of the drains were intercepted from the sewers, as my late chief and I persistently opposed their use.

Mr. H. Johnson (Wimbledon), at the close of Mr. Van Putten's remarks, said that so far as he was personally concerned he did not wish to deal with the Departmental Committee's report from the bacteriological [illegible] point of view, but having regard to evidence given by Prof. Kenwood in a case heard on the previous Saturday, he thought it would not be long [illegible] would be seriously combated.* In his own district the number of stoppages [illegible] 1·2 per cent., and if that were possible in one district it could be done elsewhere. His view was that the inquiry should not have been held to consider the abolition of the intercepting trap, but to investigate the causes of the abuse of the apparatus and how they could be remedied. He attached no importance to the death-rate in regard to whether the trap was a [illegible] stoppages being only one factor in hundreds that affected the health of a community.

Mr. R. Read (Surveyor to the Corporation), dealing with Mr. van Putten's reference to the late Sir Robert Rawlinson, said he knew that he (Sir Robert), if not opposed to, was very doubtful about the trap, and tried to get an official investigation into it, though without success. The report of the Departmental Committee supported the opinions which he formed between 1879 and 1882 that the trap was useless, did not fulfil the claims made for it, and was a filthy and dangerous obstruction, and the only logical conclusion was the withdrawal of the by-laws compelling its insertion. In the absence of the trap both drains and sewers would be cleaner. The trap was no remedy for a defective or broken drain, and a person could be quite as easily poisoned by his own sewage as by that of other people. A great point was made of the liability of the contents of water-closet traps to evaporate during the absence of householders, but there would then be no one in the house to poison, and surely, in the case of houses let in flats, someone would be left to take care of the property. In the absence of the intercepting trap the ventilation of sewers and drains became simple, and could be easily adjusted and proportioned so that road surface ventilators would always act as inlets, and the soil pipe vent shafts always act as outlets by the combined action of the wind and the flow of sewage. To insure this the inlets at the road level must be small and placed only at the summits of the sewer gradients, because the air current inside the sewers always followed the sewage flow down the gradient, no matter what alternations occurred in the shafts exposed to the wind above the roofs.

Mr. G. Bertram Hayward, Surveyor to the Acton Urban District Council, suggested that if the present [illegible] the question of abolishing or [illegible] the common types of traps in use, instead of the discontinuance of intercepting sewer gases from house drains, there would doubtless be no divided opinion on the subject. A number of statements had recently been brought forward proving that many interceptors have been found choked, but few, if any, had been [illegible] as to the cause of stoppage. This lack of particulars was important, as [illegible] deals, and the results of [illegible] intercepting trap [illegible] ventilation, the case would [illegible] and the [illegible] health bulwark. It was true that experiments had given information, but he ventured to suggest that, owing to different specific gravity and composition, none of the substitutes for human excrement used had given a true example of what takes place in practice. In no case in his experience had a stoppage been found where the trouble could not have been prevented without abolishing sewer-gas interception. Recently it had been stated that a number of blockages had occurred owing to pressure of gas in public sewers forcing out the sweeping eye cap. Another cause of obstruction equally common was improper setting of the trap, or a projection of cement on the invert of the joint between the trap and the pipe. He had found obstructive joints that could only be detected by smashing the traps. As a remedy he suggested that the ordinary trap should be provided with a longer spigot in which there was an inspection eye for cleaning and inspecting the joint at the time of fixing. [illegible] Mr. [illegible] Putten against the intercepting trap, he had only to point to the [illegible]

* In this case [illegible] which had reference to the death of a child in South London, Prof. Kenwood said that there was defective sewer [illegible] and that there was communication between the [illegible] and the sewer. The sewage might find its way into the well, rendering the water [illegible] Ed., Surveyor.

of sewage in the trap; surely in a well-ventilated drain that was preferable to the smells from thousands of gallons of sewage? Other advocates of the "back to the house" movement dealt kindly with the rat, which they described as harmless, useful in scavenging (presumably clean?) sewers, and generally with all the virtues of a drawing-room pet, notwithstanding that rats were known carriers of infection and feeders on filth, who could force their way out of reasonably sound drains when it suited their purpose. In conclusion, he suggested that the present opposition to intercepting sewer gas from house drains, as in the past, was mainly due to those local authorities who wished the public to ventilate their sewers. Sanitary authorities existed for specific purposes and with specific obligations; if their sewers could not be kept free of gas by natural ventilation, then some means of vacuum exhaust should be adopted, preferably with an attachment for cremating foul gases.

Mr. W. Firth (Shoreditch) observed that, with two or three exceptions, none of the witnesses examined by the committee were familiar with domestic sanitation. His own opinion was that people should not be compelled to breathe the air from the sewers.

Mr. W. A. Portman (Tottenham) said that, although there was a general condemnation of the intercepting trap, so far as his judgment went, that portion of the committee's report which gave local authorities option in the matter in framing their by-laws was a very wise one. As to fresh-air inlets, he had always found these, without exception, to be foul-air outlets.

Mr. J. S. E. Clements maintained that if it were properly constructed the intercepting trap was a regulator of public health, and he hoped that it would be a long time before its use was abandoned.

Mr. A. Duck (Woolwich) thought the report left no room for doubt that the trap must go, and that it was incumbent upon them to dismiss it from practice. The liability to blocking had been incontestably proved.

Mr. West (Walthamstow) said that if, as had been urged, the gases from sewers and drains were productive of infectious disease, it was clear that they ought to have had the evidence of the districts which were untrapped. Provincial towns which were untrapped had been shown to be as free from infectious disease as places in which the intercepting trap had been adopted, and the evidence on all hands was that no damage had been done to the people by the disuse of the trap.

Mr. Hampton expressed the view that local circumstances had such an important bearing on the matter that no hard-and-fast rule that public authorities adopted would meet with any general acceptance. The exclusion of rats from the house drains was only a small part of the question, a simple arrangement being sufficient to deal with that part of the problem. Flushes of hot water which came from most houses alone had the effect of keeping out rats, but if the presence of the intercepting trap were suggested as the remedy for this trouble, he did not think a good case had been made out for the trap. The pattern of trap, concluded the speaker, undoubtedly had much to do with the frequency or otherwise of stoppages.

Mr. P. A. Knapett (Lewisham) said he had never seen a property that had required the use of an interceptor. In his district they called the rats "assistant sanitary inspectors" on account of the useful scavenging work which they performed. He had never, however, seen one pass through an interceptor.

The President (Mr. A. J. Martin), in closing the discussion, said he had taken the trouble to look up the word "trap" in the dictionary, and had found that it meant "a snare." (Laughter.) He did not say they were that, but his feeling was that they ought to regard them with a certain amount of suspicion. He looked upon the trap as something in the nature of a charm which, because it was too heavy to hang round their necks, they put on their house drains. (Laughter.) It was important that house drains and sewers should be self-cleansing, but could anyone assert that a contrivance which held back fæcal matter for a whole night conduced to the self-cleansing properties of a sewer or drain? It seemed a weak argument that advocates of the trap should drag in the rat. He had no objection himself to rats in a drain, but bad construction was another thing. He had been dismayed to hear some of their enthusiastic friends asking, now that they had the committee's report, what steps they proposed to take to get people to take out the existing traps. Such a thing was absurd, and

there was certainly nothing in the report to warrant anything of the kind being done. The committee did not say the trap was an evil, but simply a thing which was of no very great use on the whole, and, possibly, better dispensed with. It would be a hardship on a man who wanted to trap off his house to be compelled to omit the apparatus. In a matter such as that he did not think they ought to base any great importance on an investigation which covered so little ground. The report presented to them the evidence of forty engineers and others on the subject, but he insisted that what was required was evidence from people in all parts of the country, and he had suggested that that institute, in conjunction, say, with the Royal Sanitary Institute, should take steps to obtain the opinions of every surveyor and chief sanitary inspector with regard to the question, and issue them in a single volume.

Mr. VAN PUTTEN, in the course of his reply said that the greater number of complaints which were received in Lewisham as to stopped drains were caused by interceptors. It had been said that natural ventilation was non-existent and that ventilation followed the flow. He knew that view was held by Mr. Read, but he differed from it; it was sometimes with and sometimes against the flow.

Mr. READ: In a big sewer?

Mr. VAN PUTTEN: Yes. If interceptors had to be used, why not put the manhole below it—in his opinion the proper position—in order to facilitate clearing out when stoppages occurred?

A vote of thanks was unanimously accorded to Mr. van Putten for his paper, and the proceedings terminated.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

A RECRUITING CAMPAIGN: CIRCULAR TO SURVEYORS.

The following circular has been issued to members of the Institution of Municipal and County Engineers.

DEAR SIR, I am instructed by the council to ask your kind assistance in bringing the claims of the Institution of Municipal and County Engineers before the members of your technical staff, or such of them as may not be connected with the institution. The institution was founded in 1873, and its several grades or classes of membership make the institution open to all engaged upon the technical work of municipal engineering, that is to say, the class of full member is open to all occupying leading positions of staff responsibility; the class of associate member is open to all who fill positions of minor staff responsibility; and the class of student is open to all those filling the junior positions either as pupils, improvers, or other subordinate rank in the offices of municipal and county engineers and surveyors.

Full particulars as to the regulations governing admission to these classes may be found in the by-laws printed on the back of Form "A" application to form sent herewith.

The council would be much obliged if you could assist them in reaching and influencing the members of your technical staff with a view to their enlistment on the roll of the institution, and to this end I am enclosing a form of inquiry which the council trust you may be good enough to fill up in order that a personal communication may be forwarded to those members of your staff who are not yet connected with the institution.

I should add that the aim of the council is to incorporate all eligible persons serving either as chiefs or as engineering assistants upon the roll of this institution, believing that thereby will the professional and personal interests of the members and their usefulness to the authorities they serve, and the offices they fill, be best promoted.

May I respectfully bespeak your personal consideration and your friendly interest and co-operation in this effort to bring before the notice of your technical staff the claims of the institution and the benefits which it is capable of conferring upon those within its ranks?—I am, yours faithfully,

THOMAS COLE,
Secretary.

November 11, 1912.

TOWN PLANNING COMPETITION.

Premiums are offered by the Institution of Municipal and County Engineers for laying out a town as a seaside pleasure resort, with a present residential population of 50,000, and with additional accommodation for 100,000 visitors. Premiums are as follows: To members and associate members of the institution—A first premium of ten guineas, a second premium of seven guineas, a third premium of five guineas; to students of the institution—a first premium of five guineas, a second premium of three guineas.

The conditions of the competition, we are informed by Mr. Thomas Cole, secretary of the institution, are as follows:—

The coast line to be the segment of a circle on a chord 5 miles long, having a centre versed sine above the chord line of 1,800 ft.; the chord line to lay east and west, and the depth of the town from the chord line to have a parallel width of 1½ miles; beach and sea bed has a gradient of 1 in 50; rise and fall of tide is 12 ft., giving 600 ft. horizontal distance between high and low water; the sea wall protecting the front to be set out at a distance of 300 ft. above high-water mark; a low cliff 20 ft. high above parade level exists on its north edge, and the ground on which the town is to be built rises at a regular uniform gradient of 1 in 50; the width of the parade and its adjuncts are left to the discretion of the competitors; at the western extremity of the site is an estuary 200 acres in extent, to be used as a yacht basin and harbour, the centre line through the estuary to form the western boundary of the town; railways to run under the town in shallow subways. Stations to be placed as follows: One, a mile from the sea on the eastern boundary; one, half a mile from the sea near the centre of the town; one, a mile from the sea on the western boundary, with sidings to the quays.

The drawings to be submitted are to comprise—(*a*) A plan showing the whole area as proposed to be laid out by the competitor to a scale of 12 in. to the mile; (*b*) A plan on a double elephant sheet of the centre of the town in more detail to a scale double that of the plan A; (*c*) a double elephant sheet of details of works or features proposed to be introduced; (*d*) a bird's-eye view of the town or a portion of the same as proposed to be laid out, as seen from the sea front. Necessary adjuncts as sewers, tramways, markets, baths, destructor, &c., to be shown.

Competitors in the preparation of their drawings are to bear in mind the possibility of these being reproduced by photography to a smaller scale. Printing and figures should therefore be bold, and scales should be drawn on each sheet. The drawings, except the perspective (*d*), are to be entirely the work of the competitor, and the institution are to have the right to reproduce any of the drawings in their journal or annual volume. The drawings are to be delivered on or before July 10th next, at an address (to be given in a future notice) in the town in which the annual meeting is to be held. Competitors are to mark their drawings with a *nom de plume* or mark, and the word "member" if he is a member or associate member, or "student" if he is a student, and to accompany them with a sealed envelope showing on the outside the mark or *nom de plume* of the competitor, with his name and address in the envelope. The names of the assessors will be announced before the date given for the delivery of the drawings.

EAST MIDLAND DISTRICT COMMITTEE.

The first meeting of the East Midland District Committee of the Institution of Municipal and County Engineers was held on Saturday afternoon last in the Shire Hall, Nottingham.

Mr. E. G. Mawbey, borough engineer and surveyor of Leicester, chairman of the district, was in the chair. Mr. E. Purnell Hooley, the district representative of the council, also being present with nine others, including the hon. secretary, Mr. R. A. MacBrair, Lincoln.

A general discussion took place as to the best means to be taken to promote the interests of the institution in the district. It was decided to approach the various members with regard to holding meetings in their districts, and to make endeavours to hold a meeting in Newark next February, Mr. Hooley's good offices being accepted in the matter. It was proposed to hold an annual district meeting in September or October next, and the names of several towns were suggested to the hon. secretary as likely places for the gathering.

Artificial Stone. A correspondent asks for the name of the makers of a stone composition called "Fluate."

The Concrete Institute.

MR. E. P. WELLS' PRESIDENTIAL ADDRESS.

Mr. E. P. Wells presided on the 14th inst. at the twenty-seventh ordinary general meeting of the Concrete Institute, held in the lecture hall, Denison House, Westminster, S.W., and in the course of the proceedings delivered the following

PRESIDENTIAL ADDRESS.

It affords me very much pleasure, in addressing you for the first time as president of the Concrete Institute, to congratulate you upon the various subjects that have been taken up by the committees during the past year, and also upon the satisfactory state of the institute's membership, which I am pleased to see, is gradually increasing, and it is the hope of the council that before another two or three years are passed the membership will be doubled.

The committees of the institute have a great many subjects at the present time under consideration. The Science Committee, it will be recollected, drafted a Standard Notation for Calculations for Reinforced Concrete, which was subsequently adopted by the Joint Committee on Reinforced Concrete appointed by the Royal Institute of British Architects in their second report, and by the London County Council in their proposed regulations covering the erection of buildings in reinforced concrete in London, while text-books which have been published in London since that date have also followed its recommendations. This, I think, will be felt as a great feather in the cap of this institute.

You are all aware that the scope of the institute has been enlarged—and not before it was wanted—to include structural engineering. The Science Committee has undertaken to compile a Standard Notation for Calculations in Structural Engineering generally. Further effort in the direction of standardisation is being made by the same committee in drafting a standard specification for reinforced concrete work, which at the present time is very badly needed, and also a report on the standardisation of attachments or joints in reinforced concrete. Other subjects of some importance are under investigation—viz., reinforced concrete piles, chemical tests for steel used in reinforced concrete, the adhesion of friction between the concrete and the steel, and the effect of sewage, oils, and fats on concrete. In respect to the last named, it will have been seen that papers are to be given this session on the same subject. These papers will be duly considered by the committee in drafting their report, and it will be in the recollection of many of you that a paper by Mr. Sydney H. Chambers was given in the 1910-11 session on "The Effects of Sewage and Sewage Gases on Portland Cement Concrete," which, you may remember, was also very fully discussed at the time; the full report of the meeting is to be found in the "Proceedings" of that year. This report will also be taken into due account by the committee.

Other committees of this institute have also been very hard at work on other branches of the subject on which standardisation may be advantageously brought to bear; and with regard to this, the institute conducts a Joint Committee on Loads on Highway Bridges upon which the Institution of Municipal and County Engineers and the Institution of Municipal Engineers have representatives. The Joint Committee is now engaged in drafting a report, and no doubt when their work is finished it will prove of distinct service, not only to the Government, but to the municipal authorities throughout the country.

The Tests Standing Committee have the following subjects under consideration, and you will note from the number of the subjects that a great amount of work will be entailed upon this committee in gathering the information which in time will be presented to the members:—

(1) The effect upon steel of the presence of sulphur in aggregate.

(2) The grading of aggregates.

(3) The expansion and deterioration of concrete due to changes of atmospheric temperature.

(4) The effect of the use of calcium chloride on the surface of concrete as affecting reinforcing metal.

(5) The erratic results obtained by the Vicat needle in ascertaining the initial set of cement.

The Reinforced Concrete Practice Standing Committee are investigating:—

(1) Methods of treating the surface of concrete.

(2) Cracks due to the expansion and contraction of reinforced concrete.

A special Investigation Sub-Committee has been formed to investigate failures and accidents in connection with reinforced concrete construction, and also the restrictions placed by the Local Government Board upon the granting of loans to local authorities for the purpose of undertaking work in that material.

The committee which was appointed to consider the widened scope of the Concrete Institute, and whose report in favour of the course of including within its purview the whole field of structural engineering which was adopted by the council, has not been wound up, but will continue to meet as an Improvements Committee.

It will be seen from the programme for next session that the policy is already taking shape by the inclusion of a few papers on subjects not having immediate connection with concrete. The result has been that a greater number of general meetings will be held this session than last, and it is thought that a more interesting programme will be furnished. It may be mentioned that last session only nine general meetings were held, whereas for this year thirteen general meetings and six educational lectures have been arranged. It was decided, on the recommendation of the Improvements Committee, to have such a course of educational lectures annually, and also to hold an examination in structural engineering once a year to test the scientific or technical attainments of applicants for studentship. The first examination will in all probability be held next year, and it is in the right direction as regards increasing the status of members of the institute, because the qualifications for membership have been tightened up, and in due time it is probable an examination will be held for the admission of members, although it is hoped it will never be insisted upon as absolutely necessary to admit an engineer to membership, because there have been and no doubt will be engineers who for various reasons will not or cannot submit themselves for examination, yet who are well qualified and would be worthy members of the institute. At the present time the institute is open to persons who are connected with the manufacture or commercial development of materials and methods of instruction included in the field of structural engineering. Such members are of much value to the institute, and I feel sure it would not be the wish of any one who has the interest of the institute at heart to exclude such persons, although, if the policy of developing the structural engineering side is continued, it may be necessary to give such persons a special classification.

The Concrete Institute has now on the recommendation of its committee the sub-title reading "An Institution for Structural Engineers, Architects," &c. The word "architects" is included because they have to design structures from the engineering standpoint; but also they have to study the artistic side of construction, or the æsthetic treatment of structural materials. That is an aspect which the Concrete Institute has kept in mind, and which it is desirable should continue to receive consideration; but I think it would be as well if the words "Institution of Structural Engineers" were added permanently to the main title of the institute, though this is a matter that will probably come up later on. There are great possibilities in such a development, as there are evidently fine opportunities for such an institution, and, considering that all the users of concrete must necessarily be connected with the theory and design of structures in some form or another, it is only a natural course to pursue on our part.

The work of the institute is now growing very rapidly, and compared with what is being done by other institutions, the subscription is very small indeed. The council, I think, have wisely adopted the decision to require an entrance fee when the membership reaches 1,000, which it is hoped will very soon be the case.

At the present time the council have an insufficiency of funds to enable them to proceed in the direction of experimenting upon the subject of rein-

forced concrete, and until some method is adopted of increasing the revenue this question of experimenting will have to be deferred. The only way that it seems possible to obtain the necessary funds will be to increase the subscription of the home members, but with regard to foreign members they might remain the same as at present. If this were done and the revenue doubled without any large increase of establishment charges, then the council would be able to undertake experiments which would be for the good of all those interested in concrete and structural engineering.

I propose in this my first presidential address to deal almost wholly with the practical side of reinforced concrete construction, as I consider that the more often attention is called to this most important part of the work the better it is for all concerned—for the engineer, the architect, the proprietor, and also the contractor.

PORTLAND CEMENT.

With regard to the first and the principal constituent in concrete—namely, Portland cement—it is strange, at this present day, how many engineers and architects still adhere to the old specification of coarse grinding, consequently requiring aëration of the cement. It has been my lot only this week to come across a specification where it was stated the cement had to be spread on a floor for twenty-one days before being used. Those of us who are well acquainted with the present-day cement, and also its fine grinding, know how deleterious this is when great crushing strength is required. I think I have said, on more than one occasion at this institute, that if cement is to be kept up to its full strength it is absolutely necessary that when it is received on the site of the works it should be stored in airtight wooden bins; and if this is done cement may be kept for many years and be just as good after the lapse of time as it was when freshly made, whereas if the cement be stored in sacks, and even a very small amount of moist air plays upon them, then the cement is rapidly hydrated and cakes in the sack. If, as is often the case, this cement be rubbed through a sieve, it becomes almost absolutely useless for purposes of concrete making—by that I mean good concrete.

I have in my mind's eye a case I had to advise upon. I bought cement in the month of October. The whole winter was a bad one, and he had very little opportunity of using the cement. It was stored in a shed through which the wind could blow freely, and he was rather astonished when the spring came and the cement was found to be solid and set. It was sent to the manufacturers, and when the matter was investigated the true cause of the mischief was found out.

I have myself on many occasions experimented with cement that has been so hydrated, and it is astonishing the enormous reduction in the strength, so much so that it becomes almost useless for making concrete.

Any of you who chooses to make the experiment can do so, and you will find that with the concrete made from an over-hydrated cement the amount of strength obtained will be very little indeed, and that its setting action will be so slow that it will practically take days before it shows much sign of hardening. The only use of such a cement is to mix with an over-calcined cement that is too quick setting; by this means the setting action can be retarded.

AGGREGATES.

Passing from cement, one is led on to the careful choice in all aggregates, the proper grading of the same, and also, what is of more importance, the seeing that everything is absolutely clean and the water pure.

I know it has been said that dirt is of some good in increasing the strength of cement concrete, but the only case that I can find where, over any period, a dirty aggregate increased the strength of the concrete was due to the fact that it had been mixed with a very over-calcined cement. It slowed down its setting action, and by this means did good, but if the test had been carried over a lengthy period, it would have been proved how failacious is the advantage to concrete of dirt in any form.

With regard to aggregates consisting of gravels that are dredged either from the river or from the bed of the ocean, it is very seldom that the mixture is perfect, and sand to coarse material is obtained. There is only one gravel that I know where one can see that the proportion is about correct, and that is obtained from the Thames and along the East Coast there is at the present time a great excess of sand, and under any circumstances I would not in any way recommend that this aggregate should be used without separation of the larger particles from the finer and subsequent crushing of the coarse material.

The difference in the strength of concrete made with an excess of sand is very marked where the proportion of cement is not great—that is to say, 6 to 1 and 7 to 1 concrete, with an excess of sand, show very great falling off in strength, whereas with richer mixtures and an excess of sand, though there is a falling off in the early stages of hardening, after a few years the concrete will almost come up in strength to a concrete made in the correct proportions. Of course, it is well known that for all water work a large proportion of sand is required so as to get a perfectly dense mixture, but in no case must this be overdone.

In concrete for water work it is not necessary to add anything to make it watertight. If concrete be properly made it will be absolutely impervious to moisture, and if it be found necessary to reduce the labour some of these compounds of hydrated lime are, no doubt, of utility in decreasing porosity, but, at the same time, concrete so made is not improved in strength.

Before leaving the subject of aggregates I wish to call particular attention, as I have done here on more than one occasion, to the use of Fletton bricks for concrete. I have found lately that wherever Fletton bricks have been used disruption has taken place in the concrete, and I think this is due to the presence of lime in the bricks. Fletton bricks that are dangerous to use are those with purple markings, and great care should be exercised by all those who propose to use brick aggregate for concrete work to eliminate absolutely Fletton bricks in any form whatever. In this I am borne out by several who have been unfortunate enough to use the bricks, the result being that the concrete has failed.

I was called in only a few months ago to a special floor that had been put down for testing bowls, when it was found that about a month after the floor had been laid it was becoming uneven in places. On examination it was found that in every case where the floor had risen Fletton bricks in the aggregate were the cause of the mischief.

MAKING OF CONCRETE.

It is always advisable in the making of concrete that it should be got into the work as quickly as possible, especially in the summer; with low temperatures it is not of such great importance, as the cold slows the setting action and also its hardening. In frosty weather the drier the concrete and the more ramming, so long as there is no chance of displacing any of the reinforcing, the better for the concrete, as it will set very much more rapidly than if there is an excess of moisture.

With regard to reinforced work it is far better that the concrete should have a slight excess of water than a deficiency. Certain experiences that I have had lately have shown that where steel has been put into concrete that was too dry, the air and moisture had got through the porous concrete to the steel and caused rapid corrosion.

In one case the bottom layer of concrete had been put in and allowed to set, the steel was placed on the dry concrete, and other dry concrete was placed on top. When this work was broken up it was found that the rods in the concrete were quite loose, could be turned round by hand, and the adhesion between the two layers of concrete was anything but good. Now, had the concrete been made wet, there would have been no separation between the steel and the concrete, it would not have been possible to twist the steel rods round in the concrete, neither would moisture have passed through the concrete to the steel and caused oxydisation after the alkaline salts had disappeared by age owing to the presence of air and moisture.

Excess of moisture, as we all know, decreases the crushing strength of the concrete; but at the same time in nearly all structures there is generally such an excess of concrete in the compression member, especially where T-headed beams are used, that it is better to have the steel perfectly protected with a slightly weaker concrete than to have imperfect protection with a stronger concrete, as then the steel protected corrosion will be almost bound to take place, with consequent disruption of the concrete.

Excessive ramming in concrete is not at all necessary where it is made wet. It is far better to employ very light ramming and use that five pounds of

concrete are brought to the surface of the shuttering boards by means of steel slices or trowels. If this be done there will be very little danger of air finding its way through into the steel reinforcing, but a coarse aggregate first put in with an insufficiency of sand is almost always certain to have some porous parts through which the air and sulphur, especially in a London atmosphere, can attack the steel.

EXPERIMENTAL CUBES.

It may be well here to call attention to what I consider to be a most important point in reinforced concrete construction namely, that as the concrete is being put into the work test cubes should be made both for ascertaining the strength of the concrete *in situ* and exposed to the ordinary atmospheric conditions, and also to ascertain in the laboratory the strength of a series of cubes made at the same time and kept under laboratory conditions. One set of cubes should be kept on the works exposed to the varying atmospheric conditions, and the other at the laboratory at the normal temperature, say, of 60 deg. Fahr.

Some years ago I made an experiment to see whether cold had any effect on concrete, and if so, to what extent. I found that in the month of December, when the cubes were taken from about 60 deg. Fahr. and placed on a roof where the temperature fell to below freezing-point, a most alarming decrease took place in the crushing resistance of the concrete, and this remained so until such time as the weather became warmer, when the crushing resistance went up and was practically the same as shown by cubes made to the same gauging, but kept under normal conditions.

This clearly shows that if a building is constructed in cold weather the crushing resistance of the concrete cubes kept on the works will be low, but if it be found that the other set of test cubes, kept under laboratory conditions, shows a rapid increase in the strength, then it is only fair to assume that the concrete that has been exposed to the cold air will, with favourable conditions, increase in strength and attain the same strength as the laboratory experiments.

The reason I am calling particular attention to this point is that if a building is constructed in the winter and the test loads are applied up to 50 per cent in excess while the weather is cold, there may possibly be an excessive amount of deflection, owing to the fact that the strength of the concrete in compression is low, whereas if the experiment were held over until the warmer weather, when the compressive strength of the concrete was largely increased, then the deflection would be practically nothing—of course, assuming that the work in the first instance had been properly designed.

If the work is properly designed, and if the supervision has been strict and the work has been carried out according to the drawings, it is fair entirely to dispense with the testing of the structure so long as the experimental cubes show that the concrete has attained the strength required by the engineer or architect.

It is rather foolish to test a structure when one knows by experience that the crushing resistance, owing to the cold, is low. It would be far better to wait until the weather had become warmer and the concrete had parted with a lot of its moisture, when it would have become much harder. On the contrary, if it is found that the laboratory tests are low, say, for the sake of example, one month after being made, then I should strongly recommend testing the structure to ascertain whether there were anything seriously at fault. Having those conditions of a low laboratory test and a much lower or otherwise the structure not exhibiting any serious deflection, then the work may be passed; but still it is advisable in all cases to watch the crushing experiments, as upon these depends almost entirely the strength of the structure. A good crushing resistance means that the concrete is strong in tension, strong in adhesion, and strong in shear, and, such being so, there is very little danger of the structure failing owing to the deficiency of steel.

TESTING.

The testing of floors and other work is, as a rule, carried out on much too small a scale. Testing should be spread over an area that will at least take in always two sets of secondary beams as well as two spans of main beams completely. By this method of testing the beams always have their full load and the adjoining beams become indicated, which gives the most severe form of test, unless, of course, continuous deflections be carried out.

My experience has taught me that where concrete is good, that is to say, mixtures of 5 to 1 and richer, with the ordinary normal loading for which the structure was designed, unless most delicate instruments be used there will be no deflection recorded, whereas when weak concretes are used—namely, 6 to 1 and under—then the deflection at times becomes very great.

In all cases, in making deflection tests, they should be made not only at the centre of the span, but also at the walls, as very often it is found that a large amount of the so-called deflection is due entirely to the squeezing of the brickwork, owing to the fact that the reaction has not been spread over a sufficient area of brickwork. In no case ought the load on the brickwork to exceed 8 tons per square foot, by this means a good distribution is obtained and the brick walls are strengthened thereby.

CAUSES OF FAILURE.

In a great many works that I have seen where failures have taken place, the failures have been very largely attributable to shuttering and strutting. I have in mind cases of beams deflecting 2 in. or 3 in. after the concrete has been filled into the mould, this being due entirely to the strutting sinking into the soft ground underneath. In several cases this has caused what appeared like shear cracks at each abutment, though the work afterwards stood the test load satisfactorily. Still, such cracks made the beam look unsightly, and there could not have been the same adhesion between the concrete and steel, owing to this settlement, as if the boxes had remained perfectly true and level during the whole time the concrete was being put in and until the same were struck.

I know of one case of a failure taking place entirely owing to the strutting sinking into the ground, the sinking taking place over more than a week. The concrete, therefore, never had the least chance of getting a fair adhesion to the steel, but was constantly being drawn away from it by this settlement of the strutting, so much so that when the strutting was removed the whole structure came down with a run.

It is always advisable, if there is any doubt at all about the ground, to have the latter tested beforehand, and it is far better to increase the sole-plates to double the size required, so as to prevent any possible chance of settlement, than to have an insufficient area, with consequent settlement and trouble taking place.

Not only does the settlement cause a reverse camber of the beam, but it also gives a fall in the floors the wrong way, and it needs extra expense all round to make good such defective work.

All these are points that are easily obviated by the simple means of closely watching the work as it proceeds, and not allowing any concrete to be put in until the engineer or his representative is satisfied that the strutting is of such a nature that settlement is not likely to take place.

Strutting should always remain up as long as possible after the concrete has been placed in position; in fact, if it were not for the exigencies of trade, and also the rapidity with which building works of the present day have to be erected, I should personally like to see all strutting remain up for very much longer periods than is generally allowed, because the harder concrete can get before removal and any weight can get thrown upon it, the better it is for the structure as a whole. Unfortunately, in the present day the question of expense has to be very largely considered, and to allow strutting to remain up as long as one would like it would increase in a great many cases the cost of the work, and I am afraid it would become almost prohibitive. Of course, in cold weather strutting must be left up for periods 50 per cent longer than is allowed in the summer time, and a great many of the failures in this country, and more especially in America, are mainly traceable to the removal of the shuttering and strutting at too early a period in the life of the concrete. The concrete at the time of striking was weak, but had an extra fortnight or more been allowed for the hardening, then the works that have failed would no doubt have stood up.

DANGER OF GYPSUM.

Before finishing with concrete making I would like to refer to water to be used therein. In this country, as a rule, water is almost invariably obtained from what is called a domestic source—namely, water supplied by large public companies who are extremely careful in what is sold to the public. Such being so, it is very rarely in England that one has to use water that does not come from the public supply; but there

are cases where it is advisable carefully to examine the same before it is used. There are some places where the water is highly charged with gypsum compounds, and such being the case, it behoves one to see that there is no likelihood of failure taking place owing to an excess of this compound.

In the South of France, in Algeria, and in a great many districts waters are highly charged with gypsum, and so bad is this in places that concrete is absolutely dissolved and disrupted in less than two or three years. Whenever there is any doubt as to the quality of the water to be employed an analysis should be made beforehand, and so prevent what might lead to a disaster.

STEELWORK.

One of the great defects with regard to reinforced concrete is constantly raised by those who have not had much to do with the subject and often by those who are largely connected with it—namely, the difficulty of getting steelwork placed in the position designed by the engineer. It is a difficult matter always to get the work placed in the designed position, owing to the carelessness of the British workman, whose idea seems to be to get the material into position as quickly as possible, no matter whether it be right or wrong, and in a great many cases if he has an opportunity of leaving the steel out he will do so. The only way to get over this difficulty is not to allow any concrete to be filled or poured in until the steelwork had been passed by the engineer or his representative. If this be done there will be very little danger to be apprehended, because if the steel is in the correct position, if the concrete is proved to be as good, as borne out by the *in situ* tests and by the laboratory tests, and if the strutting has not given way, then one may fairly assume that the work has been well carried out and will sustain all the loads for which it is designed, and that there will be no deflection, or else of such a slight nature that it is not worth troubling about. If, however, the steel be badly placed, the concrete be poor, and the strutting has failed, then there is no knowing what is going to be the result.

In a great many years of practical experience I have come to this conclusion, that even if there is a large deficiency of steel in the structure both in tension and in compression, and the concrete is of an excellent quality, there is hardly any chance of failure taking place, but if the steel is up to and even in excess of the requirements asked for, and by any chance the concrete be poor, then if an excessive load be placed upon the structure, there is nothing to prevent it failing. As I have stated before, a rich concrete is strong in crushing, tension, adhesion and shear, whereas with poor concrete exactly the reverse is the case.

A series of experiments that I carried out some years ago of some beams gave for thirty-three days test a factor of safety of 5¼ to 1; in three years the factor was over 9 to 1. The whole of this was due entirely to a very good concrete which was absolutely homogeneous throughout, and when the beams broke they failed only at the centre, the only place where cracks developed. There was no sign of shear and the diameters of the rods where the failure took place were, to all intents and purposes, the same diameters as when they were put in. These experiments, I think, simply show an enormous increase in the lever arm, due to the rich concrete; in fact, in the case I now mention the lever arm was practically the total depth from the axis of the tension members to the outside of the compression member of the beam. But even this will not account wholly for the enormous load that the beams carried, as the tests produced extraordinary stresses both in the steel and also in the concrete itself.

EDUCATION OF WORKMEN.

A great deal has been done by the London County Council School of Building in educating clerks of the works and others as to the methods in which the practical part of reinforced concrete construction should be carried out. They ought to go a little lower and take in hand the men who are connected with the carrying out of the work because until such time as they themselves understand, to even a very slight extent, what is required of them, so long will they be careless in doing the work they have to do.

The foremen employed must be instructed to keep a sharp lookout on all their men and not to allow laxity in any shape or form. If the men know that the foreman is up to all their so-called tricks of the trade, then they will take good care that the work is carried out in an efficient manner, but if by any chance the foreman is careless his workmen will be the same; and it will, I think, very often be found that where anything serious takes place it is not only the men, but the foremen, and even the clerk of the works on the job, who are answerable for this state of affairs.

Any foreman who persistently makes mistakes in the carrying out of the work, after the same has been pointed out to him, should be dismissed and not allowed to undertake any work of the kind in the future. It is only by making examples of men who do bad work that one can expect an improvement to take place in the industry in this country. Works executed abroad, as a rule, are carried out by men who seem to take a great interest in their work. Even the ordinary labourer knows what he has to do and does it, whereas in this country there are so many instances of scamping, not only in reinforced work, but also in other branches of structural engineering, that it is only strict supervision in the past that practically made our work some of the best in the world, though I have very clear remembrances before me of seeing wooden rivets and other such things being used, and I daresay there are many in this room who have seen likewise. We do not hear of wood being put in for steel in reinforced concrete—that is to say, by the designer—but many accidents have proved that wood has been put in and has been the cause of the mischief.

ELECTROLYSIS.

A point that was investigated by the Science Committee some time ago was one which it is advisable, I think, for me to call attention to, and that is, electrolysis. I have watched one work where this mischief occurred, and only about a couple of months ago I made a further examination, and found that the mischief was still increasing. It is a moot point with some as to whether there is any electrolytic action or not, but personally I have very little doubt upon the subject, so that it behoves all designers and contractors to see that there is no possible chance of electric currents finding their way into the steel reinforcing, because, should they do so, I do not think there is any doubt whatever that it will mean the eventual disruption of the concrete. It only requires the exercise of care to put a stop to this and to be perfectly certain that all cables throughout the reinforced concrete work are properly insulated, and that there are no stray currents wandering about the work.

MATHEMATICS *v.* COMMON SENSE.

I think a great many of my hearers will agree with me in regard to the calculations of reinforced concrete work that a great deal too much mathematics has been imported into the subject, and that common sense has had to take a back seat.

If we were dealing with two materials, both of which were absolutely constant—that is to say, the concrete constant within a month after it was made in strength as the steel is immediately after it is rolled—then it would be possible to go in for mathematical formulæ of a high order; but where you have a material—*i.e.*, concrete—the strength of which, if all portions are good, is increasing day by day, and in some cases attaining a strength of three, four, or more times that which it was originally calculated for, how is it possible in these ways to formulate any formulæ which are even moderately correct? It is far better to use more common sense and simplify or formulate empirical rules which you know are absolutely safe in their application. It is no good trying to extract the square root of two—it is useless. I have seen cases where the stresses have been worked out to five places of decimals, and it could all have been done by mental arithmetic, and the result would have been so close that it was really not worth while troubling about.

I see cases constantly where rods are put into work varied in diameter to 32nds of an inch. That is not at all necessary. It wastes time on the work, and in a great many cases a wrong rod goes into the wrong place. It is far better to adhere in all cases to commercial sizes, never advancing beyond 16ths of an inch, and, if possible, advancing only by ⅛ths, as by that means the size of the rod is clear to the naked eye, and does not require a caliper to be put upon it to find out whether it is 21-32nds or 22-32nds of an inch. Such reinforcements as these simply show how designers lack common sense and bring the work into discredit. Exactly the same thing takes place with calculations submitted for approval. A mass of figures will be carried out into millions where the whole lot can be simplified by reduction

... or hundreds, and the elimination of anything beyond two places of decimals. The simpler calculations are made, the less liability there is of errors creeping in, and if an error does creep in then, it is much easier to discover: but where a whole foolscap page of figures is used to arrive at a result, it means in a great many cases simply courting disaster, as well as being also a waste of time and expense with a view to possibly saving a pennyworth of steel.

I have always been a great enemy to the complicated calculations, as I do not think they are at all necessary. It only brings to mind the largest building that has even been constructed in London. I am now speaking of as long ago as about five-and-twenty years. In an arch rib there was a deficiency in the centre of the span of, I think, ¼ in. in a large sectional area of steel. To make up this deficiency in compression a bar 2 in. by ¼ in. was riveted on, and this only for a length of 2 ft. or 3 ft., thus making mathematics simply an absurdity, whereas no common-sense engineer would for the sake of ¼ in. in 100 sq. in. ever think of doing anything so absurd.

The same applies to reinforced concrete. It is far better to work in all cases to commercial sizes of rods, even if there be a slight deficiency in sectional area, than to put in multiples of rods of all diameter so as to make up a given sectional area. This entails an enormous amount of work, not only upon the designer, but also upon the foreman who has to take charge of the work, and upon everybody connected therewith, and it is of no practical value whatever. Therefore I should like to see in all rules made for reinforced concrete that common sense should enter more largely into the formulæ that are given to the world, and not a mass of mathematics provided, which the authors know perfectly well are even then empirical, because one material is a constant and the other is an inconstant.

INVESTIGATION OF FAILURES.

The committees of the Concrete Institute have been seriously considering for a long time past the question of failures, and there is no doubt that if one could get at the whole facts of the cases with regard to failures they would be most instructive. As a rule, every work that fails has been kept in the background, for fear that the contractor or somebody in connection therewith would suffer either from the commercial point of view or the professional. It will be found, I think, as a rule, that the causes of failure are ones that can easily be allocated with the exercise of a little common sense and supervision. It is, as a rule, due to great carelessness on the part of foremen and workmen employed that the failures take place. Therefore it is advisable in all cases that the principal causes of failures should be known, in order that specifications may be made so rigid that there is little likelihood of these mishaps. It is the fear of failure that debars to a certain extent reinforced concrete from being used by many clients, and therefore it should be the object of all concerned with this matter, from a professional as well as from a commercial standpoint, to see that such care be exercised in the whole of the work, both as to designing, checking and construction that no one, for one single instant, should have any doubt but that reinforced concrete is for certain classes of work the best that can be employed.

It is no good for instance if a failure takes place ... to send it privately to a bad aggregate, to keep the same a secret, because it means that others possibly in the same neighbourhood go on constructing work therewith and with the possible chance that failure will also occur, whereas had the fact of the failure been generally known there is not much likelihood that a second disaster in the same locality would occur from the same cause. So that I make a contention against [illegible] to-night and to all who may read the evidence [illegible] whenever a failure in reinforced concrete takes place they will at once communicate with the Concrete Institute and let them have the facts of the case, not necessarily for publication, but to enable the institute so to word their suggested specification as to guard against a possible accident taking place in the future.

It is only by failure that we are enlightened. All through life it is the same way, and we only learn and remember our alphabet at school by making mistakes and being punished for such mistakes so that we understand. So it is in a minor degree with the subject I am speaking to you about to-night: the elucidation of a failure may be the means in the long run of saving an enormous amount of money.

[illegible] I have trespassed on your time more than I intended, but I trust that the matter of this address is one that we all have at heart; and if it is the means of causing work generally throughout the country to be carried out in a better manner than a lot has been done in the past, then it will be of some avail.

VOTE OF THANKS.

Mr. H. Percy Boulnois, M.Inst.C.E., chairman of council of the Royal Sanitary Institute, vice-president of the Concrete Institute, in proposing a vote of thanks to the president, said that in dealing with reinforced concrete work all knew how absolutely important it was that every man should be doing his best in putting in the concrete, and should not shirk his work, otherwise disaster would follow. Materials could be standardised, but, unfortunately, one could not standardise men, and the personal element of the men came into the work enormously. The best design might be ruined by bad workmanship.

Mr. C. S. Meik, M.Inst.C.E., vice-president of the institute, who seconded the vote of thanks, expressed the opinion that, unless one could get good workmanship, one could not get good work in reinforced concrete. For all such work the men should be specially trained, and one should make sure that there was not a man among them who had been accustomed to make concrete as it used to be made. The old-fashioned method of making concrete was, of course, quite out of place when dealing with materials like reinforced concrete, and the labourer who had been used to the old style could not be made to do good work in the new style. He emphasised the necessity of making test cubes when doing important work. Such cubes made as the work was going on were of great value afterwards should anything happen to the work. If a failure took place, for instance, during testing, it could be found out by reference to the cubes made on that particular day whether the failure was due to the cement or to bad workmanship, and the engineer's mind would be relieved to a great extent when it was found the cement was not at fault.

Mr. E. Fiander Etchells, F.Phys.Soc., M.Math.A., A.M.I.Mech.E., in supporting the vote of thanks, said the institute might congratulate itself on the fact that its standard notation for calculation in reinforced concrete had been adopted both in schools and in books, as well as by official authorities and technical institutions to the exclusion of all counter proposals, and if the same success followed the application of those principles to the formulæ of structural engineering generally, then the Concrete Institute would have done something to benefit the next generation. The president had referred to the sub-title of the institute —namely, "An Institution for Structural Engineers, Architects, &c." He would like it to be more than that he would like it to be truer to the facts and make it "*The* Institution for Structural Engineers and Architects," because it was the institution *par excellence* for them. There was no other institution in this country which combined architects and engineers in one corporate body, though there might be in Austria and in Germany. In doing that, he suggested that the David of the Concrete Institute was not in any way challenging the Goliath of the Institution of Civil Engineers, for the civil engineers had a far wider aim than structural engineering only; they claimed practically the whole of civil engineering. Structural engineering was just a branch, and the man who thought that civil engineering was synonymous with structural engineering was a man who held a view of civil engineering which was far too narrow for the council of the Institution of Civil Engineers.

Twenty-nine new members were elected, and three new students were admitted during the meeting reported above, bringing the total membership of the institute up to 938.

Public Slipper Baths. — The borough engineer of Chelmsford, Mr. P. T. Harrison, would be glad to hear of other towns with a population of 20,000 to 30,000 in which public slipper baths have been erected.

Trackless Trolley System at Leeds.—Mr. J. B. Hamilton, general manager of the Leeds tramways, stated last week that the trackless system had proved eminently satisfactory, both from the point of view of the public and the corporation, and proof that the latter were satisfied was to be found in the fact that this year application was being made to Parliament for powers to extend the system over several miles of road.

"CAMARCO" ON THE BATH ROAD.

At the invitation of the Canadian Mineral Rubber Company, Limited, of 32 Victoria-street, Westminster we inspected a day or two ago a section of the Bath Road near Reading, which has been made up with their material "Camarco," and have pleasure in testifying to the excellence of the paving. The road was laid by the Berkshire County Council during the first week of July, 1912, and has therefore been under traffic for more than four months. It is scarcely necessary to say, moreover, that traffic on the Bath Road is by no means light.

Laying Top Coat of "Camarco" Coated Slag.

The "Camarco" paving which we saw appeared to be in perfect condition. It showed the uniform smoothness typical of the natural asphalts, but was neither too hard nor too slippery. There seems to be plenty of grip to the pavement for horses' hoofs, yet the surface is ideally smooth and resilient to the fast travelling motor car. The road looks as if it will be good for a life of four or five years with little or no maintenance, and we are informed that the super. yard cost of the work was by no means excessive.

The method employed in making up this area was machine mixing the aggregate and the bitumen; laying and spreading on the road to the required thickness, and consolidating by a steam roller. The machine employed was the well-known Acme rotary mixer, supplied by Durable Roads, Limited, and the coating of the metal was done expeditiously and uniformly. The aggregate employed was slag of three sizes, viz., 2½-in., 1½-in., and 1-in.

When the coated metal was consolidated, a coating coat of pure "Camarco" was brushed on "painted" over, and ¼-in. granite chippings were then spread and rolled in, in the usual manner.

"Camarco" is based upon gilsonite, among the purest of natural bitumens. It is highly elastic, and also very adhesive, has no elements soluble in water, and has no volatile constituents. Moreover, it maintains its excellent binding qualities without deterioration, both throughout the hottest summer and the coldest winter possible in the United Kingdom.

The points we specially noted in the "Camarco" paving we are describing are— (1) The successful alliance of a cheap road metal and a high-class natural bitumen, and (2) a method of road making which can, with ordinary precautions, be carried out during autumn and winter without undue risk. We have no hesitation in recommending an inspection of the paving, and we understand that the proprietors of "Camarco" will welcome any inquiries as to the exact site of their Berkshire road and as to any further details of the construction.

"Camarco" is comparatively new to this country, but, under the name of "Pioneer," it has been known to surveyors for upwards of fifteen years in Canada and the United States, and, we understand, has a record for lasting qualities second to none. Among many places where it has been successfully used are the parks in Chicago, and we observe in a recent number of our contemporary *The Motor* that Mr. Rees-Jeffreys, secretary of the Road Board, speaks in the highest terms of these paving roads.

Finished "Camarco" Road.

Messrs. Tuke & Bell, Limited.—We understand that, in consequence of the increase of the business of these well-known sewage specialists, it has become necessary to introduce further capital, and the most convenient way of effecting this is by a reconstruction of the present company, and a transference of its assets and liabilities to a new and larger organisation, formed for the purpose, and to bear the same name. The new company will have a nominal capital of £20,000, instead of the £3,000 which is the nominal capital of the present company. The reconstruction involves the liquidation of the present company, but the proceeding is merely formal and the accounts of the company will be paid, as usual, in the ordinary course of business at the offices, 69 Leadenhall-street, London, E.C.

Bridge Building.—Students, young engineers, and surveyors will find much useful information in "Preliminary Studies in Bridge Building," by Reginald Ryves, Assoc.M.Inst.C.E. (London: St. Bride's Press, Limited, 24 Bride-lane, E.C. Price 2s. nett.) The book is described as the "first of a series of small volumes, each complete in itself, dealing with the design of ordinary highway bridges of moderate span." Though highway bridges alone are considered in the matter contained in this volume is largely applicable to railway bridges, aqueducts, and similar engineering undertakings. The five primary types of bridges are described, and the conditions determining the best site for each of the three types of streams are discussed in detail; while, in connection with wandering streams various modes of designing abutments or approach spans are dealt with. Improvements of fords and the effect of eccentric loading of vehicles on the girder loads are among the numerous other items touched on. *Scotsman.*

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

Mr. Frank Nicholson, of Dornoch, has selected the following books in respect of the premium for October, which was awarded to him:—

"Principles of Reinforced Concrete Construction," by Turneaure and Maurer (Chapman).

"Town Planning," by Inigo Triggs (Methuen).

These have been duly forwarded to him.

QUESTIONS.

This week answers are invited to the following questions:—

285. Building Construction.—Explain, with sketches where necessary, the meaning of the following terms: (*a*) Larrying, (*b*) pugging, (*c*) gib and cotter joint, (*d*) lead soakers. ("Pupil.")

286. Hydraulics.—A hemispherical cistern is 20 ft. in diameter, and it is full of water. How long will it take to lower the depth of the water 5 ft. if the water escapes through a 3-in. diameter sharp-edged hole in the bottom of the cistern? The coefficient of discharge for the hole is 0·60. (H. V. O., *West Bromwich.*)

287. Street Gulley.—Will some reader kindly supply a sketch of some form of street gulley, the grid of which is on the face of the kerb and not in the channel of the roadway? ("Anxious.")

288. Mechanics.—Explain clearly the distinction between a vector, a scalar, and a vector quantity. ("Beginner.")

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

283. Strength of Materials.—What is meant by the following terms: (*a*) Modulus of elasticity, (*b*) elastic limit, (*c*) permanent set, (*d*) plastic elongation, (*e*) ultimate elongation, (*f*) contraction of area? ("Inquirer.")

The modulus of elasticity, or Young's modulus, of a material, is the ratio of the stress per unit area to the strain per unit length, when the material is deformed under the action of a direct tensile or compressive force.

In some materials, as wrought iron or steel, the modulus is a constant quantity for stresses which are caused by what may be termed working loads; in cast iron this is nearly, but not quite, true, but in a material such as concrete it varies considerably. In the latter case the actual stress at which the modulus is calculated should be specified, though for calculations in connection with reinforced concrete design a modulus is assumed which is a fair average for the range of stress acting.

Perhaps the best method of defining the terms is to consider a specimen of a material such as wrought iron or steel when tested to destruction by tension, and assume that means are available for registering the stresses and extensions at any instant.

As the load on the specimen is gradually increased, the extensions will increase proportionally, so that the ratio stress/strain will be constant for this period of loading.

At a point which can only be determined by the most accurate observations, the strains commence to increase faster, proportionally, than the stresses.

The stress at the point is known as the "elastic limit," and for all lesser stresses the ratio stress/strain is constant.

As the load is further increased a sudden and perceptible give or yield takes place almost immediately, the stress at that point being known as the "yield point."

If the load is removed at any time before the yield point is reached the bar will regain its original length, but after the yield point has been passed removal of the load shows a permanent lengthening of the bar, this being called "permanent set."

On further loading, elongation continues, the strains increasing at an accelerating rate with greater stresses. This is a "plastic elongation," and depends somewhat on the rate of loading, as the whole extension does not occur immediately on the addition of more load, a slow creeping or plastic flow following for some time without further additional load.

This state of plastic elongation becomes more and more marked, till eventually, near the maximum load, the material becomes almost perfectly plastic, and will extend greatly for a slight increase of load. This extension becomes confined to one portion of the bar, which draws out into a waist, and fracture occurs.

The "ultimate elongation" is the increase in length after fracture, and as it is measured as a percentage of the original length, that length should be stated, owing to the elongation not being uniform over different portions of the bar.

As the volume of the bar remains practically constant, there is a reduction in area, which is chiefly localised at the waist. The contraction of area is usually expressed as a percentage of the original area, which should be specified.

The ultimate breaking stress is always reckoned by dividing the maximum load by the original area, though owing to contraction of area the actual maximum stress is greater.

As an example, a wrought iron specimen, 8-in. long, 1-in. diameter, which broke at a stress of 24 tons per sq.-in., might be expected to have an elastic limit and yield point at about 16 tons per sq.-in., an ultimate elongation of 20 per cent. and contraction of area of 40 per cent. The modulus of elasticity is about 12,500 tons per sq.-in. (H. E. L., *Islington.*)

(*a*) By Hooke's Law, stress varies as strain, *i.e.*, $\frac{\text{stress}}{\text{strain}}$ = a constant. This constant is usually denoted by E, and is called the modulus or co-efficient of elasticity; or E is the stress required to produce unit strain in a bar of unit cross-section area.

But strain is measured by $\frac{\text{increase in length}}{\text{original length}}$

$\therefore$ Unit strain $= \frac{\text{length}}{\text{length}}$ — *i.e.*, the length of the bar is doubled to produce unit strain.

$\therefore$ E is the stress which will be induced in *elastically* straining a bar of unit cross-section area to double its length.

For good steel, E = 30,000,000 lb. per square inch.

(*b* and *c*) When an increasing straining action is applied to a material such as steel elongation or strain is produced. Up to a certain point, if the load be removed the strain disappears; the material is acting elastically; beyond this point, if the load be removed the strain remains, and a *permanent set* is said to have been produced.

(*c*) The greatest load which a material can stand without permanent set is termed the elastic limit of that material.

(*d*) Plastic elongation is the elongation produced during the plastic stage or beyond the elastic limit, and bears no direct relation to the stress, but is much greater than the elastic elongation for a given *increase* in load.

(*e*) The ultimate elongation of a material is the total increase in length of a given specimen when stressed to breaking.

(*f*) When a specimen is tested in tension, the elongation is accompanied by contraction in cross-

sectional area, because the volume remains constant. This is negligible within the elastic stage, but is considerable beyond the elastic limit. The contraction is uniform throughout the whole length up to the "yield point," when the specimen forms a "neck" over a short portion of its length, and at breaking the diameter at the fracture may be only one-half of the original diameter. (H. V. O., *West Bromwich.*)

284. Wood Paving. What are the comparative advantages and disadvantages of soft and hard wood for street paving? ("Suburban.")

It is exceedingly difficult to arrive at any comparative merits and demerits of hard and soft woods for street paving, as unless the various types of wood are laid under exactly similar conditions entirely erroneous conclusions may be arrived at. Various circumstances contribute to the satisfactory condition —or otherwise— of a street paving. Such circumstances are: Sufficient foundation, as after all the strength of a road is the strength of its foundation; careful selection of materials; gradient; care in laying; due attention given to repairs; situation of the street; systematic cleansing; the amount of traffic. All these factors being taken into account, and having found two sections of hard and soft wood paving in use under exactly similar conditions, it is then fair to make a comparison between the two types.

As soft wood is mentioned in the question first, let us take it first. Soft wood is taken to include red and white deal, pitch-pine and spruce. Many other woods are classed as soft woods, but these are the chief, and red deal is the more commonly used. To take the advantages first. First cost is lower, being about 12s. per square yard laid; it wears evenly, the spreading of the fibres where one block butts on another filling any depression at the joint; the grit used to give foothold in wet weather is more easily pressed into the wood without damage to the fibre, and so is not merely swept into the gutters by the traffic. The disadvantages are: Soft wood is more pervious than hard wood, and consequently is less sanitary than hard wood. This objection, however, is lessened, if not completely disposed of, by treating the blocks under pressure with creosote or other waterproofing material. The life of soft wood is shorter than hard wood —on the average about eight years. The annual maintenance is higher, being from 1s. to 1s. 6d. per square yard. Cost of cleaning is also higher, owing to the greater tendency of mud and fæcal matter to adhere to the surface, annual cost of cleaning per square yard being about 3d.

Hard woods, for the purpose of street paving, usually refer to the Australian woods karri and jarrah. Other varieties have been used and termed hard woods, but the two mentioned above are the most important. The advantages of hard woods are: The life is longer than soft woods, being about fourteen years; the wood is practically impervious to moisture, so being more sanitary and more suitable for roads where the centre is liable to be used as a cab-rank; there not being such a demand for hard woods of the type used for paving as there is for deals, there is more likelihood of obtaining sound heart wood, and so a sounder material; the annual cost of maintenance is lower than for soft woods, being from 10d. to 1s. 3d. per square yard; cost of cleansing is also lower, owing to the harder skin, and is from 2d. per square yard per annum. The disadvantages of hard woods are: The first cost is higher, being from 15s. to 17s. 6d. per square yard laid; owing to the hardness of the wood the edges of the blocks are apt to break off under the action of the traffic, and the grain not spreading, after the nature of soft woods, the surface of the paving becomes ribbed, and presents an appearance like corduroy, a surface of this nature being most unsatisfactory, especially for fast-moving traffic; the surface also tends to become more slippery.

The question may be summarised thus —

Advantages: —

Hard wood: Longer life, more sanitary, less upkeep, less for scavenging.

Soft wood: Low first cost, wears more evenly, less slippery.

Disadvantages: —

Hard wood: Higher first cost, wears less evenly, more slippery.

Soft wood: Shorter life, less sanitary, more upkeep, more for scavenging.

("E.C.I.R.P.")

The advantages of hard woods such as oak, blackbutt and jarrah, for street paving, are their long life under heavy wear of traffic, about fifteen to twenty years, which is 25 per cent longer than soft woods under the same conditions. It does not always require creosoting.

The disadvantages, however, being that they shrink, and large cracks are formed in summer weather, unless well watered, or by the seaside where the action of the salt air keeps them moist.

Hard wood wears very unevenly, for it is impossible to get all the blocks of the same density, or evenly graded, for the wood taken from the top of a tree is less dense than that at the bottom, and after about eight years of hard wear the surface becomes very corrugated, and holes 2 to 3 ft. in diameter are formed.

Soft woods, as red pine and yellow deal, well seasoned and creosoted, form a very good paving.

Creosoting lengthens the life of the wood, and also for sanitary purposes it sterilises urine, and prevents damp soaking into the fibres.

The chief advantages of soft wood as compared with hard are due to the fact that it is silent and less slippery.

It also wears more uniformly, and has proved to be the cheapest form of road surface if the prime cost and upkeep is taken for over a period of twenty-five years.

It is for these reasons that soft wood is now generally used, and it is found to be more satisfactory than hard wood, although its life is slightly less.

It has, however, the disadvantage of swelling, but this can be easily allowed for by inserting a compressive joint of 1½ in. of clay at the junction with the kerb. (G. W. H., *Kingstanding-Thornes.*)

Surveyors' Institution Junior Meetings. A paper, entitled "Report Writing," which was read on Monday evening last by Mr. E. L. Rice at a junior meeting of the Surveyors' Institution, has been awarded the Professional's Prize.

Australian Hardwoods. Sir G. H. Reid, High Commissioner for Australia, will preside at the opening meeting of the Colonial Section of the Royal Society of Arts next Tuesday afternoon, when an illustrated paper on "The Hardwood Timbers of New South Wales" will be read by Prof. W. H. Warren Dean of Faculty of Science Sydney University. Tea chair will be taken at 4.30.

London County Council Tramways.—A scheme for the reconstruction of the London County Council tramways from Highbury Station to City-road, *viâ* St. Paul's-road, Canonbury-road, New North-road and Eagle-road, at an estimated expenditure of £62,750, has been submitted to the Highways Committee. Another scheme to be considered is that of constructing a tramway from Yorkroad to East-hill, Wandsworth, *viâ* Highstreet and East-hill, at a cost of £26,480.

Cost of Municipal Services.—The Local Government Committee of the London County Council have prepared a report on the cost of administering public services. This shows that the cost in London is 63s. per head of the population, whereas in Birmingham it is only 45s. In Sheffield the figure falls as low as 38s., in Bristol it is 48s., and in Leeds 48s. It appears, however, that while the total nett cost of general municipal services per head of population is highest in London, the total cost per £ of assessable value is lowest.

SEA-COAST EROSION.—For a very complete and inexpensive library on the cause, prevention and repair of coast erosion the following three works are recommended: "Coast Erosion and Foreshore Protection," by John S. Owens, M.D., Assoc.M.Inst.C.E., F.R.G.S., and Gerald O. Case (price 7s. 6d., post free 7s. 10d.), with numerous illustrations and diagrams; "Sea-Coast Erosion and Remedial Works," by R. C. Allanson-Winn, M.Inst.C.E.I. (price 1s., post free 1s. 1d.); and "Erosion of the Coast and its Prevention," by F. W. S. Stanton, Assoc.M.Inst.C.E., F.S.I. (price 3s., post free 3s. 2d.), with numerous maps and other illustrations. The publishers are the St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, London, E.C.

Correspondence.

"Be calm in arguing; for fierceness makes
Error a fault and truth discourtesie."
—Geo. Herbert, "*The Temple.*"

INTERCEPTING TRAPS IN HOUSE DRAINS.

To the Editor of The Surveyor.

Sir,—I had the privilege of attending the recent meeting of the Royal Sanitary Institute, and listening to the able address of Mr. H. Percy Boulnois on the report of the Departmental Committee of the Local Government Board on "Intercepting Traps in House Drains," as well as to the discussion thereon, and, although disappointed confess I was not surprised that the result of the evening's conference shed no new light on the subject, nor in any degree further advanced the solution of this long and much debated problem. I say advisedly I was not surprised at the unsuccessful result, because it was hardly to be expected that such an important and complex subject could be finally thrashed out in a couple of hours. It has been occupying the serious attention of sanitarians for the past quarter of a century, and, as Mr. Boulnois stated in his address, has occupied the Departmental Committee for four years in pursuing investigations and inquiries, and publishing their report thereon without, alas! any definite or conclusive result. Consequently I at least of those present left the meeting in a frame of mind which recalls a quotation from the "Rubáiyát" of Omar Khayyám ". . . and heard a great argument about it and about, but evermore came out by the same door as in I went."

The discussion might not inaptly be compared to "tug of war" competitions of two hours' duration, in heats of ten minutes each, excepting that at the meeting cited none of the competitors secured the award of the umpire. It is therefore not surprising that the chairman, Sir Maurice Fitzmaurice, adjourned the discussion to a subsequent evening. I do not claim the ability to decide this momentous question as to the retention or abolition of the intercepting trap, nor would it be possible to do so within such limitations as are here afforded—the solution of this enigma may, with complete confidence in their abilities, be left to the municipal and county engineers and surveyors, and other allied professional gentlemen, to whose province it essentially belongs, owing to their long-continued great experience in all matters appertaining to the sewerage of towns and districts which they officially control; nevertheless, in common with other sanitary engineers, I take a vivid interest in this most important question, but would, at the same time submit that the burning question to be decided at the out-set and before all other issues are debated is the absolutely safe severance and disconnection of the water-closet apparatus from the house drain. In the "Minute" on the intercepting trap in the issue of your journal of the 15th inst. you properly state that—"The wastes from sinks, baths, &c., are already disconnected from the drains at the gullies," and call attention to "the necessity of some means being adopted of effectively disconnecting water-closets from drains without having recourse to an appliance which would perpetuate the defects of the intercepting trap," and you "commend this proposition to the inventive genius of sanitary engineers and manufacturers of sanitary appliances." Without any further preamble, I will at once say that the required pattern of water-closet has already been successfully introduced by Messrs. George Jennings, Limited, and is known as "The Closet of the Century," with syphonic discharge, wherewith complete disconnection from the soil pipe or drain is secured, with continuous fresh air circulation between the traps. This apparatus has gained the Silver Medal and highest award of the Royal Sanitary Institute, and has been installed in many of the most important buildings in all parts of the world. To occupy valuable space in your paper in describing this water-closet apparatus in detail would be an undue liberty, and I will merely add that the apparatus can be seen and tested in the museum of the Royal Sanitary Institute, or at the showrooms of above-mentioned firm. By some persons it may be considered that the sole object of this letter is to advertise my firm's productions, and although I admit there are some grounds for such contention, I am content to leave the judgment on our actions in this matter to those higher minds who recognise and appreciate that a manufacturer may be able to confer lasting public benefits even and when advocating his own wares.—Yours, &c.,

Walter Jennings, Director.
Messrs. George Jennings, Limited, Sanitary Engineers.

Lambeth Palace-road,
London, S.E.
November 18, 1912.

BITUMINOUS MATERIALS.

To the Editor of The Surveyor.

Sir,—In common with many of your readers, I have been much interested in the correspondence which has now for some time past been appearing in your columns on the subject of bitumen. Before the public can follow any discussions of this kind, in which owing no doubt partly to the approaching International Road Congress they appear to be daily more and more interested, it is necessary that they should have fixed in their mind the exact meaning to be attached to all such words as "asphalt," "bitumen," "bituminous," &c. When two distinct meanings are confounded under one or more words (and such must be the case where our knowledge is progressive, and therefore imperfect), erroneous inferences will be drawn, and what is true in one sense of the word will be affirmed as true in both. Hence the necessity for appropriating to each term a clear and distinct meaning.

It has occurred to me that you would be adding another to your many services to all who are interested in modern road construction if you would open your columns to a discussion on the definition of the words above mentioned; and with this end in view I now venture to offer a small contribution by way of opening the question.

Bitumen.—Prévost Hubbard, the distinguished head of the Division of Roads and Pavements in the Institute of Industrial Research, Washington, U.S.A., adopts the following definition of this term:* "Bitumens may be described as consisting of a mixture of native or pyrogenetic hydrocarbons, and their derivatives, which may be gaseous, liquid, a viscous liquid or solid, but, if solid, melting more or less readily upon the application of heat, and soluble in chloroform carbon-bisulphide and similar solvents." It will be seen from the above definition that the word "bitumen" covers a very wide field, and therefore requires some qualifying addition when we are making reference to some particular substance. Happily, the road engineer is concerned only with a limited number of the substances which come under the general head of bitumens. Bitumens are either native or artificial. The former occur in Nature, and are the result of natural processes; the latter, as the term "artificial" implies, are obtained by distillation or other chemical processes. Bitumens also are found in mineral substances (such as bituminous coal), from which they may be educed by destructive distillation. Such bitumens, of course, come under the head of artificial.

Asphalte.—So far as my memory serves me, a correct definition of this term appeared not long ago in your Students' column "Limestone impregnated with natural bitumen." This is in substantial agreement with M. Léon Malo, an eminent French authority, who defines asphalte as "calcareous rock impregnated naturally with bitumen." Of all forms of bituminous material this is, perhaps, the most familiar to the citizens of London, being laid in the form of monolithic pavement in many of our main streets.

Asphalt, Asphaltum.—These two words are synonymous, and are used indifferently in U.S.A. to denote the solid form of natural bitumen. It will be noted that the word "asphalt" is spelt without a final "e." An example of asphalt or asphaltum familiar to us all is that obtained from the Trinidad Lake, which may be seen, also in the monolithic form of pavement, on the Thames Embankment, where it is employed as a matrix for graded sand. The use of the word "asphalt" is, I suggest, unnecessary, and likely to lead to confusion, and I venture to propose that in future only the two forms, "asphalte" (with an "e") and "asphal-

* "Dust Preventives and Road Binders," 1910, p. 131.

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
Appointments Vacant	725
Assistants and Students' Section	710
Association of Managers of Sewage Disposal Works: Notices	725
Barnsley Sewage Disposal	695
Bituminous Materials	715
Bituminous Road Materials in the United States	691
"Camera" on the Bath Road	700
Concrete Institute	694, 701
Correspondence	712
Crompton Parkinson	711
Institute of Sanitary Engineers	709
Institution of Municipal and County Engineers	695, 701, 713, 724
Institution of Municipal Engineers: Notices	724
Institution of Water Engineers: Notices	725
Intercepting Traps in House Drains	695, 696, 712
Local Government Board Inquiries	715
Meetings	728
Mixing Cement with "Bitumen"	713
Modern Road Construction	713
Municipal Competitions Open	726
Municipal Contracts Open	726
Municipal Engineers and the Petrol Tax	714
Municipal Work in Progress and Projected	717
Personal	709
Progress in Developing and Conserving Water Supply for Municipal and Domestic Purposes	721
Recent Publications	724
Road Congress Exhibition	714
Royal Commission on Sewage Disposal: Eighth Report	716
Royal Sanitary Institute: Notices	725
Tenders for Municipal Works or Supplies	728
The Motor Bus	695
Town Planning Competition	695, 701, 713
Trackless Trolleys and Road Maintenance	723
United States Office of Public Roads	723
Water Supply in the United States	695
What is a Garden City?	711

[illegible] specified in each of the respective [illegible] above heading.

Bituminous.—This term is most comprehensive, and is in common use in reference to all materials partaking of the essential properties of bitumen, whether native or artificial.—Yours, &c.,

JOHN HARRISON.

Worcester.
November 18, 1912.

THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS' TOWN PLANNING COMPETITION.

To the Editor of THE SURVEYOR.

SIR,—The council of the Institution of Municipal and County Engineers is to be congratulated on [illegible] a Town Planning Competition [illegible] early. The conditions cannot be criticised [illegible] have received the approval of the council. The premiums offered for [illegible] the dignity of the institution demands, for premiums [illegible] last annual meeting, are likely to deter rather than [illegible] the drafting of plans.

The premiums [illegible] or part of the [illegible] Mr. Lloyd George's offer to the electors in making demands altogether disproportionate to the increased benefits offered. The council has the failings of the Dutch, who "offer too little and ask far too much." Hardly one of the competitions promoted during the past few years, even for a building estate of 200 or 300 acres, has offered less than £50 for a first premium, and [illegible] £100. For schemes for laying out the Blackley estate for the Manchester Corporation, premiums of £150, £100 and £50 were offered. Douglas, for laying out pleasure grounds and a park, offered as premium of £200 and two of £100. Schemes for less populations and plans than [illegible] 100 times greater—*e.g.*, the Australian capital provided premiums of £1,750, £750 and £500; for the Dusseldorf extensions £1,000 and £375 were offered; and for laying out a portion of Buenos Ayres, £1,060, £640 and £450. No one expects the latter or, in view of the latter, but if they do not want their competition to end in a fiasco, they must more liberally increase the premiums and [illegible] their conditions. One [illegible] or sets of plans asked for, two of the larger scale plan for the centre of the city, and the bird's-eye view—are quite unnecessary, and for such a competition should not be required. A perspective for a small villa will cost 3 guineas, and there is no perspective draughtsman worthy of the name who would make a bird's-eye view of a town of 50,000 inhabitants for the largest of the premiums offered by the institution. Most architectural competitions at the present day distinctly debar perspectives and colour, and here we have a competition for engineers asking for fancy pictures for a £10 premium!

Then, again, the description offered is most vague. Surely a sketch or block plan might have been prepared showing the main features of the district, and the levels given. We are told the town has already a population of 50,000, and accommodation for 100,000 visitors, but nothing is said as to whether the existing town is to be replanned, which seems somewhat absurd, or if the existing streets and buildings are to be ignored, which is equally absurd, or for what prospective population it is necessary to provide.

The low cliff is said to be 20 ft. above the Parade on the north edge of the site, but no level is given for the Parade, and the north edge may mean the whole 5 miles of its length or a short portion only. Again, who could plot or locate the estuary of 200 acres from the description given?

It is to be hoped that amended conditions with sketch plan, and increased premiums will be given, for unless this is done I am sure the institution cannot expect to get the more able of its members to compete; and while the result may provide amusement for our architectural friends, it can only bring ridicule on the profession of the municipal engineer.—Yours, &c.,

SURVEY.

November 19, 1912.

MODERN ROAD CONSTRUCTION.

To the Editor of THE SURVEYOR.

SIR,—Referring to your comments and the article upon "Road Efficiency," reproduced in your issue of the 15th inst., may I be allowed a small space in your valuable paper to ask both councillor and surveyor who they consider is to blame for the present state of things, as it is one thing to find fault, but quite another to amend it?

Eight years ago I thought out the problem on what I considered practical lines, and four years afterwards introduced the "Jonesway" system, with a view of saving what is now considered "money wasted," but the system was thought too elaborate and expensive at £3,000 per mile. Since then I have introduced the "Jonesway" armour at a considerably less cost, yet this is considered too expensive, though experimental lengths of other methods have been tried at an average cost of £2,652 per mile.

Is it not time we heard something as to which is the best and cheapest for uniformity in road construction?

Engineers admit that the armour placed at the point or seat of attrition will last twenty years, and extend the line of foundations and surface, while others do not consider it expensive in the long run; it is the initial outlay! Figures shown in the Local Taxation Returns expose the highest in loans and cost of maintenance on record; the interest upon loans would exceed the total loan required a century ago before canals and railways were introduced to relieve the roads of the bulk of traffic, which makes one consider whether the saving in time at the increased cost of modern transit compensates the community.

If it was necessary years ago to relieve the roads of traffic which appears to be coming back to the roads, is it not essential to regulate it by means of a central track for the heavy and fast traffic if it is beneficial to other users of the road?—Yours, &c.,

THOMAS JONES.

Hampton-in-Arden.
November 19, 1912.

MIXING CEMENT WITH "BITUMEN."

To the Editor of THE SURVEYOR.

SIR,—As I cannot say it would be found by Mr. W. J. Howard-Smith in the patent specification he mentions, I however can assure him there is no need to pay 8d. to learn if it is "a good thing to mix cement with 'bitumen' (*i.e.*, pitch and tar)," as the mixing of pitch, sand, &c., is not a new process, and the manufacture of materials of this class has

been carried on for many years. The sand, or whatever is used in the pitch, is found necessary for the several purposes these mixtures are used, for a pitch is useless alone. It has no body or toughness, and is, of course, very brittle, and has a low melting point.

The compositions in some cases are intended to take the place of a natural bitumen, such as Trinidad, but the natural product, even at a higher price, is always to be preferred to the artificial. It can only therefore be said to be a "good thing" to employ a filling material with pitch from a manufacturer's point of view, and when mixtures of sand, pitch and artificially produced petroleum residuums—often referred to as "bitumen"—are preferred to natural products obtained from sources where genuine bitumen is known to occur, it may be taken for granted that it is due to want of knowledge and experience or some other particular reason.—Yours, &c.,

A. E. H. Dussek.

Canal Bank,
Deptford, London, S.E.
November 19, 1912.

MUNICIPAL ENGINEERS AND THE PETROL TAX.

To the Editor of The Surveyor.

Sir,—The following communication has been sent to the Road Board by the Institution of Municipal Engineers.—Yours, &c.,

B. Wyand,
Secretary, Institution of Municipal Engineers.

39 Victoria-street, S.W.
November 15, 1912.

[Copy of letter referred to.]

Sir,—Under the provision of the Finance (1909-10) Act, 1910, medical practitioners are granted certain remissions in respect to (a) the duty on motor spirit, (b) the licence on motor cars, in the case of motor-cars "used by them for the purposes of their profession."

There are in this country some hundreds of engineers and surveyors to local authorities who have charge of a very large mileage of highways, and who have, upon quite a moderate salary, to find their own means of locomotion. Many of these are practically compelled to provide and maintain a motor vehicle of some kind or another, and the expense of annual licence and of petrol for running purposes presses heavily upon their income.

The council of the institution have had this matter under consideration, and they feel that it is one which might receive the attention of your board, with a view to obtaining a concession for municipal engineers similar to that granted to the medical profession.—I am, Sir,

Your obedient Servant,
B. Wyand,
Secretary, Institution of Municipal Engineers.

November 14, 1912.

THE CROMPTON PAVEMENT.

To the Editor of The Surveyor.

Sir,—Bearing in mind George Herbert's quotation at the head of the columns, and having no desire to take up your space with a personal controversy with Mr. W. J. Howard-Smith, I would like to point out that his correspondence related at the outset to criticism of Colonel Crompton's pavement, and was headed accordingly, and those which I have not deviated.

It is now quite evident, not only from the flippant manner in which Mr. Howard-Smith originally criticised Colonel Crompton's pavement, but also from his subsequent letters on the subject, that his knowledge of bitumen is limited to the so-called "British" variety, and after his forty years' experience with this material no doubt it is difficult for him to throw off the trammels of the past and realise that Colonel Crompton has adopted more advanced ideas than his own.

In some remarks which I made in *The Car Illustrated* in 1910 I mentioned that the Road Board was then in its infancy, and, like most other infants, the first word I am here taught to speak was "tar." As, however, the Road Board is now growing up and using words of two and three syllables, such as asphalt and bitumen, doubtless it will soon be able to expound to road engineers the real meaning of these apparently still much misunderstood words.—Yours, &c.,

Cecil Nathan.

3 London Wall-buildings,
London, E.C.
November 18, 1912.

WHAT IS A GARDEN CITY?

To the Editor of The Surveyor.

Sir,—My attention has just been called to a letter on the above subject from Mr. A. J. Price, of Lytham, which appeared in your issue of the 15th inst., and from which I gather that he is under the impression that Mr. Culpin is the secretary of First Garden City, Limited, Letchworth.

I am, and have been for over six years, secretary of this company. I think some mistake has occurred, but am quite sure Mr. Price must be under some misapprehension, as Mr. Culpin is the last man in the world to suggest such a thing. Possibly confusion has been caused by the fact that Mr. Culpin is the secretary of the Garden Cities and Town Planning Association, which is a propagandist body whose objects are to preach the gospel of town planning, garden cities, garden suburbs, garden villages, and so forth.

First Garden City, Limited, is a commercial company, whose sole object is the development of an estate of 4,500 acres at Letchworth as a garden city.—Yours, &c.,

Harold Craske, Secretary,
First Garden City, Limited.

Letchworth, Herts.
November 19, 1912.

To the Editor of The Surveyor.

Sir,—Mr. Price has not in any way dealt with the points I made in my last letter, so I do not intend wearying your readers with any further reply to him. Apparently he is of opinion that he knows more about what the garden city is and what is the garden city movement than those who are connected with it; so we will leave it at that.

He mixed up the leaders, and now he mixes me up with the secretary of First Garden City, Limited. I thought by this time it was pretty well known that the Garden Cities and Town Planning Association, although the founder of the movement and responsible for the propaganda, is not responsible for the actual work of development, and that the secretary of the company responsible for the great work which is being done at Letchworth is Mr. Harold Craske, whose address is at Letchworth.—Yours, &c.,

Ewart G. Culpin, Secretary,
Garden Cities and Town Planning Association.

3 Gray's Inn-place,
Gray's Inn,
London, W.C.
November 20, 1912.

THE ROAD CONGRESS EXHIBITION.

To the Editor of The Surveyor.

Sir,—In your list of firms who are exhibiting at the exhibition of road materials in connection with the Road Congress next June we note that you have entitled us The Canadian Rubber Company, Limited. We trust that you will be kind enough to publish this letter as a correction to the above title. Our proper title is as we sign ourselves below.

We are particularly anxious to emphasise the term "mineral rubber," as our bitumen "Camarco" is noted for its great elasticity as well as its other rubber-like qualities, and yet is a pure natural bitumen. Another thing that we notice is that we, with other non-tar firms are classed under the heading of "Tarmacadams, &c." This might give an inquirer a wrong opinion of the origin of "Camarco."—Yours, &c.,

The Canadian Mineral Rubber Company, Ltd.

[The announcement referred to in the foregoing appeared in last week's issue, and was printed as received from the exhibition authorities. While we are therefore not responsible for the errors the statement contained, we have pleasure in inserting the necessary correction. Ed. The Surveyor.]

Municipal and County Club.—The Lord Mayor, Sir David Burnett, and the Sheriffs of the City of London will be the guests of the evening at a banquet to be given by the Municipal and County Club at the Whitehall Rooms, on Monday, December 16th. Sir Wm. Purdie Treloar, Baronet, vice-president of the club, will preside.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Ashby Woulds U.D.C. (November 15th. Major J. Stewart). £3,000 for the water supply of the Ashby Woulds district under the provisions of the Public Health Act 1875. Mr. W. A. Musson, clerk to the Swadlincote and Ashby-de-la-Zouch Joint Water Committee, stated that they wanted the board's consent to the water supply. The price for 1,000 gallons was 9d., and there was no limitation as to the maximum or minimum supply. The existing mains were laid by the Hartshorne and Seals Rural District Council in 1900 from their area to Moira Village. The remainder of the pipes were laid by the Ashby Woulds Urban District Council. The supply was from a reservoir at Woodville, and that council paid £7 10s. per annum for wear and tear of the mains inside their area, and £12 per annum for those outside. They had the option of purchasing. Mr. N. J. Rowley, surveyor and inspector to the urban district council, gave evidence.

Basford R.D.C. (November 8th. Mr. W. O. E. Meade-King). £570 for the Bradmore and £754 for the Bunny water supplies.—Mr. S. Maylan, engineer to the council, explained that the scheme originated from the request made by Dr. Cordeux, of Bunny Hall, for a supply of the Nottingham Corporation water. He asked for a continuation of the mains from Rempstone, and also for a contribution of £900 towards the cost of the scheme. Eventually he increased the offer to £1,000. Mr. W. Stone, on the representation of Bunny council was withdrawn. Negotiations were opened with the corporation, and their terms were accepted. The original estimate of £1,000 had now had been increased to £1,804, on account of the increased price of iron pipes. Mr. Maylan explained that 7in. pipes in the Bradmore district would be used instead of 6in. pipes. Dr. Cordeux pounds was to be paid by Dr. Cordeux, leaving a balance of £1,004 to be borrowed. The rate per £ for repaying the estimate Bradmore £754 and Bunny £7 10s. proposed to make the loans repayable in thirty years. The estimated population of the district was 199 and Bunny 211 [illegible] consumption 15 gallons per head.

Hazel Grove (Cheshire) U.D.C. (November 1st. Mr. F. H. [illegible]) for the making of new streets. The scheme was prepared by the surveyor, Mr. G. S. Doncaster, who was complimented on the [illegible] plans were prepared.

Newquay U.D.C. (November 19th. Mr. Edward Leonard). £110 for the [illegible] improvement at Stonecastle Corner. [illegible] contractor's tools [illegible] the clerk, Mr. [illegible] stated that the council adopted the Private Street Works Act in 1910 almost entirely with the object of [illegible] for sixteen years, and the council had endeavoured from time to time to get it put in order, but without success. The surveyor, Mr. John Ennor, gave details of how it was proposed to [illegible] he said were at present in a very bad state.

Ossett T.C. (November 5th. Mr. E. Leonard). —£590 for the erection of a fire-engine house and [illegible] keeper's house in Illingworth-street; £1,169 for the purchase of land [illegible] £163 for street improvements in Southdale-road; and £2,100 for expenditure in excess of borrowing power in the erection of the town hall.—The town clerk, Mr. T. W. Wilson, represented the corporation, and, dealing first with the application for borrowing powers for the proposed erection of a fire brigade station and the purchase of a fire engine, said that during the last few years there had been a large [illegible] warehouse fires in Ossett, and they [illegible] because they had no fire engine. The borough surveyor, Mr. H. Holmes, gave evidence in support of the application. Respecting the application for sanction to borrow £2,100 for expenditure in excess of borrowing powers in the erection of the town hall, there was no opposition.

Penistone (Yorks) U.D.C. (November 6th. Mr. E. Leonard). £500 [illegible] public hall and public offices on land adjoining Shrewsbury-road.—The proposed building it was stated will have an area of 1,000 yds., with a frontage to Shrewsbury-road of just over 82 ft. The public hall will be 40 ft. wide [illegible] ft. long, and will seat 150 persons.

Pontefract T.C. (November 5th. Mr. Montague Clifton).—£5,600 for the erection of public baths.—It was stated that Mr. J. G. Lyon, one of the three Freemen of the borough, had offered to defray the cost of [illegible] £5,000, making the total cost £10,200. The baths are to be placed on the Headlands estate, [illegible] destructor, and corporation stables have already been erected. The baths will displace baths which are altogether disproportionate to the needs of the borough.

Rotherham T.C. (November 14th. Major J. Stewart). £5,000 for works [illegible] powers. The town clerk stated that [illegible] the council proposed [illegible] in future all footpaths, either those made by the local authority or new streets made by private owners under the provisions of the Public Health Act, to be flagged. In 1910 a loan of £5,000 was obtained, being the first instalment in connection with the carrying out of the footpath scheme. In making the present application the Highways Committee had been moved by the necessity of actively carrying out what he might term the conversion, because for one thing they found that the present form of causeway had got into [illegible] and was [illegible] the [illegible] of the population.

Scarborough T.C. and Scalby U.D.C. (November 13th. Major J. Stewart). The Scarborough Corporation sought a loan of £400, and the Scalby Council an [illegible] £200 [illegible] Burniston-road at a dangerous corner near Scarborough. The total cost will be £1,200, and the Road Board have made a grant of £600.—It was stated that the Scarborough Corporation were proposing to incorporate [illegible] of Scalby into the borough of Scarborough. Alternatively the Scarborough Corporation asked for £600 if the Scalby Council's application was refused. There was no opposition to further applications by the Scarborough Corporation for £600 for erecting seventeen additional bathing bungalows in the North Bay, £250 for erecting an open [illegible] North Bay, [illegible] the present [illegible] and £200 for a [illegible] existing [illegible] Esplanade, [illegible] Road, [illegible] Peasholm Park.

Stoke-on-Trent T.C. (November 19th. Mr. M. K. North).—£11,000 for storm-water drainage at Burslem [illegible] £1,100 for the [illegible] of [illegible] Street. Mr. L. B. [illegible] said that in the Park district of Burslem a large building estate had developed during the past few years. Complaints had been received in times of storm of the flooding of cellars of houses in the district owing to the existing sewer not being of sufficient capacity to take away the sewage and the storm water. Mr. A. Burton, borough surveyor, produced plans, and explained that £241 had already been spent on "unemployment [illegible] during the coal strike. Mr. Lee said the site for the new fire station was centrally situated. The land was [illegible] purposes.

APPLICATIONS FOR LOANS.

Bromsgrove R.D.C. £1,650 [illegible] necessary.

Cambridge T.C.—£1,868 for the provision of a recreation ground.

Chippenham T.C. £1,000 [illegible] street improvements.

Coleraine U.D.C.—£3,000 for the erection of workmen's dwellings.

Doncaster T.C.—£28,895 for the erection of 124 workmen's dwellings.

East Ham T.C.—£3,883 for the provision of a recreation ground.

Felixtowe U.D.C.—£4,052 for electricity extensions.

Oundle R.D.C. £1,000 [illegible] water supply scheme.

Panteg U.D.C.—£2,000 for an additional housing scheme.

Wakefield T.C.—£14,134 for street works.

LOANS SANCTIONED.

Ashton-under-Lyne T.C. £3,000 [illegible] existing sewer.

Beds C.C. £5,306 for a new [illegible] at Leagrave.

Blyth U.D.C.—£13,598 for an elementary school.

Bristol T.C.—£400 for a public convenience.

Bromley T.C.—£915 for artificial stone paving and road widening.

Hants C.C.—£39,348 in respect of the joint asylum at Park Prewitt.

Maldens and Coombe U.D.C.—£1,627 for additional pumping machinery. The board pointed out that the council should take steps to prevent, as far as possible, subsoil and surface water from entering the sewers, and should also take into immediate consideration the question of the extension of the sewage disposal works and the provision of a refuse destructor. The surveyor, Mr. H. Jeffes, has been instructed to prepare a draft specification of the pumping machinery required.

Nuneaton T.C.—£10,000 for the completion of the Griff water supply.

Quorn U.D.C.—£524 for a village hall.

Rushden U.D.C.—£2,500 for the provision of a recreation ground.

Sunderland R.D.C.—£5,283 for a diphtheria ward at the hospital.

FORTHCOMING INQUIRIES.

NOVEMBER.	£
25. **Friern Barnet.** For private street works (Mr. Courtenay Clifton)	2,022
25.—**Ystradgynlais.** For the provision of new offices (Mr. R. H. Bicknell)	2,321
26. **Aberavon.** For the purchase of a motor fire engine and road widening (Mr. R. H. Bicknell)	2,325
26.—**Castleford.** For the extension of the market (Mr. Edgar Dudley)	1,600
26.—**Felixstowe.** For electricity purposes (Mr. H. R. Hooper)	4,052
26.—**Milford Haven.** For the water undertaking (Mr. A. G. Drury)	1,040
26.—**Staines.** For works of sewerage (Mr. F. H. Tulloch)	2,250
27.—**Southend.** For electricity purposes (Mr. H. R. Hooper)	3,900
27.—**Sutton-in-Ashfield.** For street widening purposes (Mr. Edgar Dudley)	600
27.—**Weston-super-Mare.** For road improvement purposes (Mr. R. H. Bicknell)	5,000
27.—**York.** For street improvement works (Major J. Stewart)	2,350
28.—**Chadwick.** For laying out a common (Mr. M. K. North)	1,450
28.—**Dover.** For street improvement purposes (Mr. H. R. Hooper)	580
28. **Kiveton Park.** For works of water supply (Major J. Stewart)	1,280
28. **Llandovery.** For works of bridge construction (Mr. A. G. Drury)	500
28. **Nottingham.** For road widening purposes (Mr. Edgar Dudley)	860
28. **Skegness.** For the provision of a steam fire engine (Mr. T. C. Ekin)	—
29. **Derby.** For the purposes of a new street (Mr. Edgar Dudley)	376
29.—**Leicester.** For the extension of the cemetery (Major J. Stewart)	12,182
29. **Tonbridge.** For the provision of generating plant (Mr. H. R. Hooper)	2,400
DECEMBER.	
2 **Birmingham.** For the purposes of streets and baths (Mr. R. H. Bicknell)	8,420
3 **Oldbury.** For road widening purposes (Mr. R. H. Bicknell)	900

Wakefield Water Supply.—The Corporation of Wakefield, acting on the advice of Mr. C. Clemesha Smith, the waterworks engineer, have decided to lay an 18in. main, between 6 and 7 miles in length, from the city to Waindyke, in order to improve the supply to Castleford Whitwood, Featherstone, and the surrounding districts. Application is to be made to the Local Government Board for power to borrow £20,000.

ROYAL COMMISSION ON SEWAGE DISPOSAL.

PROPOSED CENTRAL AUTHORITY AND NEW RIVERS BOARDS.

The Eighth Report of the Royal Commission on Sewage Disposal, which was issued on Wednesday, deals with the standards of purity to be applied to sewage and to sewage effluents discharging into streams and rivers, and the tests which should be used in regard to them. The commissioners repeat a previous recommendation that the River Pollution Prevention Act of 1876 should be altered so as to allow local circumstances to be taken into account. The recommendations of the report, which are based upon the presumptive alteration of the Act, call furthermore for the formation by Parliament of a central authority and of subsidiary rivers boards, adequately equipped with expert officers and organised to secure the economical and efficient discharge of the duties of local authorities and others in regard to pollution, and to protect the public health and the amenities of rivers. The commissioners conclude that the most trustworthy chemical index of recent sewage pollution of a river is afforded by the figure indicating the amount of ammonia present. But this constituent does not indicate the character of the pollution, for the determination of which another test is required, and the amount of the dissolved oxygen taken up in five days has been found by the commissioners to furnish the most trustworthy chemical index of the actual state of a stream. They recommend that this amount should be adopted as a standard.

In fixing any special standard, the commissioners state, the dilution afforded by the stream is the chief factor to be considered. If the dilution is very low it may be necessary for the Central Authority, either on their own initiative or on application by the Rivers Board, to prescribe a specially stringent standard, which should also remain in force for a period of not less than ten years. If the dilution is very great the standard may, with the approval of the Central Authority, be relaxed or suspended altogether. "Our experience," the report continues, "leads us to think that, as a general rule, if the dilution, while not falling below 150 volumes, does not exceed 300, the dissolved oxygen absorption test may be omitted, and the standard for suspended solids fixed at 6 parts per 100,000. To comply with this test no treatment beyond chemical precipitation would ordinarily be needed. If the dilution, while not falling below 300 volumes, does not exceed 500, the standard for suspended solids may be further relaxed to 15 parts per 100,000. For this purpose tank treatment without chemicals would generally suffice if the tanks were properly worked and regularly cleansed. These relaxed standards should be subject to revision at periods to be fixed by the Central Authority, and the periods should be shorter than those prescribed for the general or for the more stringent standards."

St. Paul's Bridge Scheme. The London County Council have informed the City Corporation that they have decided to seek powers next session to construct tramways from Southwark-street over the proposed new St. Paul's Bridge to a point near the most western end of Cheapside, and also to construct a shallow underground subway.

Town Planning Schemes. A memorandum issued by the Local Government Board relative to the operation of the Housing and Town Planning Act (1909) mentions that twenty local authorities have been granted authority by the board for the preparation of town planning schemes. Three of these schemes, two by Birmingham Corporation, affecting different areas in the city, and one by Rochdale, have been prepared and submitted for approval. Among the other local authorities that are preparing schemes are Bournemouth, Chesterfield, Halifax, Hanwell, Liverpool, Newcastle-on-Tyne, Sheffield, Southport, Stoke-on-Trent, and Walthamstow. Applications for authority to prepare schemes have been received from twelve other authorities, and 124 local authorities have proposals for schemes under consideration. The memorandum goes on to state that in many cases landowners are adopting better methods of developing estates without the formalities of town planning schemes, and that the Act has had a good influence, quite apart from the actual preparation of schemes under it.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works, at which particulars appear below:—Buildings.—Blackpool £10,000, Durham, £10,118, George £7,630; housing and town planning.—Chester-le-Street, Dumfries, Falmouth; roads and materials.—Hornscastle £2,643; sewerage and sewage disposal.—Barnard Castle, Ellesmere £7,000, Hitchin £14,000, Lichfield £9,000; water, gas and electricity.—Pontardawe, Worcester £7,000; miscellaneous.—Southport. Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

BUILDINGS.

Blackpool T.C.—It is intended to spend about £10,000 upon the improvement of the public baths during the ensuing winter.

Cornwall C.C.—An estimate of £10,000 has been approved for the sanatorium treatment of consumptives.

Dartmouth T.C.—The borough surveyor, Mr. W. G. Lane, and the medical officer of health, have been requested to consult with a committee with respect to the provision of an isolation hospital.

Durham C.C.—A scheme is to be prepared for Easington Colliery, at an estimated cost of £10,118.

Cockle U.D.C.—A scheme for a town hall, instead of municipal offices, as previously decided, was passed on Wednesday last. The estimated cost is £7,630.

Lynn T.C.—The question of increased public bath accommodation has been referred to the consideration of a committee.

Norwich T.C.—The Education Committee has accepted the tender of Messrs. T. Gill & Son, at £3,964 for the erection of a school at Winsum View.

Peterhead T.C.—The tender of Messrs. John McAdam & Son, Aberdeen, at £6,936 has been accepted for the construction of the golf road reserve at Formaty Hill.

Rowley U.D.C.—The Education Committee have instructed the architects to prepare plans for a technical school, at an estimated cost of £1,000.

Sandwich T.C.—Extensions are to be carried out at the Guildhall, at a cost of £1,926.

Sunderland R.D.C.—A tuberculosis pavilion is to be provided at the sanatorium hospital, at a cost of £1,100.

Surrey C.C.—The council have decided that they cannot take any action at present, or in the immediate future, to improve Richmond Bridge.

HOUSING AND TOWN PLANNING.

Ashbourne R.D.C.—A letter has been received from the Local Government Board agreeing that the cost of maintenance of the proposed six dwellings to be erected for the working classes at Parwich should be charged on the parish and not on the whole county.

Banbury T.C.—The tender of Messrs. Bosworth & Lowe, of Nottingham, at £6,572, has been accepted for the erection of forty houses.

Battle (Sussex) U.D.C.—The scheme for the erection of working-class dwellings has received the sanction of the Local Government Board, and the tender of Messrs. Banks & Gearing, of Hastings, has been accepted for six cottages.

Cambridge T.C.—With respect to the cottages proposed to be built by the corporation the original cost was estimated at £1,603. Some delay took place, owing to local circumstances, and then further delay with the Local Government Board, who required certain modifications, and particularly the enlargement of bedrooms. The corporation have now received tenders amounting to £1,724 10s. for two blocks, one containing six cottages and the other with twelve single-room tenements for old people.

Chester-le-Street U.D.C.—As the result of a communication from the Local Government Board, a committee has been appointed to consider the question of the provision of working-class dwellings.

Coleraine U.D.C.—A scheme for the erection of workmen's dwellings at Short's Hill at an estimated cost of £3,000, has been agreed to.

Dumfries T.C.—Approval has been given to the carrying out of a scheme of housing which will mean the clearing away of a large amount of slum property along King-street between Queensberry-square and Loreburn-street. The cost of the scheme is estimated at £8,000.

Falmouth T.C.—The surveyor, Mr. J. S. Walton, has received instructions to prepare plans for twenty-two workmen's dwellings.

Glasgow T.C.—A plan has been submitted to the Special Committee on Cottages for the Working Classes of ground at Riddrie belonging to the corporation, on which it is suggested cottages suitable for the working classes might be erected. It is proposed that the cottages should consist of four and five apartments, with baths and other modern conveniences, and that the rent of each cottage should not exceed £18 per annum.

Paignton U.D.C.—The surveyor, Mr. C. O. Baines, has received instructions to take the necessary steps for the preparation of a town planning scheme. He told the council that the estimated cost was £200, including maps, notices, and the salary of an assistant for the work. The borough surveyor of Bridlington, Mr. Ernest Matthews, had intimated to him that the cost to his council was £120, exclusive of the assistance rendered by his permanent staff.

Penzance T.C.—A scheme has been approved for the erection of forty houses upon a site near Alverton.

Selby U.D.C.—A site has been agreed upon for the erection of about 100 cottages.

Tullamore U.D.C.—Thirty-eight cottages are to be erected, at a cost of £4,793.

PARKS AND OPEN SPACES.

Eastbourne T.C.—It has been decided to seek Parliamentary powers for the purchase of the Devonshire Park of 11 acres. The property, for which the sum of £110,665 is asked, includes a theatre, a floral hall of 2,000 seating capacity, pavilion, baths, public-house, and eight shops. The Duke of Devonshire promises to give the town £10,000 of his share of the purchase money on the condition of having two representatives on the managing board, and a further gift of the interest on a further £12,000 on the further condition that the proceeds of 1d. rate are devoted to music.

ROADS AND MATERIALS.

Belford R.D.C.—A grant of £200 has been made to the Road Board towards the work of improvement of road surfaces in the district during the year 1912-13. One half is payable on requisition, and the remainder when the work is satisfactorily completed.

Bowland (Yorks) R.D.C.—A new road is to be constructed at Bashall Eaves, at an estimated cost of £310.

Bromley R.D.C.—Poverest-lane is to be widened, at a cost of £330.

Dumbarton C.C.—The widening of the Loch Lomond-road is to be proceeded with by the Western District Committee, provided the money which represents the committee's quota can be borrowed over a period of years.

Frinton-on-Sea U.D.C.—The surveyor, Mr. E. M. Bate, has received instructions to prepare particulars and obtain tenders for tar-paving the footpaths on the north side of Hadleigh-road.

Greenock T.C.—An experiment is now being made in Nicolson-street with Ferromac. Last week, on the invitation of Roadite, Limited, a company of surveyors from various districts inspected the work in progress, and had the operations explained by Mr. Cowan, the representative for Scotland.

Hampton U.D.C.—It has been decided, at the request of the Middlesex County Automobile Club, to support an application to the Middlesex County Council for by-laws to be made by the county council for regulating the use of locomotives with a number of trailing wagons attached on public highways and for preventing obstruction.—With regard to an inquiry from the Hornsey Borough Council as to making a contribution towards the costs incurred in the event of an adverse decision in a prospective claim against an omnibus company for extraordinary traffic on a certain road in Hornsey, it has been decided that the council is not prepared to promise assistance.

Haywards Heath U.D.C. The tender of the Haywards Heath Gas Company for the supply of tar, at 2s. 6d. per Imperial barrel, has been accepted.

Horncastle U.D.C. The granite setts in West-street and Bridge-place, at a cost of £263.

Kingston (Surrey) T.C. Wood paving, estimated to cost £217, is to be laid in front of the municipal offices.—The Road Board and the county council are to be asked to furnish full particulars of the proposal to form a by-pass road avoiding the borough in connection with the suggested arterial road.—Mr. R. H. Clucas, the borough surveyor, has been authorised to comply with the request of the Automobile Association and Motor Union for an indication on a map, for a series of town maps they are preparing, of a secondary route for motor cars through Kingston alternative to the main roads.

Maldens and Coombe U.D.C.—For making up and macadamising about 525 ft. of roadway in Beckenham-lane, the tender of Messrs. J. Mowlem & Co., Westminster, has been accepted, at £608 (surveyor's estimate, £570); and for paving the footways with artificial stone slabs, and maintenance, the tender of Messrs. J. Wainwright & Co., Limited, of Shepton Mallet, was accepted, at £133 (surveyor's estimate, £140). The Local Government Board have sanctioned a loan of £617 for the foregoing, to be repaid within five years.—Last week the council passed resolutions relative to the proposed making up of part of Duke's-avenue, at an estimated cost of 13s. per ft., part of Park-view (12s. 11d. per ft.), part of George-road (12s. 9d. per ft.), part of Queen's-road (12s. 7d. per ft.), and part of Coombe-gardens.

Southend T.C.—It is proposed to spend an additional £200 upon the improvement of Sutton-road, and thus obtain a 60-ft. road from the Prittlewell Station past Utton's brickfields.—The borough surveyor, Mr. E. J. Elford, has prepared a sketch plan embodying a proposal in connection with the third section of the Western Esplanade widening to take in a greater width of foreshore immediately adjacent to the pier. The Highways Committee are considering the subject, with a view to submitting a scheme to the council.

Surrey C.C. Included in the grants for improvements to main and district roads are George-street, Richmond, cost £22,278, grant £4,652; road over and approaches to the railway bridge in Haydon's-road, Wimbledon, cost £3,400, grant £1,133; Kingston-road, Merton, cost £1,850, grant £340.—The Highways Committee reported that in pursuance of the resolution of the council of January last, the county surveyor, Mr. A. Dryland, had employed the necessary assistance and made a survey for a new road to form a loop on the Portsmouth-road between Beverley Brook Bridge and the village of Esher. Plans and sections have been prepared showing the route which, after numerous trial surveys and consultations with the Traffic Branch of the Board of Trade and with the local authorities, appears to be the most desirable for the purpose of the main scheme, which has been to find an alternative route for an entirely new road between the above-mentioned points, so as to afford better access and egress to London from the south-west. The committee had given instructions for the scheme to be forwarded to the Road Board for their consideration.

Thames Ditton U.D.C.—It has been agreed to send a representative to a joint conference with Surbiton and Malden and Coombe on the proposal to urge the Road Board to allocate a proportion of the cost of constructing the proposed new arterial road.

Wanstead U.D.C. The council have accepted the tenders of Messrs. W. & C. Francis at £1,174 and £147, for making up Woodbine-terrace and Southernhay-road, and Messrs. G. J. Anderson at £129 for making up Manor-road.

SEWERAGE AND SEWAGE DISPOSAL.

Barnard Castle U.D.C.—The council have instructed Messrs. Taylor & Wallin (Mr. Harry W. Taylor, [illegible] to prepare plans for the [illegible] the existing [illegible] and to provide additional [illegible] and an [illegible].

Ellesmere U.D.C. A provisional application has been received for a loan of £7,000.

Hitchin U.D.C. The council have approved of a scheme of new outfall sewer and sewage disposal works prepared for them by Mr. E. J. Silcock, M.Inst.C.E., Westminster and Leeds. The estimated cost of the works is £14,000, and application is to be made to the Local Government Board at once for sanction to borrow the necessary money.

Lichfield U.D.C.—The tender of Messrs. Edwards & Co., of Doncaster, at £9,000, has been accepted for works of sewerage.

Linlithgow T.C.—A representative of Mr. F. Wallis Stoddart, Bristol, recently visited the sewage works with the view of advising the council as to certain proposed improvements. Mr. Walker, the engineer referred to, has since embodied his opinions in a report to the local authority. The council, having considered the report, have decided to carry out the alterations and improvements as recommended.

Linthwaite U.D.C.—At a meeting last week a circular was read from the town clerk of Ossett with reference to the expenditure caused by the crude trade effluents delivered into the sewers by manufacturers. A resolution was adopted urging upon the President of the Local Government Board the necessity of next year amending the law as recommended by the Royal Commission on Sewage Disposal, "so as to secure effectual preliminary treatment of the refuse, or the payment of a reasonable charge to the local authority."

Swadlincote U.D.C.—Included in the produce of the sewage farm are about 300 tons of "some of the best mangolds ever grown in England," according to the description of the chairman of the council, Mr. H. M. Howard. The price is 15s. per ton.

WATER, GAS, AND ELECTRICITY.

Coleford U.D.C.—It has been agreed to consider the question of providing a water supply.

Dromore U.D.C.—Application is to be made to the Board of Trade for a Provisional Order to enable the council to produce and distribute electricity for all public and private purposes. It was stated that the present system of public lighting was costing the council £150 a year, representing £3,000 capital. The engineers, Messrs. Millar, Wilson & Pegg, have prepared two schemes, estimated to cost £3,200 and £3,600, and it was argued that by adopting either the council might count on a profit of, roughly, £300 a year after payment of working expenses.

Dufftown T.C.—Waterworks are to be constructed, at a cost of £200.

Felixstowe U.D.C.—The tender of the "D.P." Battery Company, Limited, of Bakewell, Derbyshire, has been accepted for additional battery, duplicate booster and arrangements for balancing at £1,116, subject to the Local Government Board sanctioning the necessary loan.—The tender of the Felixstowe Gas Light Company has been accepted for lighting the whole of the district by gas, excluding the radius of 150 yds. from the back of the Promenade, for a seven-years' contract from January 1, 1913, at the price of £611 per annum.

Hove T.C.—By a majority of one vote, the council decided at their meeting last week to give notice to the Hove Electric Lighting Company of their intention to exercise their right of purchasing the undertaking.

Maldens and Coombe U.D.C.—The lighting contract with the Kingston Gas Company has been renewed for a period of three years at £3 7s. 6d. per lamp per annum.

Neath R.D.C. The report of the electric lighting department states that the position is highly satisfactory, and that the revenue for the past year was £5,000. The cost at present is only 1½ per unit, the lowest on record.

Pontardawe U.D.C.—With a view to the probable construction of an impounding reservoir on the upper reaches of the Pawe river, a number of trial holes are being sunk and water gauges placed upon the neighbouring land.

Stafford T.C.—The extensions and alterations at the Milford pumping station have been completed. The new pumping plant, which cost £1,000, gives an increased yield of water, and effects a saving of £200 a year in fuel. The extensions, which have been carried out under the direction of the borough engineer, Mr. W. Plant, have not necessitated the borrowing of money.

Tanderagee U.D.C. The Duke of Manchester has offered the necessary land for a reservoir in order to expedite the scheme for a water supply for the district,

which is estimated to cost £3,220. The offer has been accepted, and the council have reaffirmed a resolution expressing their willingness to combine with the rural council in promoting the scheme.

Tetbury U.D.C.—A scheme for the extension of the water supply, to cost £2,250, is under consideration.

Torquay T.C.—Work is to proceed in connection with the construction of the first section of the new water mains from the reservoirs on Dartmoor.

Whitwood U.D.C.—The tender of the Leeds Meter Company, at 6d. per yard has been accepted for the cleaning of water mains.

Wolverhampton T.C.—The cleansing of the old reservoir at Tettenhall has been satisfactorily carried out, and an examination of the structure has revealed the fact that extensive repairs will have to be undertaken. The paving of the floor is weak and in very bad condition, and the structure generally is not watertight, but it is not intended to carry out any strengthening and waterproofing before next spring.

Worcester T.C.—Subject to a loan being obtained, it has been decided to carry out the extension of Hylton-road boiler-house and the installation of additional machinery at the electricity works, at a cost of £7,000.

MISCELLANEOUS.

Aberavon T.C. The proposal to borrow £13,770 for the purpose of providing an athletic ground and shelter on the beach has been vetoed by the Local Government Board. In their letter of refusal the board state it was understood that the main object of the scheme was to provide an enclosed area to enable games of football, cycle-racing, and pony-trotting to be witnessed by the public, presumably on a charge of admission. It appeared to the board to be very doubtful whether such a scheme or work of the character proposed could be held to be within the powers of the town council. The proposal also to provide shop-stalls in the beach shelter would seem to be beyond the statutory power of the town council.

Chertsey R.D.C.—On the recommendation of the surveyor, Mr. H. Bowes, the wages of council workmen generally have been raised in Byfleet by 2s. to a standard of £1 a week. In Chobham parish certain increases were made of 1s., and at Thorpe one increase of 2s. was granted.

East Grinstead U.D.C.—The surveyor, Mr. W. E. Woollam, has received instructions to carry out the work of making roads, and constructing the fencing at the new cemetery.

Southport T.C.—The Corporation tramways have been run at a loss, and in a special report Mr. C. W. Mallins, tramways manager to the Liverpool Corporation, suggests the construction of tramways along the promenade for 5¾ miles, and that these might ultimately be linked up with the Liverpool tramways on the south and carried north across the Ribble to join the Blackpool trams. This would shorten the distance between Southport and Blackpool by 24 miles, and between Liverpool and Blackpool by 11 miles.

Stockton T.C.—It has been decided to purchase one of Dennis Brothers' motor fire engines at the price of £690, complete with all accessories.

Motor-Omnibus Traffic.—A conference representing all the local and road authorities in the Greater London area is to be held at the City of London Guildhall on December 17th, with a view to combined action on the subject of motor-omnibus traffic.

Mechanical Haulage.—A paper on this subject will be read by Mr. George Symon, surveyor to the Blaydon Urban District Council, at a meeting of the Institution of Municipal Engineers to be held at Newcastle-on-Tyne to-morrow (Saturday) at 3 o'clock.

British Fire-Prevention Committee.—Recent elections to the council of this body include Sir Aston Webb and Sir Maurice Fitzmaurice, C.M.G., M.INST.C.E., chief engineer to the London County Council. The executive, as re-elected, includes, among others, Mr Edwin O. Sachs, F.R.S.E.D., as chairman, Mr. Horace S. Folker, F.A.I., as hon. treasurer, Mr. Ellis Marsland as general hon. secretary, Mr. J. W. Restler, M.INST.C.E. of the Metropolitan Water Boards, and Mr. Max Clarke, F.R.I.B.A. The British Fire-Prevention Committee was formally founded on November 20, 1897, the day of the Cripplegate fire, and has therefore just completed its fifteenth year.

PERSONAL.

Mr. H. P. Maybury, county surveyor of Kent, has been granted an increase of salary from £1,000 to £1,500 per annum.

Mr. F. Grove, assistant county surveyor of Surrey, has had his salary increased to £300, rising by annual increments of £20 to £400.

Mr. W. Fairley, engineer to the Richmond Main Sewerage Board, has had his salary increased by £100 as from 25th December next.

Mr. D. J. Bowe, surveyor to the Clacton Urban District Council, is to have his salary raised £30 per annum as from January next.

Mr. John Dymock, of West Kilbride, has been appointed burgh surveyor and sanitary inspector of Millport in place of Mr. Robert Adam, resigned.

Mr. C. Brown, borough surveyor of Wells (Somerset), is seriously indisposed, we regret to state, and his son has been deputed to carry on the work of the department.

Mr. G. W. Hilditch, ASSOC.M.INST.C.E., has been appointed draughtsman in the borough surveyor's office, Hertford, for the preparation of plans for a sewage disposal scheme.

Mr. W. H. Pearce, ASSOC.M.INST.C.E., chief assistant to Mr. F. Roberts, ASSOC.M.INST.C.E., borough engineer and surveyor, Worthing, has been appointed surveyor to the Urban District Council of Swanage.

Mr. C. D. White, surveyor to the Newton Abbot Urban District Council, with the clerk and sanitary inspector, will represent the council at the town planning conference to be held at Exeter on the 26th and 27th inst.

Messrs. O. Catlin, Holborn, G. B. Chilvers, engineer and surveyor, Oundle, Northants, R. D. Craig, Metropolitan County Board, Adelaide, and S. Wilkinson, Surbiton, have been elected members of the Royal Sanitary Institute.

Mr. John D. Watson, M.INST.C.E., engineer to the Tame and Rea District Drainage Board, who has been engaged to advise the Metropolitan Sewerage Commission of New York on the disposal of the sewage of that city, left for America on Thursday of last week.

Mr. Munro, burgh surveyor of Nairn, who has resigned, has been presented with a purse of sovereigns from the town council, "in estimation," as Provost Macrae put it in handing the gift to the recipient, "of your worth as a public servant, and of our satisfaction with your work."

Mr. H. H. Hodgson, surveyor and sanitary inspector to the Leeds Rural District Council, and assistant overseer for Roundhay, has been recommended for a superannuation allowance of £279 as a consequence of being deprived of office by the extension of the boundaries of Leeds.

Mr. Julian C. Rogers, formerly secretary to and now an honorary member of the Surveyors' Institution, was last week presented with the Gold Medal of that body for the paper entitled "An Evening in the Institution Library," which he read at a meeting held on January 22nd last. The leading points of Mr. Rogers' contribution, we may recall, were presented in our issue of February 2nd.

Mr. A. Hamer, borough surveyor of Bishop's Castle, died recently, we regret to state, at the age of seventy-six. He was appointed surveyor to the Highway Board in 1864, and borough surveyor in 1885, and had thus completed forty-eight years' service. Mr. Hamer had given notice of his retirement, and Mr. B. P. Chadwick, of Bridgnorth, has been appointed to the vacant positions of borough surveyor and inspector of nuisances.

Mr. H. Percy Boulnois is to be credited, in connection with the debates he recently initiated at the Sanitary Institute, not only with the unqualified success which attended the important discussions, but with an instance of mental and physical energy which must be accounted a feat. On the occasion of the adjourned debate he spent an arduous day in Exeter, travelled to London, took part in the coursing of the hare he had started at Buckingham Palace-road, and before seeking a well-earned rest dealt with accumulated correspondence. Considering that he had only recently recovered from a passing illness, this is surely a day's record which would tax the vitality of many a younger man.

FOR OTHER ADVERTISEMENTS
See End of Paper.

KEYNSHAM RURAL DISTRICT COUNCIL.
APPOINTMENT OF HIGHWAY SURVEYOR.

The above Council invite applications for the appointment of Surveyor of Highways for their District (about 10 miles by 7, embracing 14 parishes), at a salary of £175 per annum. Duties to commence early in the New Year, probably about the end of January.

The person appointed will be required to carry out all the duties appertaining to the office of a Surveyor of Highways, including the keeping of all necessary books and accounts, and be capable of making estimates and plans, to devote his whole time to the duties of the office, and to provide a horse or other suitable means of locomotion.

Preference will be given to Candidates between the ages of 25 and 40 years, with experience as aforesaid.

Applications, stating age, experience, and qualifications, and accompanied by copies of not more than three recent testimonials, endorsed "Surveyor, &c.," to be delivered to me not later than Saturday morning the 7th December, 1912.

Selection of Candidates will take place on the 10th December, 1912, and appointment on the 17th December, 1912.

The Appointment will be subject to the approval of the Somerset County Council.

Canvassing Members of the Council, directly or indirectly, will disqualify.

FRANK G. WHITTUCK,
Clerk to the Council

Keynsham, Bristol.

ESSEX COUNTY COUNCIL.
HIGHWAYS COMMITTEE.

RECONSTRUCTION OF BURNT MILL BRIDGE.

Tenders are invited from Contractors for the execution of the necessary work involved in the reconstruction of the above bridge which crosses the Stort Navigation near Burnt Mill Station, G.E. Railway.

The work consists for the most part of the erection of abutments in brickwork and concrete, the floor being formed in steel decking.

Drawings may be seen and Bills of Quantities obtained on Saturday, November 23rd, 1912, upon application to the County Surveyor of Essex at Chelmsford.

The Council do not bind themselves to accept the lowest or any Tender.

Tenders, sealed and endorsed "Burnt Mill Bridge," are to be delivered to this Office not later than the first post on Monday, December 2nd 1912.

PERCY J. SHELDON, M.INST.C.E.,
County Surveyor.

Chelmsford,
November 20, 1912.

ESSEX COUNTY COUNCIL.
HIGHWAYS COMMITTEE.

RECONSTRUCTION OF HIGH ONGAR BRIDGE.

Tenders are invited from Contractors licensed to execute Ferro-concrete work on the Hennebique system for the erection of a New Bridge over the River Roding in the Parish of High Ongar.

Drawings may be seen and specifications obtained on and after Saturday, November 23rd, 1912 upon application to the County Surveyor of Essex at Chelmsford.

The Council do not bind themselves to accept the lowest or any Tender.

Tenders, sealed and endorsed "High Ongar Bridge," are to be delivered to this Office not later than the first post on Monday, December 2nd, 1912.

PERCY J. SHELDON, M.INST.C.E.,
County Surveyor.

Chelmsford.
November 20th, 1912.

HAMPTON URBAN DISTRICT COUNCIL.
AIR COMPRESSING MACHINERY.

The above Council are prepared to receive Tenders for the supply and erection at their Sewage Disposal Works of a duplicate set of Condensing Steam Engine Air Compressors and other subsidiary works in connection therewith.

Plan, General Conditions, Specification, Form of Tender, and further particulars may be obtained of the undersigned at the Offices of the Council, where Tenders, duly filled up, must be delivered, sealed and endorsed "Tender for Air Compressors, &c," not later than 4 p.m. on Tuesday, the 10th day of December, 1912.

Dated this 19th day of November, 1912.

(By order)
SIDNEY H. CHAMBERS,
Surveyor.

Public Offices,
Hampton, Middlesex.

WOMBWELL URBAN DISTRICT COUNCIL.
ROAD MATERIALS, &c.

The Council invite Tenders for the Supply during the twelve months ending December 31st, 1913, of the following Materials, *viz.*:—800 tons Granite, 400 tons Whinstone, 500 tons Blue Rock Limestone, 1,000 tons Tarred Dross, 1,500 tons Lump Slag and Rejections, 400 tons Basalt, 200 tons Dross Chippings, 100 tons Limestone Asphalt, 30 tons English Cement, and various quantities of Setts, Kerbing, Channelling, Flags, and Stoneware Pipes.

Further particulars and forms of tender may be obtained from Mr. W. Quest, Surveyor to the Council, Town Hall, Wombwell.

Tenders must be delivered to the undersigned, sealed and marked "Tender for Road Materials, &c.," not later than Monday, the 2nd day of December, 1912.

PERCY MILNES WALKER, Solicitor,
Clerk to the Council.

Town Hall, Wombwell.
November 20th, 1912.

COUNTY BOROUGH OF WEST HAM.
TO CONTRACTORS.

The Council hereby invite Tenders for the Erection of Fire Brigade Station and Firemen's Dwellings, Silvertown.

Plans and Specification may be seen, and Form of Tender, Bills of Quantities and further particulars obtained, at the office of Mr. John G. Morley, Borough Engineer, Town Hall, West Ham, E., upon payment of £1, which will be returned upon receipt of a *bonâ-fide* Tender.

NOTE.—No Tender will be considered unless the same is delivered at the Office of the Town Clerk, Town Hall, West Ham, E., in the envelope supplied, by registered post, not later than 4 o'clock p.m. on Tuesday, 10th December, 1912.

The Council do not bind themselves to accept the lowest or any Tender. The Contractor will be required to enter into a bond, with one surety, for the due performance of the Contract, and no work will be ordered under the Contract until such bond has been duly executed.

The Contractor whose Tender is accepted, and with whom a Contract is entered into, will be required to pay the whole of his workmen such rate of wages, and observe such hours of labour as are recognised by the Workmen's Trade Unions, and shall not assign, nor under-let, or make a sub-contract with any person or persons for the execution of any part of such work. In the event of any breach of such agreement the Council will enforce the penalty clause in its entirety.

By Order of the Council,
FRED. E. HILLEARY,
Town Clerk.

Town Hall, West Ham, E.
November 22nd, 1912.

CIVIL ENGINEER (A.M.I.C.E.) requires Temporary Berth. Expert knowledge on Modern Methods of Sewerage and Sewage Disposal. 11 years' experience in and upon Works. Experienced in Quantities, Setting-out Works, Theodolite, and Level, &c. Box No. 1,202, c/o of THE SURVEYOR, 21 Bride-lane, Fleet-street, E.C.

Progress in Developing and Conserving Water Supply for Municipal and Domestic Purposes.*

By ALLEN HAZEN, New York

In many parts of the United States water is available for all required public water supplies, without special effort being made for its collection and conservation. This is especially true of cities located on rivers of considerable size and upon the Great Lakes. In these cases it has often proved necessary to prepare the water for use by purifying it, but from the broad standpoint of securing water, no serious difficulty has been presented.

In other parts of the country water is obtained for supply from relatively small streams by building reservoirs in which flood flows are stored and made available for use in dry periods. Many of the largest cities in the country, including New York, Boston, Baltimore, San Francisco and Denver, are supplied in this manner. This general method is especially used in hilly country, and often has the advantage that the water may be supplied by gravity, thereby saving the cost of pumping. This advantage is so considerable that storage reservoirs are often used even where rivers are at hand which could furnish a sufficient quantity of water. There are also certain sanitary advantages growing out of the use of stored upland water which have frequently been of importance in determining the selection of these sources.

WATER SUPPLY POSSIBILITIES IN THE UNITED STATES.

The water supply resources of this country are very great indeed. No one knows or can know exactly how great they are. They differ with climate and topography. They are relatively less in the arid and sub-arid regions of the west and on the Southern Pacific coast. In this great area the whole available water supply will be developed and used, either for water supply or for irrigation, at a date that in the history of the country is not remote. Through the middle states there are occasionally cities located near the head waters of streams where there is or will be difficulty in securing water in large quantities without transporting it for longer distances than have been considered feasible up to the present time. With these exceptions the water resources of the country are so great in comparison with the requirements of domestic use that they may be considered practically unlimited. . . .

In a strip of land, 400 miles long and 50 miles wide, extending from Boston to Washington, are located many of the largest cities of the United States. In this region more water has been developed for public water supplies than in any other corresponding area in the world. The amount is larger than in densely populated European areas, because our per capita consumptions are several times higher; but with this done, the water resources available to this region have not been exhausted. It is true that in the immediate neighbourhood of Boston and New York the most available supplies have been developed and utilised, and it is necessary to go somewhat further for additional water; but if there were demand for more water and a market to sell it at remunerative prices, physical resources are available so that an enormously greater quantity could be supplied. Without attempting a close estimate, it may be said that at least ten times the amount now supplied could be furnished, and probably a much greater quantity. . . .

That which applies to this small area of greatest density of population applies in even greater measure to most of that part of the United States east of the arid region.

CONFLICT OF INTEREST BETWEEN CITIES.

It frequently happens that a source of water supply that is selected by one city is also physically well adapted to use by another. Each city desires to secure the control of that source or sources which can be most economically and advantageously used for its own purposes, and many conflicts have grown out of this condition. Until recently the city or company or individual that was first upon the ground and acquired sufficient property to control the situation, or secured the legislative authority to take the same by the exercise of eminent domain, held it to the exclusion of all others. In recent years a number of states where cities are near each other have established methods by which rights in new sources of supply could be acquired only after procedure intended to prevent cities, corporations or individuals from acquiring more than their fair share of water, and to protect the assumed natural right of each municipality to have for its own use the source or sources of supply most convenient and natural to it, as far as the same is not inconsistent with the like rights of its neighbours, and in case of conflict, to make as fair a division as possible. . . .

COMMUNITY OF INTEREST IN WATER SUPPLY.

Another problem similar to the last, but differing in its manifestation, is presented, where two or more cities are so situated that they can be more economically served by natural resources by one system of works than by independent systems. Cases of this kind are numerous in the older and more densely populated parts of the country, where it is frequently necessary to transport water for much greater distances than the average distances between adjoining municipalities.

The cost of transportation is often an important part of the whole cost of the water, and this cost is reduced by using one or two large lines, as compared with several smaller ones.

To secure this and other economies of combined action, water districts have been formed comprising several, or a considerable number of municipalities. In other cases water companies have supplied groups of communities. In some cases the whole water business has been consolidated under one management. In other cases the management of the distribution systems has remained local, and water has been supplied at wholesale to the local works, which have preserved their independence by acting as retailers only.

In most cases water suitable for a water supply, and land suitable for developing it, are also available for other uses. As the water resources are enormously greater than the needs of domestic supply, it naturally follows that most of the water and most of the property, from a physical standpoint, available for developing it are not in actual use for furnishing water supply, and generally the water and the properties are taken up and used for other purposes. This is not only a natural result, but it is the best arrangement considered from the standpoint of the development of the whole country. If all the water and all the land that might possibly be some time used for water supply were reserved from other uses, it would result in an unwarrantable tying up of the resources of the country, and would work great injustice.

Some of the uses to which such water and property may be put are not incompatible with their use for public water supply. Without attempting a complete statement, an example of such double use may be given. Public parks upon the gathering ground of a water supply system are not objectionable, and where large parks are desired and areas are also to be reserved for water supply purposes, it is in the interests of conservation of the resources of the country to use the same areas for both purposes as far as possible. . . .

If one follows up representative rivers in a hilly country, especially the smaller rivers in New England, or other densely populated portions of the east, a succession of dam and reservoir sites is frequently presented which, from a physical standpoint, might be utilised for storing and making available the flood flows of the streams. These reservoir sites are commonly the most productive and valuable lands; and they frequently afford the best sites for towns and cities. Hundreds of New England towns are located on ground which, under other conditions, might have been the floors of reservoirs; and the sites for the high dams that might have formed such reservoirs are occupied by mill dams of only moderate height. Railroads frequently follow the streams. To utilise such possible sources involves buying all property, removing the villages, buying out the mills and moving

* Extracts from a paper submitted to the Eighth International Congress of Applied Chemistry.

the railroads above the flow lines of the proposed reservoirs.

When a great city is looking for a water supply to serve the added needs of the growth of a generation, it can afford to buy out villages that are not too large and to re-locate railroads, and to do the other things that may be necessary to utilise a supply in such a location. This is a matter of degree. There are limits beyond which even the largest and richest cities may not go. Some of the best reservoir sites are occupied by thriving towns and cities, and are seats of industry to such an extent that they can never be used for water supply purposes. Other natural sites are remote from development and the lines of progress, and can be secured. It is often a question of buying out and utilising a naturally economical but now otherwise occupied site near at hand, or carrying the water from a more remote site which can be obtained with less disturbance to existing conditions. . . .

ANTICIPATING THE FUTURE.

One of the most interesting and difficult questions presented is as to how far a city really ought to anticipate the future in acquiring land and rights. If it were said our city has 100,000 inhabitants, and in a century will have 1,000,000, and we shall then require so many gallons of water per capita, and it will take such and such areas to supply this water, and we propose to buy them now, the result might easily be burdening the present generation unduly with interest charges on bonds issued to pay for remote and even speculative requirements, for it is quite possible that the increase in population may not be as great as assumed, and it is equally possible and probable that the habits of the people who live in another century will be different from ours. It may be that more will be required or it may be that less will suffice. It is only necessary to mention the shower bath and the swimming pool to suggest the great uncertainty of the remote future.

Then there is the certainty that there will be great developments in the whole business of water supply, and the possibility that sources will be opened up not now considered available. If there were a magnificent source of supply near at hand which could be obtained at small expense, prudence would dictate the advisability of securing it. This condition may still exist in a few cases. Far more commonly, to secure a liberal supply for a century would involve the expenditure of great sums of money to procure land and rights which would not be justified by the reasonable prospects of the case, and which ought not to be lightly undertaken. What then will happen? The properties controlling the sources will fall into other hands, and be put to such uses as they are fit. Water power is developed, the land is cultivated, railroads are built, and the property becomes valuable. Many sources of supply otherwise excellent are used for other purposes to the point which for ever effectively prevents their use for water supply. Towns and even cities are located in valleys which would otherwise form ideal reservoir sites. They cannot be moved with increasing demand for water. Instead, other and more remote sources of water supply must be found and developed, and the saving in land and rights may more than compensate for the added length of conduit.

If the water resources of our country were more limited, so that, for instance, all the water that could be produced was likely to be required for domestic and municipal purposes within a limited length of time, then it would seem desirable and necessary to study the water resources more thoroughly and to make outline projects for future requirements, and to make a greater effort to reserve the properties for water supply purposes. With conditions as they are, it may be questioned if this is feasible except in a few exceptional cases.

STATE LINES IN WATER SUPPLY.

The business of procuring, storing, distributing and selling water is . . . done by municipal and other corporations having State charters and subject to State laws. There are cases, including one very notable one, where the most economical and advantageous supply for a city is in another state, but one state does not have authority to build waterworks in another state, nor to authorise its municipalities to do so. There are instances of private corporations that have secured water in one state and sold it in another, but in many important cases the State line has been regarded as an insurmountable barrier. For this reason a supply partly on either side of a state line is usually considered not to be available for municipal use at the present time. . . .

There is no logical reason why any city in this country should not have the privilege and all the rights that are necessary to develop a water supply wherever in its neighbourhood it can be most economically and advantageously done. If existing laws do not permit this, as they apparently do not, the sooner this matter can be corrected the better it will be. The Constitution of the United States prohibits the States from imposing duties on exports. It does not seem to prevent a state from prohibiting the export of a commodity. One state has done this with water, and has amended its constitution to this end. Probably the idea of this change in the law was that ultimately all the water resources of the state would be required by its own citizens, and that it was wise to prevent the diversion of any of the water into another state. . . .

If water supplies are developed and used, and all the water drawn from them that can be drawn during this century, there will be just as much water available in the centuries that follow as if not a drop had been utilised in this. If, instead of prohibiting the sale of water outside the state, provision were made for controlling it, or so that the rights would revert after a long period, water could be sold and profits realised on its sale through a period of years which might be very long, and still there would be absolutely no reduction in the amount of water ultimately available to the citizens of the state.

On the other hand, developing supplies for use outside the state would tend to insure retaining the properties on which they rest for water supply purposes, while if they are not so used some of them are certain to be used for other purposes, and will cease to be available for water supply before the time when they might be required for use in the state in which they are situated, and so far as this is the case the prohibition of present use means permanent loss of these sources of water supply.

COMPENSATION.

Compensation is calculated upon the theory that when the right to divert water is obtained, the diversion of the water begins at once, and is complete. In order to secure a valid right for the diversion of water from a particular source, it is customary and apparently necessary in most cases to secure the full right to the whole source. This practically results in the recovery by the riparian owners of damages for the diversion of all the water, and as only a fraction of the water is needed at first, the balance flows down the stream as before, and the owners continue to enjoy a large part of that which they have been paid for. Of course, conditions vary greatly. There are cases where diversion is comparatively complete from the start, but they are exceptions.

It frequently happens that the area from which water is to be taken is large, and that flood flows from it are very great, and flow to the sea without advantage to anyone. In fact, these flood flows are frequently destructive and do positive harm instead of good on their way. Taking a source for water supply frequently means building a large impounding reservoir and holding back these flood flows to fill the reservoir. It is sometimes possible to so manage the business that only flood flows will be taken for water supply, and that the moderate flows of the stream will remain undiminished. In England this procedure has been established by law, and is called compensation in kind. That is to say, the law provides that when a stream is taken for water supply, the storage provided shall be sufficient to not only furnish the water taken for domestic supply, but also to maintain flows of the stream which are regulated by procedure so that riparian rights below will be no less valuable than they were before.

In a number of cases arrangements of this kind have been carried out in America voluntarily. Such arrangement may be mutually advantageous because it relieves the water undertaking of heavy water damages, and at the same time, if properly carried out, insures the power owners against loss of power, and, in fact, practically may even give them more power than they had before. Legal recognition is needed to enable this most useful procedure to be carried out fully and with the best results.

Irish Roads.—The total sum allocated by the Road Board to Ireland up to March last was £203,528.

TRACKLESS TROLLEYS AND ROAD MAINTENANCE.

In the House of Commons on Monday consideration was given to the report on the Light Railways Bill, as amended in Standing Committee.

Mr. J. M. Robertson (Parliamentary Secretary, Board of Trade), on behalf of the Government, moved the omission of Clause 2, which empowers the Light Railway Commissioners to authorise trackless trolley systems. He said the clause as amended in committee cast a heavy liability on the promoters of trackless trolley systems in regard to the roads, and it was regarded by the roadway interest as being an evil so great that they would rather have no provision made for trackless trolley systems at all. They said they would rather have the existing procedure under which they had to come to Parliament for powers. As the clause had been originally framed for the purpose of facilitating trackless trolley schemes, the Government considered that it was not reasonable to persist with the amended clause when those whom it was anticipated would benefit by it did not attach any value to it. The effect of the omission of the clause would be that the law in relation to trackless trolley systems would remain as it was now. It seemed to the Government it was preferable that questions of road maintenance should be dealt with in a general comprehensive and systematic manner rather than in such a piecemeal fashion as was the case in this measure. The amendment would leave trackless trolleys out of the Bill.

The retention of the clause was supported by several speakers, on the ground that under its terms the owners of trackless trolleys would be required to contribute, as do tramways, to the upkeep of the roads; other members objected to this new form of locomotion being singled out with this object, while heavy motor waggons and so forth escaped contribution.

Mr. Joynson-Hicks approved of the action of the Government, holding that the House should be set free to deal with the whole question at the first opportunity.

Mr. C. T. Needham (South-West Manchester) agreed that this question of the maintenance of the roads was one which ought to be dealt with in a large measure, and not in detail by reasons in such a Bill as the present. He had a letter from the tramways department of the Manchester Corporation, supporting this view of the question.

Mr. Robertson stated that the Municipal Tramways Association also took the view that the question of road maintenance should be dealt with [illegible] systematic manner than was possible in a Bill [illegible] this sort.

Mr. P. W. Raffan (Keighley) asked that an assurance that the question of the promotion of the schemes would be borne in mind, and that some inquiry at least would be made into it. It was extremely hard that the promoters of traction schemes should have to come to Parliament year after year at a great expense, when a much more expeditious and less expensive plan could be devised.

Mr. Robertson promised that this aspect of the question should be borne in mind.

On a division the proposal to take out the clause was carried by 317 votes to 134.

The consideration stage of the Bill was completed, and the Bill was then read a third time.

True Economy. Finding that to employ a contractor to do the work would be far too costly, the villagers of Ashley, in Staffordshire, headed by the vicar, the Rev. J. Richards, are occupying themselves in their spare time in constructing a system of sewerage. Mr. Richards expects that a 1d. rate in Ashley yields only £12, and that it would have taken thirty years to have paid off the money if they had employed a contractor. As it was the work would soon be finished.

Roads Improvement Association Activities.—At the next council meeting of the Roads Improvement Association a private exhibition of a film depicting London traffic conditions will be given by the British and Colonial Kinematograph Company. The Roads Improvement Association is considering the possibilities of the cinematograph for (1) educating the general public how to avoid common traffic dangers, (2) demonstrating to the authorities cases of needless traffic congestion or danger, and (3) generally promoting the association's propaganda.

UNITED STATES OFFICE OF PUBLIC ROADS.

THE LABORATORY APPARATUS.

The following is a list of the testing apparatus and accessories which form the equipment of a laboratory of the United States Office of Public Roads. It is not to be assumed that the list is exhaustive as regards the equipment used by that office, but it includes all the apparatus necessary for the carrying out of tests of a well-known character.

Testing Machines: A four-cylinder Deval abrasion or attrition machine—An impact testing machine for toughness tests—A Dorry hardness testing machine—A cementing-value impact testing machine.

Apparatus for Preparing Specimens: A briquette machine and mould, for cementing value tests—A diamond core drill—A diamond saw. Two grinding laps—A small disc grinder—A small jaw crusher—Two ball mills—A large drying oven—A desiccator for cooling briquettes.

Sieves: Two 15-in. sieves 0.6-in. mesh and No. 40 mesh. A set of sieves including sizes from 1½ in. by ¾ inches down to ¾ inch; also ¾ in., and sizes 10, 20, by tens to 80, and 100 and 200.

Scales: Platform scales (500 lb. to ¼ lb.). Scales (5 kilograms to ½ gram). Chemical balance (100 grams to 100th gram.

Thermometers: A room thermometer. An oven thermometer.

Measures: A cubic foot measure. A ½ cubic foot measure. Vessels graduated to 100, 500 and 1,000 cubic centimetres. A 200 cubic centimetre beaker for specific gravity test.

Other Vessels: A dozen 3-quart pans for holding rock samples before and after the abrasion test. A dozen pint jars.

Tools: A 50-lb. anvil. A 10-lb. sledge hammer. A 3-lb. double-face stone hammer. A 1½-lb. single-face tool hammer. A 6-in. scoop.

Materials, &c.—A barrel of quartz sand, between No. 30 and No. 40 sieves. A 50-lb. bale of waste. A galvanised iron waste can. Oil can and motor oil. Six sink scrubbing brushes. 100 sample box (17 in. square when empty). 500 blank labels.

New Reinforced Concrete Loading Pier at Southend-on-Sea.—Construction work has commenced for the new loading pier which the Corporation of Southend-on-Sea has decided to erect under the superintendence of Mr. Ernest J. Elford, M.Inst.C.E., the borough engineer. The total length of the pier will be 600 ft., and it has been designed for a working load of 5 cwt. per square foot. The whole of the work will be executed on the "Piketty system" of reinforced concrete. Mr. T. W. Pedrette, Enfield, N., is the contractor. The contract is for £11,000. The borough engineer selected and recommended the adoption of the "Piketty system" after receiving designs, in open competition, from [illegible] firms of ferro-concrete specialists.

Modern Survey Work.—A lecture on surveying was given by Mr. F. H. Wrench, Assoc.M.Inst.C.E., at the last meeting of the Sheffield Society of Architects and Surveyors. Mr. Wrench described some of the instruments used and the methods adopted in surveying, and he dealt with the exploration survey made by travellers in an unmapped country, topographical surveys, those surveys made for boundary and jurisdiction purposes, and those made for engineering or constructional purposes. In order to get over difficulties in the art of sketching, photography had been introduced in many classes of work, and this had proved most valuable. The plan table was hardly ever used in this country, probably because the ordnance survey had done much of the work for which this instrument was most useful. But with this instrument remarkably rapid surveying was done. For rough work the student could easily make his own plane table. A method practically unknown in England, very useful to explorers, was the photo-theodolite, with which some excellent work had been done in Canada, among the Rockies. The best results with the camera were only obtainable in treeless districts, where an extensive panoramic view could be secured. Mr. Wrench exhibited a number of surveying instruments, and he also showed samples of survey work carried out in most of the principal countries of the world. Thanks to Mr. Wrench were carried, on the motion of Mr. A. F. Watson, seconded by Mr. T. Winder.

SOME RECENT PUBLICATIONS.*

Common-sense Homes.—A Practical Book for Everybody upon the Essential Equipment and Treatment of the Home. By Spencer Sells, member of the Society of Engineers and the Institution of Municipal Engineers. Price 5s. nett. London: Cassell & Co., Limited.

The author aptly quotes a dictum that "The national well-being depends very much upon the standard of comfort in the home." Hence his imposing-looking volume of 168 demy-quarto pages, introduced by a coloured frontispiece of a room fitted with a type of Devon fire and studded with twenty diagrammatic illustrations and thirty-two plates, all admirable specimens of draughtsmanship and reproduction respectively. The letterpress, written in non-technical language, is divided into seven sections: Structure; Water supply; Drains and drainage; Dust, dirt, refuse; Light and air; Warming; and Lighting. It evidences throughout sound common-sense and practical knowledge, and we commend it cordially to every householder. If that usually happy-go-lucky individual could be persuaded to assimilate some of the simple principles here set forth as to methods and fitments, he would be helped materially to maintain the "standard of comfort" of his home at a higher level than that usually set for him by the casual plumber.

A DIARY FOR CITY MEN.

"The City Diary" (W. H. & L. Collingridge, price 1s.) celebrates its jubilee with the new volume for 1913. To the City man it cannot fail to be of daily usefulness, as it not only has ample space for the insertion of daily records, but it contains a large amount of information respecting the City of London, and is a reliable guide to all its institutions. It gives lists alphabetically arranged, according to wards, of the members of the corporation and its officers; of the City churches, with the names of clergy, lecturers and vestry clerks; and of the City Livery Companies, with the names of the clerks and the situation of the halls. Details concerning the London County Council, the City Union, and other governing bodies are supplied, and an exhaustive table of social organisations, forming a singularly practical companion for every citizen. The diary portion, with three days to a page, is interleaved with blotting-paper of excellent quality, and cash columns are ruled on the several pages. It is certainly a good shillingsworth.

To the railway engineer or contractor whose work is likely to take him into Spanish-speaking countries the "Dictionary of Railway Terms," compiled by Andrés J. R. V. García, and published by Constable & Co., Limited, at the price of 12s. 6d. nett, will be particularly welcome. The work is exclusively devoted to interpreting words and terms that concern railway enterprises, special terms which are used in Cuba, Mexico and South America, and which differ from those used in Spain, being included, and the exhaustive character of the dictionary will readily be understood when it is stated that the two sections (Spanish-English and English-Spanish) cover some 250 demy 8vo. pages, each page containing between fifty and sixty entries.

The current number of the *Electrical Review* celebrates the fortieth anniversary of that widely-read publication. A feature of the issue is an article by Sir Wm. H. Preece, K.C.B., F.R.S., for a short time the editor. Sir William cannot be accused of exaggeration when he says that the file of the *Electrical Review* is a history of the life of the electrical industry, and we join in his congratulations to the editors and proprietors on the position they have so well maintained, and hope that at some future day we may be able to complement them on the jubilee of their achievement.

On the first line of the sixth paragraph of the review of the Municipal Tramways Association Interim Committee's report on rail corrugation, in last week's issue, the sentence should have read "It is a puzzle and at the perplexity upon the subject . . ." Another error occurred in the seventh line of the second column, the word "scarcely" appearing in place of "merely."

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. Thomas, M.Inst.C.E., County Surveyor, Buckinghamshire.

EASTERN DISTRICT.

Chairman—Mr. Alfred Fidler, M.Inst.C.E., Northampton.

An Eastern District meeting is to be held at Lyons' Victoria Mansions Restaurant, Victoria-street, Westminster, on Saturday, December 7th.

Programme.

5 p.m.—Meeting of the Eastern District Executive Committee at the offices of the institution, 11 Victoria-street, Westminster, S.W. Note. The members of this committee were elected at the Grays meeting, and have been so notified.

6 p.m.—Dinner at Lyons' Victoria Mansions Restaurant (Victoria-street, Westminster). Tickets 2s. 6d. each.

7 p.m.—Discussion on the report of the Departmental Committee of the Local Government Board in reference to Intercepting Traps on House Drains, to be opened by Mr. H. P. Boulnois, M.Inst.C.E.

8 p.m.—Music and conversation.

8.30 p.m.—Suggestions and discussion in regard to the work of the institution, with special reference to the Eastern District.

Notices.

In order that the necessary arrangements may be made, members must give notice of their intention to be present not later than Monday, December 2nd, and remittances for dinner tickets should also be sent by this date. Members are requested to make a special effort to attend this meeting, and, if convenient, the dinner, as the hon. district secretary has had to agree to take a certain number of tickets for the latter. A cordial invitation is given to members of the institution outside the Eastern District to attend the dinner and discussion.

Ernest J. Elford, M.Inst.C.E.,
Hon. District Secretary.

Borough Engineer,
Southend-on-Sea.

SOUTH-EASTERN DISTRICT.

A meeting of members of the above district will take place at Sidcup at 2.30 p.m. on Wednesday, January 8th, when the road sections will be inspected.

Mr. Maybury has kindly consented to supply the revised cost of the trial lengths up to December 31st; the meeting will be followed by a dinner at Frascati's Restaurant, Oxford-street, at 6.30 p.m.

A meeting of the institution will be held at Caxton Hall, Westminster, on Friday, December 6th, at 8 p.m., to discuss a paper to be read by Mr. H. T. Wakelam on "Tramway Rail Corrugation."

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. Frank Latham, M.Inst.C.E.I., F.S.E., Borough Engineer and Surveyor, Penzance.

JOINT SOUTHERN AND SOUTH-EASTERN DISTRICT MEETING.

A Joint Southern and South-Eastern District meeting will be held in the council chamber, No. 4 Southampton-row, London, W.C., on Wednesday, November 27th, at 8 o'clock, when a paper, "The Effect of Recent Decisions upon the Arbitration Clause," by Mr. W. Valentine Ball, M.A., barrister-at-law, author of "The Law Affecting Engineers," joint editor of "Emden's Building Contracts," 4th edition, will be read.

The subject of Mr. Valentine Ball's paper is of wide importance to engineers and others engaged in municipal work, and it is hoped that each member will, where possible, bring to the meeting his town clerk, chairmen of committees, and others interested in the

matter. The discussion will be an open one, and an advance copy of the paper may be had upon application.

The building, No 4 Southampton-row, is almost opposite the Holborn Station of the Great Northern and Piccadilly Tube, and within a minute of the British Museum Station of the Central London Railway. Omnibuses from all parts practically pass the door.

ARTHUR PALMER,
J. WOOLFORD BROOK,
Joint Hon. District Secretaries.

JOINT WESTERN AND SOUTH-WESTERN DISTRICT MEETING.

A Joint Western and South-Western District Meeting will be held at Gloucester and Exeter on Friday and Saturday, November 29th and 30th.

PROGRAMME.

Gloucester Meeting, Friday, November 29th.

3 p.m.—Meet at the New Inn, Gloucester.
Business meeting of the Western District.
Short address by the president.

4 p.m.—Discussion of Mr. A. Winter Gray's paper, "Superannuation and Security of Tenure," which will be taken as read.

5 p.m.—Adjourn for tea.

6 p.m.—Informal meeting, at which Mr. Latham will preside.

Exeter Meeting, Saturday, November 30th.

3 p.m.—Meet at the Bude Hotel, Exeter.
Business meeting of the South-Western District.
Short address by the president.

4 p.m.—Discussion of Mr. A. Winter Gray's paper, "Superannuation and Security of Tenure," which will be taken as read.

Discussion on the question of "Working-Class Housing," when two or three short papers will be presented. Members are requested to contribute what information they can on the question, in order that it may be fully discussed, with a useful interchange of views and experience.

6 p.m.—Adjourn for tea.

7 p.m.—Social evening, with musical programme, at the Bude Hotel, to which members and their friends are invited.

Members are requested to make every effort to attend on at least one of the above days. As stated, Mr. Latham will be present on both days, and would be glad to meet as many members as possible.

JOHN BROOK,
C. OWEN BAINES,
Joint Hon. District Secretaries.

November 11, 1912.

B. WYAND,
39 Victoria-street, S.W. *Secretary.*

INSTITUTION OF WATER ENGINEERS.

President—Mr. J. S. PICKERING, M.INST.C.E., borough surveyor and water engineer, Cheltenham.

WINTER GENERAL MEETING.

The seventeenth Winter General Meeting of the Institution of Water Engineers will be held at the apartments of the Geological Society, Burlington House, W., on Saturday, December 14th. The proceedings will commence at 10.30 a.m., or as soon as the business of the special general meeting called for 10 o'clock, is completed. The usual informal dinner will be held on Friday evening.

The following papers have been promised for reading and discussion:

(1) "Some Recent Examples of Pollution of Public Water Supplies," by J. C. Thresh, D.SC., M.D., &c.

(2) "The Valuation of Water Undertakings on Transfer to Local Authorities," by E. J. Silcock, M.INST.C.E., F.S.I.

(3) "Recent Advances in the Science of Water Purification," by Adolph Kemna, D.SC.

Advance copies of these papers will, it is hoped, be available for the use of those wishing to take part in the discussions, but as only a limited number will be printed early application should be made.

PROGRAMME.

10.30 a.m.—The minutes of the seventeenth ordinary general meeting and of the special general meeting will be read and submitted for confirmation; ballots will be taken for council for the year 1913-14, and for new members; reading of papers and discussions thereon.

The meeting will be adjourned for luncheon or otherwise as circumstances may require.

PERCY GRIFFITH,
Secretary.

20 Victoria-street, S.W.

ROYAL SANITARY INSTITUTE.

PROVINCIAL SESSIONAL MEETING, DONCASTER.

A sessional meeting of the Royal Sanitary Institute will be held to-morrow (Saturday), in the Mansion House, Doncaster, at 11 a.m., when a discussion will take place on "Town Planning in Relation to the Development of the South Yorkshire Coalfield," to be opened by Dr. A. B. Dunne, medical officer of health, Doncaster Rural District Council.

Among those whom it is hoped will take part in the discussion are Messrs. R. A. MacBrair, M.INST.C.E., city engineer and surveyor, Lincoln; R. G. Whitley, surveyor, Bentley Urban District Council; C. F. Wike, M.INST.C.E., city engineer and surveyor, Sheffield; and John W. Wilson, surveyor, Bolton-upon-Dearne Urban District Council.

The chair will be taken by Mr. H. Percy Boulnois, M.INST.C.E., chairman of council of the institute.

The members will be entertained at lunch by the Corporation of Doncaster, and later in the day will proceed on a visit to the Woodlands Model Colliery Village.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

President—Mr. JOHN D. WATSON, M.INST.C.E., F.R.SAN.I.

ANNUAL GENERAL MEETING AND DINNER.

The eleventh annual general meeting and dinner of the Association of Managers of Sewage Disposal Works will take place on Thursday, December 12th, at the Holborn Restaurant, London.

PROGRAMME.

11 a.m.—Council meeting.

2 p.m.—Annual general meeting, chairman's annual report, balance-sheet, reading of papers; discussion.

6.30 p.m.—Reception.

7 p.m.—Annual dinner.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1369 Holborn), subject to later confirmation by letter.*

SURVEYOR OF HIGHWAYS. November 23rd. Southwell Rural District Council. £100 per annum.—Mr. John Ellis, clerk.

CLERK OF WORKS.—November 25th.—Ruislip-Northwood Urban District Council. £3 3s. per week.—Mr. Edmund R. Abbott, clerk. Applications to be endorsed "Clerk of Works."

ENGINEER AND SURVEYOR.—November 25th.—Rawmarsh Urban District Council. £200 per annum.—Mr. J. W. Bellamy, clerk. Letters to be endorsed "Engineer and Surveyor."

SURVEYOR.—November 25th.—Brackley Rural District Council. £110 per annum.—Mr. C. E. Barnes, clerk.

SURVEYOR AND INSPECTOR OF NUISANCES.—November 26th.—Eton Urban District Council. £150.—Mr. J. E. Gale, clerk, 3 Sheet-street, Windsor. Envelopes to be endorsed "Surveyor, Eton."

TOWN PLANNING ASSISTANT. November 28th.—Doncaster Rural District Council. £12 per month.—Mr. H. M. Marshall, clerk.

CLERK OF WORKS.—November 29th.—Queenstown Urban District Council. £2 10s. per week.—Mr. J. H. Campbell, clerk.

SURVEYOR.—November 29th.—Bedwas and Machen Urban District Council. £120 per annum.—Mr. A. E. S. Thomas, clerk, Bedwas, Mon.

INSPECTOR OF NUISANCES.—November 29th.—Bedwas and Machen Urban District Council. £80 per annum.—Mr. A. E. S. Thomas, clerk, Bedwas, Mon.

INSPECTOR OF NUISANCES.—November 30th.—Newquay Urban District Council.—Mr. G. F. Nicholls, clerk.

DEPUTY CITY SURVEYOR.—November 30th.—Corporation of Manchester. £750 per annum.—Mr. Thos. Hudson, town clerk.

DISTRICT SURVEYOR OF MAIN ROADS.—December 3rd.—East Sussex County Council. £160—£200.—Mr. F. Merrifield, clerk.

ARCHITECTURAL ASSISTANT.—December 4th.—Corporation of Birkenhead. £170—£185.—Mr. Chas. Brownridge, borough engineer and surveyor.

INSPECTOR OF NUISANCES.—December 5th.—Oundle Rural District Council. £90 per annum.—Mr. G. Coombs, clerk, New-street, Oundle.

ROAD FOREMAN.—December 11th.—Tonbridge Urban District Council. 35s. per week.—Mr. W. L. Bradley, engineer and surveyor, The Castle, Tonbridge.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1369 Holborn), subject to later confirmation by letter.*

WANDSWORTH. November 30th.—Designs for a public swimming bath at Balham.—Mr. P. Dodd, borough engineer, 215 Balham High-street, S.W.

BELFAST. January 1st.—Designs for 126 houses of two apartments each, and 126 houses of three apartments each, for the corporation. Premiums are offered of £25, £15, and £10.—Mr. R. Meyer, town clerk.

ORSETT (Essex).—January 1st.—For the construction of a sewerage and sewage disposal scheme in the parish of South Ockendon, for the Orsett Rural District Council. Premiums of £50 and £25 are offered.—Mr. James Beck, clerk, 2 Orsett-road, Grays.

DUBLIN.—January 1st.—Designs for municipal buildings for the corporation. The proposed expenditure is £200,000, and the author of the design placed first will be appointed to carry out the scheme on a 5 per cent. basis. Premiums of £150 and £100 are offered. The assessor is Mr. Albert E. Murray, F.R.I.B.A. The Town Clerk.

HARROGATE. February 3rd.—Designs for a council school, for 675 children.—Mr. C. E. Rivers, ASSOC.M. INST.C.E., borough engineer.

FOLKESTONE. No date.—Designs for a bandstand, cost not to exceed £20,000, for the corporation. Premium of 100 guineas, 50 guineas and 25 guineas are offered. The Town Clerk.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1369 Holborn), subject to later confirmation by letter.*

Buildings.

HARROGATE. November 25th.—For the erection of a lodge and conveniences, and additions to [illegible] for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor.

HERTS.—November 25th.—For the erection of a school, for the county council.—Mr. Urban A. Smith, county surveyor, Hatfield.

STOURBRIDGE.—November 25th.—For engine-house extension, new boiler seatings and raising of chimney stack, for the District Water Board.—Mr. J. Donaldson Harward, clerk, High-street, Stourbridge.

PORTSMOUTH.—November 26th.—For the erection of forty-three houses, with wall and iron fence, for the corporation.—Mr. G. Hammond Etherton, town clerk.

HULL.—November 27th.—For alterations at the power station, for the corporation.—City Engineer.

MANCHESTER.—November 27th.—For alterations to boiler-house and reconstruction of main flue at generating station, for the corporation.—Mr. Thomas Hudson, town clerk.

HALE.—November 28th.—For the conversion of the girls' home into public offices, for the urban district council.—Mr. J. G. Whyatt, clerk.

GLASGOW.—November 30th.—For the construction of public conveniences, for the corporation.—Mr. J. Lindsay, town clerk.

GUILDFORD.—November 30th.—For the erection of cemetery chapel and lodge, iron fencing and gates, and forming paths, for the Joint Burial Committee.—Messrs. Potter & Crundwell, joint clerks, Farnham.

WEST HAM.—December 2nd.—For the erection of a handicraft centre, for the corporation.—Mr. Fred. E. Hilleary, town clerk.

MAESTEG.—December 3rd.—For alterations to town hall and market buildings, for the urban district council.—Mr. R. Scale, clerk.

LANCS.—December 3rd.—For the erection of an elementary school, for the Education Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

HYDE.—December 3rd.—For extensions to public baths, for the corporation.—Mr. Thomas Brownson, town clerk.

WOLVERHAMPTON.—December 3rd.—For the erection of a horse repository, for the corporation.—Mr. G. Green, borough engineer.

HUNSTANTON.—December 4th.—For the erection of shelters, for the urban district council.—Mr. J. S. B. Glasier, clerk.

KENT.—December 4th—19th.—For the erection of a school, for the Education Committee.—Mr. F. W. Crook, secretary, Caxton House, Westminster, S.W.

MONMOUTHSHIRE.—For the erection of a police court, for the Joint Standing Committee.—County Surveyor, Newport.

Iron and Steel.

NEWMARKET.—November 25th.—For carting, excavating for and laying 5 miles of 3-in. cast-iron pipes, including fixing valves and hydrants, and erection of brick water tower, for the rural district council.—Mr. S. J. Ennion, solicitor.

COVENTRY.—November 25th.—For the supply of manhole covers, gullies, pavement channels, and step irons, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

NEWMARKET.—November 25th.—For the supply of 163 tons of 3-in. cast-iron pipes and specials, the erection of cast-iron tank and other works, for the rural district council.—Mr. S. J. Ennion, solicitor.

BILLERICAY.—November 25th.—For providing and laying cast-iron water main, for the rural district council.—Mr. C. Edgar Lewis, clerk.

GOOLE.—November 26th.—For the supply of cast-iron pipes, for the rural district council.—Mr. G. England, clerk.

LEYTON.—November 26th.—For the supply and erection of unclimbable fencing, for the urban district council.—Mr. E. H. Essex, surveyor.

AYR.—November 27th.—For the supply of 220 tons of steel-grooved tramway rails and fish-plates, for the corporation.—Mr. P. A. Thomson, town clerk.

SOUTHWARK.—November 27th.—For the supply of fifty cast-iron street orderly bins, for the borough council.—Borough Engineer.

CLACTON.—December 4th.—For the supply of 50 tons of British cast-iron plates and connections, for the urban district council.—Mr. G. T. Lewis, clerk.

SOUTHEND.—December 6th.—For the supply of 200 tons of Sanberg steel rails and fish-plates, for the town council.—Mr. E. J. Elford, borough engineer.

Roads.

STAFFORD.—November 23rd. For making up portions of two streets, for the corporation.—Mr. R. Battle, town clerk.

KNUTSFORD.—November 25th.—For making up a certain street, for the urban district council.—Mr. R. W. Marshall, surveyor.

RUNCORN.—November 25th.—For the supply of Haslingden kerbs and channels, for the urban district council.—Mr. E. Marshall, secretary.

RUNCORN.—November 25th.—For 2,200 yds. of granite tar-macadam, for the urban council.—Mr. E. Marshall, secretary.

ROMFORD.—November 25th.—For the supply of best blue Guernsey granite, for the rural district council. Mr. George Lapwood, highway surveyor, Victoria Chambers, Romford.

ROWLEY REGIS.—November 25th.—For work of making up, for the urban district council.—Mr. Daniel Wright, clerk.

RUNCORN.—November 25th.—For work of road widening, for the urban district council. Mr. E. Marshall, secretary.

FRIERN BARNET.—November 26th.—For work of making up, for the urban district council. Mr. E. J. Reynolds, engineer and surveyor.

SWANSEA.—November 26th. For carrying out private street works, for the corporation. Mr. H. Lang Coath, town clerk.

LEWISHAM.—November 26th. For making up certain roads, for the borough council. Borough Surveyor.

SOUTHGATE.—November 26th. For carrying out private street works, for the urban district council. Mr. W. M. Ellenor, clerk, Council Offices, Palmer's Green, N.

GATESHEAD.—November 26th. For work of paving, for the corporation. Mr. W. Swinburne, Town Hall, Gateshead.

COLWYN.—November 26th.—For work of road widening, for the urban district council. Mr. W. Jones, engineer and surveyor.

WOODFORD.—November 26th.—For making up certain streets, for the urban district council.—Mr. W. Farrington, surveyor.

HULL.—November 27th.—For flagging and timber work, for the town council.—Mr. A. E. White, city engineer.

GREENWICH.—November 27th.—For supplying 3,000 ft. super. of 3-in. and 3,000 ft. super. of 2½-in. tooled York stone, for the borough council.—Mr. Francis Robinson, town clerk.

ROCHDALE.—November 27th.—For work of making up, for the corporation.—Borough Surveyor.

WEST HARTLEPOOL.—November 27th. For work of making up, for the corporation. Mr. Nelson F. Dennis, borough engineer and surveyor.

WARWICKSHIRE.—November 27th.—For the supply of road material (broken and unbroken), for the county council. Mr. John Willmot, county surveyor.

HORSHAM.—November 27th. For the supply of 600 tons of broken basalt stone (1¼-in. gauge), for the urban district council. Mr. S. Mitchell, clerk.

GREENWICH.—November 27th.—For work of paving, for the borough council.—Mr. Francis Robinson, town clerk.

NEWPORT (Mon.).—November 28th.—For works of street improvement, for the town council. Borough Engineer.

CANNOCK.—November 29th. For the supply of refined tar, prepared in accordance with the specification of the Road Board, for the urban district council. Mr. C. A. Laxton, clerk.

MONMOUTHSHIRE.—November 29th. For alterations to main road, for the county council.—Mr. W. Tanner, county surveyor, Newport.

PORTHCAWL.—November 29th.—For carrying out private street works, for the urban district council. Mr. W. Chorley, clerk.

SEAFORD.—November 30th.—For the supply of granite flake and broken granite, for the urban district council.—Mr. W. H. Pawson, clerk.

CAMBRIDGE.—December 2nd.—For the supply of broken granite, syenite, basalt or similar stone, for the corporation.—Mr. J. E. L. Whitehead, town clerk.

HITCHIN.—December 2nd.—For the supply of broken granite, for the urban district council.—Mr. W. Onslow Times, clerk.

BROMLEY.—December 3rd.—For work of making up, for the corporation.—Mr. F. H. Morgan, town clerk.

EALING.—December 3rd.—For supplying and laying patent or other road materials, for the corporation.—Mr. Geo. Brydges, town clerk.

HOVE.—December 4th.—For paving and other works, for the corporation.—Mr. H. Endacott, town clerk.

BRIDGWATER.—December 6th.—For the supply of stone for the roads, for the rural district council.—Mr. T. M. Reed, clerk.

WEST SUSSEX.—December 7th.—For the supply of broken granite, quartzite or other approved stone, chippings, tarred macadam, picked surface flints, pit flints, sand or binding material, cartage and team labour, for the county council.—Mr. H. W. Bowen, county surveyor.

SOUTHAMPTON.—December 9th.—For the supply of refined tar for surface treatment of the main roads, for the county council.—Mr. H. Barber, clerk.

BECKENHAM.—December 9th.—For making up Overbury-avenue and Hampden-road, for the urban district council.—Mr. F. Stevens, clerk.

SOUTHAMPTON.—December 9th.—For the supply of columnar basalt, Clee Hill basalt, Welsh granite, coverack, or similar syenite, quartzite, and tarred-macadam, for the county council.—Mr. H. Barber, clerk, The Castle, Winchester.

SOUTHAMPTON.—December 9th.—For the hire of steam rollers, for the county council.—Mr. H. Barber, clerk.

STRETFORD.—December 9th.—For paving certain passages, for the urban district council.—Mr. Geo. H. Abrahams, clerk.

WILTS.—December 10th.—For the supply of granites, basalts, flints, limestones and gravel, for the county council.—Mr. J. George Powell, county surveyor.

WILTS.—December 10th.—For steam rolling main roads, for the county council.—Mr. J. George Powell, county surveyor.

WILTS.—December 10th.—For the supply of tools for road work, for the county council.—Mr. J. George Powell, county surveyor.

KENT.—December 11th.—For the supply of 60,000 tons of broken road stone, such as Rhenish basalt, Guernsey, Jersey or Alderney granites, Clee Hill basalt, Leicester granite, Penlee, St. Keverne or other Cornish granites, Northumberland whinstone, Penmaenmawr or other North Wales granites, quartzite, Norway granite, or Quenast or Tassines, for the county council. Mr. W. B. Prosser, clerk.

CHEADLE.—December 11th. For making good two roads, for the urban district council.—Mr. Arthur Briggs, clerk.

SOUTHAMPTON.—December 20th.—For the supply of tools for use on the main roads, for the county council.—Mr. H. Barber, clerk.

SOUTHAMPTON.—December 20th.—For the supply of surface-tarring machines, for the county council.—Mr. H. Barber, clerk.

SOUTHALL-NORWOOD.—December 24th.—For making up and channelling work, for the urban district council.—Mr. R. Brown, engineer and surveyor.

Sanitary.

RUISLIP-NORTHWOOD.—November 25th.—For the removal of house refuse, for the urban district council.—Mr. E. R. Abbott, clerk.

COLWYN.—November 25th.—For the construction of stoneware pipe sewer, for the urban district council. Mr. J. Amphlett, clerk, Council Offices, Colwyn Bay.

COVENTRY.—November 25th. For the supply of earthenware or stoneware pipes, bends and junction pipes, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

COCKERMOUTH.—November 25th. For laying a sewer, for the rural district council.—Mr. J. B. Wilson, Greenan Villa, Cockermouth.

ASHTON.—November 25th.—For constructing ashpits and ashbins, for the urban district council. Mr. J. W. L. Foulkes, clerk, Ashton-in-on-Mersey.

ALNWICK.—November 25th.—For laying socketed glazed pipes and tile field pipes, for the rural district council.—Mr. H. W. Walton, clerk.

SOUTHOWRAM.—November 25th.—For work of scavenging, for the urban district council.—Mr. J. E. Oates, surveyor.

CAERPHILLY.—November 26th.—For the erection of two public conveniences and construction of sewers, for the urban district council.—Mr. Alfred O. Harpur, surveyor.

WESTCLIFF.—November 26th.—For work of sewering, for the urban district council.—Mr. F. P. Wheatley, town clerk.

GLOUCESTER.—November 26th.—For the construction of a main outfall sewer, for the corporation.—Town Clerk.

WOOD GREEN.—November 27th.—For the construction of two ring brick culverts, for the urban district council.—Mr. W. P. Harding, clerk.

STOCKTON-ON-TEES.—November 30th.—For emptying ashpits and privies, for the rural district council.—Mr. T. H. Faber, clerk.

AUCKLAND.—December 2nd.—For laying earthenware pipe drains and manholes, for the rural district council.—Mr. Sam Adams, clerk.

LEEDS.—December 2nd.—For the supply of 6 No. independent units of combined centrifugal sewage pumps direct, coupled to 3-phase alternating current motors, and other incidental work at the new pumping station, for the corporation.—Mr. Robert E Fox, town clerk.

CHEPPING WYCOMBE.—December 3rd.—For the supply of stoneware pipes and coal, for the corporation.—Mr. T. J. Rushbrooke, borough surveyor.

MALLING.—December 3rd.—For work of scavenging, for the rural district council.—Mr. F. J. Allison, clerk, West Malling.

CARSHALTON.—December 4th.—For the construction of stoneware pipe sewers, manholes and lampholes, for the urban district council.—Mr. C. P. Lovelock, clerk.

LEEDS.—December 5th.—For the construction of sewers in certain streets, for the corporation.—Mr. W. T. Lancashire, city engineer.

NANTWICH.—December 14th.—For the construction of sewage disposal works, comprising detritus, settling, storm-water and stand-by tanks, filter-beds, humus tanks, and laying sewers and manholes, for the rural district council.—Mr. Charles E. Davenport, engineer.

Stores.

MACCLESFIELD.—November 27th.—For the supply of iron castings, gun-metal and phosphor-bronze castings, and iron and steel, for the corporation.—Mr. R. Williamson, superintendent of the Cleansing Department.

NOTTINGHAM.—December 5th.—For the supply of cement, blue lias lime, red bricks, timber, earthenware pipes, iron castings, gulleys, Yorkshire flags, kerb, granite setts, broken granite, ironstone slag, chippings, river gravel, coal, picks, shovels, scoops, ironmongery, scavenging and other brushes, disinfectants, refined tar, pitch, and creosote oil, for the corporation.—Mr. W. J. Beard, town clerk.

Miscellaneous.

COVENTRY.—November 25th.—For the supply of earthenware or stoneware pipes, bend and junction pipes, for the corporation.—Mr. J. L. Swindlehurst, city engineer and surveyor.

COVENTRY.—November 25th.—For the supply of cast-iron manhole covers, gullies, pavement channels, and step irons, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

EAST COWES.—December 6th.—For sinking an artesian borehole, for the urban district council.—Mr. A. Dunnett, Local Government Offices, Cowes, I. of W.

ISLE OF WIGHT.—November 27th.—For the supply and pumping at water records, for the rural district council.—Mr. H. Eldridge Stratton, clerk.

LAMBETH.—December 10th.—For the supply and installation of three hydraulic lifts and the dismantling and removal of existing lifts, for the Board of Guardians.—Mr. James J. Goldsmith, 3 and 4, Brook-street, Kensington Road, S.E., to be addressed. Tender for lifts."

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BUCKINGHAM.—For the erection of six cottages, for the rural district council:—

W. H. Thomas, Buckingham	£1,139
J. G. Stevens, Preston Bissett	1,075
A. J. Cox, Steeple Claydon	1,038
F. J. Walker, Steeple Claydon	960
Crook & Judd, Waddesdon	926
H. W. Ricketts, Hadzienham	795

CARLISLE.—For laying water main, for the rural district council.—Mr. F. Barker, waterworks manager:—

W. Hirst, Whitehaven	£476
D. Thomson & Son, Carlisle *	365
J. Austin & Co., Carlisle	348

LEWISHAM.—For rebuilding the Lewisham-bridge school, Lewisham, for the London County Council:—

J. & C. Bowyer, Limited, Upper Norwood	£16,746
W. Akers & Co., Limited, South Norwood	16,657
H. Lovatt, Limited, Victoria-street	16,560
F. & H. F. Higgs, Herne hill	16,380
H. L. Holloway, Deptford	16,114
W. Johnson & Co., Limited, Wandsworth-common	15,944
J. Appleby & Sons, Southwark-park *	14,802

Architect's estimate, £16,077.

LONDON.—For the supply of 130,000 creosoted deal paving blocks, 3 in. by 9 in. by 5 in., required in connection with the repaving of Clapham-road (55,000) and the doubling of the line in South Lambeth-road 75,000) for the London County Council:—

	Prices a thousand. By barge. £ s. d.	By van. £ s. d.
Improved Wood Pavement Company, Limited, London	7 11 9	7 16 6
Acme Flooring and Paving Company (1904), Limited, London	7 9 0	7 13 0
W. W. Howard Brothers & Co., London	7 8 3	7 13 0
Burt, Boulton & Haywood, Limited, London	7 9 2	7 12 9
T. Gabriel, Sons & Burtons, Lambeth	7 7 0	7 9 7
J. B. Lee & Sons, Limited, London *	7 6 0	7 8 0

Estimate of the chief officer of tramways, £995.

PRESTWICH.—Accepted for works of private street improvements, for the urban district council:—

W. H. Worthington, Limited, Manchester.—For Mather-avenue, Mildred-avenue, Mowbray-avenue and Back Bury New-road.
G. H. Metcalfe, Prestwich.—For Back Merton-road.

RUGELEY.—For the removal of refuse, for the urban district council.—Mr. W. E. Rogers, surveyor:—

T. Carthy, Rugeley	£175
J. Norman, Rugeley	166
F. Woolley Brereton	149
H. Sharratt, Rugeley *	149
G. Woolescroft, Rugeley	145

RUISLIP-NORTHWOOD.—For laying stone slab paving and granite kerbing and channelling, for the urban district council.—Mr. W. L. Carr, surveyor:—

E. Free & Sons, Maidenhead	£96
H. Farrow, Brixton	91
Langley & Johnson, Slough	87
G. P. Trentham, Birmingham	80
Willis & Powis, Wembley	79
A. E. Wilson, Jnr., Northwood	79
Clements, Knowling & Co., Limited, Brentford	77
G. R. Mann, Edgware *	76

SOUTHWARK.—For the incorporation of additional land in the site of the Pocock-street school, Southwark, and the re-arrangement of the playgrounds, for the London County Council:—

Holliday & Greenwood, Limited, Brixton	£1,859
Rice & Son, Stockwell-road	1,767
J. Garrett & Son, Balham-hill	1,666
H. Groves, Greenwich	1,625
E. A. Roome & Co., Basinghall-street *	1,611

Architect's estimate, £1,679.

STREETLEY.—For sewers, manholes, purification works, &c., for the sewerage and sewage disposal scheme.—Mr. R. Green, engineer:

Johnson Brothers, Gloucester	£11,979
G. Holloway, Wolverhampton	11,600
Childs & Withers, Bilston	11,581
G. Bell & Sons, Limited, London	11,042
J. Wilson & Sons, Baudesworth	10,181
G. Law, Kidderminster	10,161
Morley & Sons, Keighley	9,910
M. A. Boswell, Wolverhampton	9,778
Currall, Lewis & Martin, Birmingham	9,730
Martin & Element, Smethwick	9,598
G. P. Trentham, Birmingham	9,376
A. Hill & Co. (informal), Kidderminster	9,090
Edwards & Co., Doncaster *	9,060

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

NOVEMBER.

24. Royal Sanitary Institute Provincial Sessional Meeting at Doncaster.
25. Institution of Municipal Engineers. Northern District Meeting at Newcastle-on-Tyne. Mr. George Symon on "Mechanical Haulage." Town Hall, 4 p.m.
26. Royal Society of Arts (Colonial Section). Professor W. H. Warren, Sydney, on "The Hardwood Timbers of New South Wales." 4.30 p.m.
27. Institution of Municipal Engineers. Council Meeting, 30 Victoria-street, S.W. 6 p.m. Southern and South Eastern Joint District Meeting, 4, Southampton row, Mr. Valentine Ball, M.A., Barrister-at-Law on "The Effect of Recent Decisions upon the Arbitration Clause." 8 p.m.

NOVEMBER.

28.—Concrete Institute: Mr. John M. Theobald, F.S.I., on "Bills of Quantities for Reinforced Concrete Work." 7.30 p.m.

29.30.—Institution of Municipal Engineers: Joint Western and South-Western District at Gloucester and Exeter. Mr. A. Winter Gray on "Amalgamation and Security of Tenure" (Gloucester); discussion on "Working-class Housing" (Exeter).

30.—Institution of Municipal and County Engineers: North-Eastern District Meeting at York.

DECEMBER.

6.—Institution of Municipal and County Engineers: Meeting in London. Mr. B. F. Wakelam on "Tramway Rail Corrugation." Caxton Hall. 8 p.m.

7.—Institution of Municipal and County Engineers: Eastern District Meeting, Lyons' Victoria Mansions Restaurant, Victoria-st., S.W.

7.—Institution of Municipal Engineers: North Western District, Social Evening, Victoria Hotel, Manchester. 6 p.m.

7.—Institution of Municipal and County Engineers: South-Eastern District Meeting, 11 Victoria-street, S.W.

12.—Association of Managers of Sewage Disposal Works: Annual General Meeting and Dinner, Holborn Restaurant.

12.—Concrete Institute: Messrs. R. Cathcart and Laurence Gadd, F.S.I., on "The Effects of Concrete of Acids, Oils and Fats." 7.30 p.m.

14.—Institution of Water Engineers: Seventeenth Winter General Meeting, Burlington House, W. 10.30 p.m.

18.—Institution of Municipal and County Engineers: Metropolitan District Meeting, 11 Victoria-street, S.W.

18.—Quantity Surveyors' Association: Conversazione, Connaught Rooms, Great Queen-street, Kingsway, W.C. 8 p.m.

JANUARY.

8.—Institution of Municipal and County Engineers: South-Eastern District Meeting at Sidcup.

APPOINTMENTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those persons [illegible] their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their insertion in the next issue. Appointments Summaries. Such advertisements may, in cases of emergency, be telephoned* (**No. 1359 Holborn**), *subject to later confirmation by letter.*

EAST SUSSEX COUNTY COUNCIL.

APPOINTMENT OF DISTRICT SURVEYOR OF MAIN ROADS.

The Roads and Bridges Committee of this Council are prepared to receive Applications for the Office of District Surveyor of Main Roads for the No. 1 or West District, comprising at present about 94 miles of main road.

The District Surveyor, who will be under the direction and control of the County Surveyor, will be required to devote his whole time to his duties and to reside in such part as may be fixed by the Committee, and will receive an annual salary of £160, rising by yearly increments of £5 to £200 per annum, payable quarterly, exclusive of such travelling expenses as may be allowed by the Committee.

Canvassing for the office will be considered a disqualification.

Candidates must be between the ages of 25 and 35 years, and have had practical experience in the maintenance and improvement of roads. Preference will be given to those who are Members or Associate Members of the Institute of Municipal and County Engineers.

Applications for the appointment, accompanied by copies of not more than three recent testimonials, marked on the outside "District Surveyor," to be sent in on or before Tuesday, the 3rd December, 1912, addressed to the Clerk of the County Council, County Hall, Lewes, from whom further particulars can be obtained on application by letter.

F. MERRIFIELD,
Clerk of the County Council.

November 12, 1912.

COUNTY BOROUGH OF BIRKENHEAD.

The Corporation of Birkenhead are prepared to receive applications for the post of an Architectural Assistant in the Borough Engineer and Surveyor's Department, at a salary of £170, rising by annual increments of £5 to £185.

Preference will be given to candidates who have had some previous experience in connection with school buildings.

Applications, in candidate's own handwriting, stating age (which must not exceed 35 years) and experience, accompanied by copies of not more than three recent testimonials, sealed and endorsed "Architectural Assistant," must be delivered at the Office of Mr. Chas. Brownridge, M.Inst.C.E., Borough Engineer and Surveyor, Town Hall, Birkenhead, not later than 12 noon on Wednesday, the 4th December, 1912.

Canvassing will be deemed a disqualification.

THE RURAL DISTRICT COUNCIL OF DONCASTER

invite applications from competent Architects and Surveyors for the appointment of Town Planning Assistant in the Surveyor's Department. Candidates must be quick and accurate Surveyors, Levellers, and good Draughtsmen.

Salary £12 per calendar month.

Applications, to be on foolscap paper in candidate's own handwriting, stating age, qualifications, previous experience, and present employment, together with copies of not more than three recent testimonials, should be sent in on or before Thursday, the 28th inst., addressed to

H. M. MARSHALL,
Clerk to the Council.

Union Offices,
High-street, Doncaster.
November 19, 1912.

BOX 1,196.—The vacancy advertised in THE SURVEYOR, November 1st (p. 619), has now been filled.

TENDERS WANTED.

COUNTY OF SOUTHAMPTON.

MAIN ROADS.

SUPPLY OF TOOLS.

Tenders are invited for the Supply and Delivery of Tools for use on Main Roads throughout the County during the year ending 31st March, 1914.

Conditions and Form of Tender may be obtained on and after November 20th from Mr. W. J. Taylor, County Surveyor, The Castle, Winchester.

Tenders are to be delivered to me on or before Saturday, 21st December, 1912, in sealed envelopes, endorsed "Tender for Tools."

H. BARBER,
Clerk of the County Council.

The Castle, Winchester.
November 15, 1912.

COUNTY OF SOUTHAMPTON.

MAIN ROADS.

HIRE OF STEAM ROLLERS.

The County Council invite Tenders for the Hire of Steam Rollers for use on the Main Roads throughout the County during the year ending 31st March, 1914.

Conditions and Form of Tender may be obtained on application from Mr. W. J. Taylor, County Surveyor, The Castle, Winchester, on and after November 20th.

Sealed Tenders, marked "Tender for Hire of Steam Rollers," are to be delivered to me on or before Monday, the 9th December, 1912.

H. BARBER,
Clerk of the County Council.

The Castle, Winchester.
November 15, 1912.

COUNTY OF SOUTHAMPTON.

MAIN ROADS.

TAR.

Tenders are invited for the Supply of Refined Tar for surface treatment of the Main Roads during the year ending March 31st, 1914.

Specification, Form of Tender, General Conditions and Schedule of Stations to which the Tar is to be delivered, may be obtained on and after November 20th from Mr. W. J. Taylor, County Surveyor, The Castle, Winchester, on deposit of One Guinea, which will be returned on receipt of a *bonâ-fide* Tender.

Tenders, endorsed "Tar," to be delivered to me on or before Monday, the 9th December, 1912.

H. BARBER,
Clerk of the County Council.

The Castle, Winchester.
November 15, 1912.

COUNTY OF SOUTHAMPTON.

MAIN ROADS.

TO STONE CONTRACTORS.

Tenders are invited for the Supply of Stone for the Repair of the Main Roads during the year ending March 31st, 1914.

The following Stones are required:

Columnar Basalt.
Clee Hill Basalt.
Welsh Granite.
Coverack or similar Syenite.
Quartzite.
Tarred Macadam, &c.

Form of Tender and Schedule of approximate Quantities required, and Stations to which the Stone is to be delivered, may be obtained on application to the County Surveyor, The Castle, Winchester, on and after November 20th.

Sealed Tenders, endorsed "Road Stone," to be delivered to me on or before Monday, December 9th, 1912.

H. BARBER.
Clerk of the County Council.

The Castle, Winchester.
November 11, 1912.

COUNTY OF SOUTHAMPTON.

MAIN ROADS.

SURFACE TARRING MACHINES.

Tenders are invited for the Supply and Delivery of Surface Tarring Machines.

Conditions and Forms of Tender may be obtained on and after November 20th from Mr. W. J. Taylor, County Surveyor, The Castle, Winchester.

Tenders are to be delivered to me on or before Saturday, 21st December, 1912, in sealed envelopes, endorsed "Tender for Tarring Machines."

H. BARBER,
Clerk of the County Council.

The Castle, Winchester.
November 15, 1912.

WILTS COUNTY COUNCIL.

MAIN ROADS UNDER DIRECT MANAGEMENT.

ROAD METAL.

The Roads and Bridges Committee of the County Council invite Tenders from Quarry Proprietors, Stone Merchants, and others for the Supply of Road Metal for a period of one year commencing 1st day of April next.

The Material required will consist of Granites, Basalts, Flints, Limestones, Gravel, &c., particulars of which are set out in Specifications. Schedules of approximate Quantities and Forms of Tender to be obtained of the County Surveyor, Trowbridge. The bulk of the Material will be required to be delivered at railway stations or wharves, except in the case of local material.

Sealed Tenders, to be addressed to the Clerk of the County Council, County Offices, Trowbridge, must be delivered on or before the 10th day of December, 1912.

All Tenders to be endorsed "Tenders for Road Metal."

No pledge is given that the lowest or any Tender will necessarily be accepted.

(By order)

J. GEORGE POWELL,
County Surveyor.

County Surveyor's Office,
Trowbridge.
November 20, 1912.

WILTS COUNTY COUNCIL.

MAIN ROADS UNDER DIRECT MANAGEMENT.

STEAM ROLLING.

The Roads and Bridges Committee of the County Council invite Tenders for Steam Rolling on 316 miles of Main Road, for a period of one year, commencing on the 1st day of April next.

Specifications, Schedules of approximate Quantities and Form of Tender can, on application, be obtained from the County Surveyor.

Sealed Tenders, addressed to the Clerk of the Council, and endorsed "Tender for Steam Rolling," must be delivered on or before the 10th day of December, 1912.

No pledge is given that the lowest or any Tender will necessarily be accepted.

(By order)

J. GEORGE POWELL,
County Surveyor.

County Surveyor's Office,
Trowbridge.
November 20, 1912.

WILTS COUNTY COUNCIL.

MAIN ROADS UNDER DIRECT MANAGEMENT.

TOOLS FOR ROADWORK.

The Roads and Bridges Committee of the County Council invite Tenders for Tools for work on 316 miles of Main Road, for a period of one year, commencing on the 1st day of April next.

Specification and Form of Tender can, on application, be obtained from the County Surveyor.

Sealed Tenders, addressed to the Clerk of the Council, and endorsed "Tender for Tools," must be delivered on or before the 10th day of December, 1912.

No pledge is given that the lowest or any Tender will necessarily be accepted.

(By order)

J. GEORGE POWELL,
County Surveyor.

County Surveyor's Office,
Trowbridge.
November 20, 1912.

CITY OF NOTTINGHAM.

The Works and Ways Committee are prepared to receive Tenders for the Supply of the undermentioned Stores and Materials, the Contracts to commence on the 1st January next, and to terminate on the 31st December, 1913:—

(A) Cement.
(B) Blue Lias Lime.
(C) Red Bricks.
(D) Blue Bricks.
(E) Timber.
(F) Earthenware Pipes, &c.
(G) Earthenware Pipes, &c. (Patent Joints).
(H) Iron Castings, Iron Gulleys, &c.
(I) Yorkshire Flags, Kerb, &c.
(J) Granite Setts, Kerb, and Broken Granite.
(K) Ironstone Slag, Chippings, &c.
(L) River Gravel.
(M) Coal.
(N) Picks, Shovels, Scoops, &c.
(O) Ironmongery.
(P) Scavenging and other Brushes.
(Q) Disinfectants.
(R) Refined Tar.
(S) Pitch.
(T) Creosote Oil.

Forms of Tender may be obtained on applying to Mr. Arthur Brown, M.Inst.C.E., City Engineer, Guildhall, Nottingham, on payment of a deposit of 5s. each, which will be returned on receipt of a *bonâ-fide* Tender, in accordance with the Specification, providing such Tender is not withdrawn, and is delivered by the time stated below.

Patterns and Samples may be inspected at the Eastcroft Depot, London-road, Nottingham.

The Committee will not consider any Tender except on the authorised Form of Tender, which must be delivered to the undersigned, in the official envelope provided, on or before Thursday, 5th December, 1912.

The lowest or any Tender will not necessarily be accepted, and Tenders will only be accepted from persons who conform to the conditions as regards paying the local standard rate of wages, &c., and to the working rules of the Nottingham District applicable to the various trades.

(By order)

W. J. BOARD,
Town Clerk.

Guildhall, Nottingham.
November 12, 1912

BECKENHAM URBAN DISTRICT COUNCIL.
TO CONTRACTORS.

The Beckenham Urban District Council invite Tenders for the Making Up of Overbury-avenue, 600 yds. in length, and Hampden-road, 280 yds. in length. The Works include about 500 cub. yds. Hard-core, 1,130 cub. yds. Flints, 1 110 lin. yds. New 6-in. by 12-in. Granite Kerb, 1,750 lin. yds. of Second-hand Setts, 280 sq. yds. Blue Brick Paving, and the Laying of 2 700 sq. yds. of Red Brick Paving.

Plans and Sections may be seen, and Bills of Quantities, Specifications and Forms of Tender obtained, on application to Mr. John A. Angell, Surveyor, on the production of a receipt from the Collector (who attends his Office daily from 9 a.m. to 5 p.m.) for a deposit of £2 which will be returned on the receipt of a *bonâ-fide* Tender.

A clause will be inserted in the Contract providing that the Contractor shall (1) pay to the employees the wages generally accepted as current for workmen engaged on similar work in the Town where the work is executed, and (2) to the extent of 75 per cent at least of the staff required in the execution of such works give preference to, and engage such competent workmen of the class required as may be *bonâ-fide* residents in the Parish of Beckenham and may offer themselves for employment.

Payment under the Contract will not be made until six months after the completion of the Works.

Tenders, duly sealed and endorsed "Tenders for Street Works," to reach undersigned not later than 4 p.m. Monday, December 9th, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

F. STEVENS,
Clerk to the Council.

NANTWICH RURAL DISTRICT COUNCIL.
WILLASTON AND WISTASTON SEWERAGE AND SEWAGE DISPOSAL WORKS.

The above Council invite Tenders from Builders and Contractors for the Construction of Sewage Disposal Works, comprising Detritus, Settling, Storm-water and Stand-by Tanks, and Filter-beds and Humus Tanks, together with the Laying of about 700 lin. yds. of 12-in. and 5,126 lin. yds. of 9-in. Sewers, and the Construction of 57 Manholes and other appurtenant works.

Plans may be seen, and Specifications, Quantities and Forms of Tender obtained, at the office of the Engineer to the Council, Mr. Charles E. Davenport, A.M.INST.C.E., 152 Hospital-street, Nantwich, on deposit of Two Guineas, which sum will be returned on receipt of a *bonâ-fide* Tender and the return to the Engineer of all documents received from him.

The Council do not undertake to accept the lowest or any Tender.

Sealed Tenders, endorsed "Willaston, &c., Sewerage," must be sent in to me not later than 4 o'clock in the afternoon of Saturday, the 14th day of December, 1912.

(By order)

H. G. ATKINSON,
Clerk to the Council.

Rural District Council Offices,
Nantwich.
November 12, 1912.

BRIDGWATER RURAL DISTRICT COUNCIL.

Tenders are invited for the Supply of Stone for the Roads within the above District. The Contracts will be for one year, from 1st April, 1913, to 31st March, 1914.

Printed Forms of Tender, containing full particulars and conditions of Contract, will be supplied on application to the undersigned, or the Council's Surveyor, Mr. W. A. Collins, 56A Eastover, Bridgwater.

Sealed Tenders, endorsed "Highway Tenders," to be addressed to the undersigned, postage paid, on or before Friday, the 6th day of December, 1912, and samples of Stone to be delivered at the Surveyor's Offices on or before such date.

The Council do not bind themselves to accept the lowest or any Tender.

T. M. REED,
Clerk to the above Council.

Bridgwater.
November 1912.

PARISH OF LAMBETH.
BOARD OF GUARDIANS.
ELECTRIC LIFTS.

The Guardians of the Poor of the Parish of Lambeth hereby invite Tenders for the Supply and Installation of three Electric Lifts and Dismantling and Removal of existing Lifts at their Renfrew-road Workhouse, Lower Kennington-lane, S.E., and their Infirmary, Brook-street, Kennington, S.E.

Tenders, which must be endorsed "Tender for Lifts," must be sent to the undersigned, or placed in the box provided for their reception in the Office of the Clerk to the Guardians, by the tenderers or their representatives, should they so desire, on or before Tuesday, the 10th December, 1912, and will be opened in the Board-room at noon on the following day, when all persons tendering, or their authorised agents, should be in attendance. Specification and Form of Tender may be obtained from the undersigned upon payment of £2 in respect thereof, which will be returned to each person sending a *bonâ-fide* Tender. The Guardians do not pledge themselves to accept the lowest or any Tender.

(By order of the Guardians)

JAMES L. GOLDSPINK,
Clerk.

Guardians' Offices,
Brook-street,
Kennington-road, S.E.
November 19, 1912.

BOROUGH OF EALING.
TO ROAD CONTRACTORS AND MANUFACTURERS OF ROAD MATERIALS.

The Town Council of this Borough is prepared to receive Tenders from Manufacturers of Patent or other Road Materials for the Supplying and Laying of such Materials in the Carriageways of certain Roads.

The Contractors, in their Tenders, are to state the price per super. yard for the Laying of some 10,000 to 12,000 super. yards, and also to specify the type of paving quoted for, their guarantee, and the term of years for which they are prepared to enter into a Contract to maintain such paving when laid.

Sealed Tenders, endorsed "Tender for Road Paving," must be delivered at my Office not later than 9.30 a.m. on Tuesday, the 3rd day of December, 1912.

The tenderer whose offer is accepted shall be held to have bound himself to an agreement, and may be compelled to carry out the obligation arising from his Tender, even though he may not have signed a formal Contract.

Dated this 15th day of November, 1912.

(By order of the Council)

GEO. E. BRYDGES,
Town Clerk.

Town Clerk's Office,
Town Hall,
Ealing, W.

HORSHAM URBAN DISTRICT COUNCIL.
TENDERS FOR ROAD MATERIALS.

The above-named Council invite Tenders for the Supply of the following Road Materials:—

600 tons of Broken Hard Stone, 1½-in. gauge;

to be delivered free at Horsham Railway Station not later than the 31st of January, 1913, in such quantities and at such times as shall be directed in writing by the Council's Surveyor. The weights to be as taken in the trucks at Horsham Station by the said Surveyor.

Sealed Tenders, endorsed "Tender for Road Materials," quoting a price per ton, and accompanied by a small sample of the Stone quoted for, to be delivered to the undersigned not later than 12 noon on Wednesday, the 27th of November instant.

Forms of Tender are not supplied; and the Council do not bind themselves to accept the lowest or any Tender.

(By order of the Council)

S. MITCHELL,
Clerk.

Council Offices, Horsham.
November 19, 1912.

KENT COUNTY COUNCIL.

BROKEN ROAD STONE AND TARRED MACADAM.

The Bridges and Roads Committee of the County Council invite Tenders for the Supply of the undermentioned Materials, to be delivered between the 1st of April, 1913, and the 31st of March, 1914, as follows:—

60,000 tons (more or less) of Broken Road Stone, such as:—

(1) Rhenish Basalt.
(2) Guernsey, Jersey or Alderney Granites.
(3) Clee Hill Basalt.
(4) Leicestershire Granites.
(5) Penlee, St. Keverne or other Cornish Granites.
(6) Northumberland Whinstone.
(7) Penmaenmawr or other North Wales Granites.
(8) Quartzite.
(9) Norway Granite.
(10) Quenast or Lessines.
(11) Or other equally durable Material.

Tenders are also invited for Tarred Macadam, and special forms for the supply of this material will be furnished upon application.

Also the following Local Materials:—

7,500 yards (more or less) of Surface-picked or Grubbed Flints.
3,000 yards of Kent Rag.

Specification and Forms of Tender can be obtained upon application to the County Surveyor, Maidstone.

Sealed Tenders, endorsed "Tender for Road Metalling," must be sent to the undersigned (upon the prescribed form) not later than 12 noon on Wednesday, the 11th day of December next.

The Committee reserve the right to apportion the order as they may feel disposed, and will favourably consider offers of small consignments.

The lowest or any Tender will not necessarily be accepted.

W. B. PROSSER,
Clerk to the Council.

Sessions House, Maidstone.
November, 1912.

JOHN YATES & CO. Ld.
Aston Manor, Birmingham.
ESTABLISHED 1804.
'Grams — "YATONIAN, BIRMINGHAM."
'Phones EAST 400, 401, and 402 Private branch exchange.

BARRIER STANDS, CROWBARS of all kinds.
WE ALSO MAKE:—
PICKS, SHOVELS, GRAFTS, BARROWS, LAMPS, PUMPS, FORKS, WEDGES, &c. &c. &c.

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NO SLUDGE NUISANCE

SMALL WORKING EXPENSES
CONTRACTORS TO H.M. GOVERNMENT.
SLATE BEDS
47 VICTORIA STREET, WESTMINSTER, S.W.
TELEPHONE—2211 VICTORIA.

The Surveyor

And Municipal and County Engineer.

Vol. XLII. NOVEMBER 29, 1912. No. 1,089.

Minutes of Proceedings.

Royal Commission on Sewage Disposal: Eighth Report.

Renewed interest will be aroused in the doings of the Royal Commission by the issue of a further report, not only on account of the contents of the report itself, but by reason of the intimation conveyed therein that their next publication will be the *final* report. From this we gather that the labours of the Commission are shortly coming to an end, and if this occurs soon they will have completed their work without having the satisfaction of seeing their recommendations put into full effect by the establishment of rivers boards with a central controlling authority. On the other hand, it is only fair to admit that, in several directions, the Local Government Board have altered their requirements in accordance with the recommendations of the Royal Commission, and in this sense their labours have had some direct practical results. In May next the Royal Commission on Sewage Disposal will have been in existence for fifteen years, and for some time past very little interest has been evinced in their doings. In this connection it is not out of place to note that in the document by which the Commissioners were originally appointed they were requested to report their opinion upon the matters submitted for their consideration *with a little delay as possible*. It is obvious that it was not anticipated at that time that the Commission would be in existence for so long a period as fifteen years.

For some time past it has been generally accepted as an axiom that it is impracticable to fix a standard of purity for sewage effluents, as local circumstances must be taken into consideration. In the Rivers Pollution Prevention Act of 1876 the sewage effluent alone was considered, and local circumstances were not taken into account, and the present report, in dealing with the question of standards, commences with a reiteration of the recommendation contained in the fifth report to the effect that the law should be altered so as to allow local circumstances to be taken into account, and so that local authorities should not be required to purify their sewage more highly than is necessary to obviate the risk of actual nuisance arising from its discharge. In the final conclusions of the present report it is recommended that an effluent, in order to comply with the general standard, must not contain, as discharged, more than 3 parts per 100,000 of suspended matter, and, with its suspended matter included, must not take up at 60 deg. Fahr. more than 2 parts per 100,000 of dissolved oxygen in five days. From this it will be observed that the general standard affects the amount of suspended matter and the capacity of the effluent to take up dissolved oxygen in five days. In any special standards that may be fixed the chief factor to be considered will be the amount of dilution afforded by the stream into which the effluent is discharged. As a matter of fact, however, the introduction of the test for dissolved oxygen taken up in five days into the prescribed general standard was also due to the great importance of the degree of dilution afforded by a river as a factor in determining the selection of a standard. In comparing the relative advantages of this test with the much more speedy and more easily worked test for oxygen absorbed in four hours from permanganate, the Commissioners point out that the dissolved oxygen absorption test reflects more accurately the observed conditions of the streams, it represents more naturally the actual process which takes place in the stream, and laboratory experiments have shown that it is the more delicate test of the two. Further, it is, in essence, a bacteriological test. In addition, emphasis is laid upon the statement made in the fifth report that, whatever be the standard adopted, under no circumstances must compliance with that standard be held to justify the use for drinking purposes of streams receiving those effluents without subsequent treatment by the waterworks authority. The observations on the administrations of standards contain a repetition of the recommendation made in the fifth report, with one or two modifications suggested by further consideration of the subject. It is recommended that definite periods should be fixed in which standards once prescribed should not be altered. Further, in considering the needs of a watershed, the rivers board having jurisdiction over each area will naturally have to proceed by degrees, and might consider it desirable to deal with pollutions occurring in the upper reaches of the river before attacking the problems presented by discharges occurring lower down. The Commissioners, however, believe this to be unnecessary and, in many cases, undesirable in practice. They think that the rivers board might be well advised to turn their attention first to securing compliance with the standard by the larger towns whose works are as yet inefficient. It is suggested that the standards should not apply to storm-water sewage, which should be dealt with upon the lines recommended in the fifth report, the adoption of which would, it is considered, prevent the occurrence of nuisance.

The report is well worthy of careful study in detail. The whole subject has, in our opinion, been dealt with in a thoroughly practical manner, and we believe that the recommendations will be received with approval by all reasonable persons. In the first place, the Commissioners have fixed a definite normal standard for sewage effluents under ordinary circumstances, and have made provision for the arrangement of special standards in cases where exceptional local circumstances obtain. This will be welcomed by all municipal engineers, district surveyors and others who have the management of sewage disposal works in their hands, and who, in the past, have had no definite general standard to guide them. Secondly, local circumstances generally, and the degree of dilution afforded by the stream or river into which the sewage effluent is discharged in particular, are to be taken into account in fixing the standard which

is to be attained in any particular case. Special consideration of local needs and local possibilities will alone determine what will protect sufficiently the amenities of the river without incurring needless expense, and local authorities will not be required to purify their sewage more highly than is necessary to obviate the risk of actual nuisance arising from its discharge. Thirdly, the establishment of rivers boards will ensure the consideration of the needs of each watershed area as a whole, and some discrimination in the degree of purity required in the effluents at different points along the main watercourse. This should prevent such an anomalous state of affairs as exists to-day in, for example, the Thames Valley, where a uniformly high degree of purity is apparently required in the sewage effluents discharged (*a*) at Erith into tidal water and below the discharge from the London sewers, (*b*) at Kingston, above tidal water, but below the Water Board's intakes, and (*c*) at Staines, above the Water Board's intakes.

In view of the anticipations that next year's Parliamentary Session is to be a less strenuous one than the present, is it too much to hope that the Government will see its way to introduce and place upon the Statute-book a measure embodying the recommendations of the Royal Commission on Sewage Disposal, and thus bring its long labours into practical effect?

* * *

Rivers Pollution.

While our own Royal Commission on Sewage Disposal has just issued its eighth report dealing with the standards of purity to be applied to sewage and to sewage effluents discharging into streams and rivers, and the tests which should be used in regard to them, a somewhat similar report has recently been made by a committee of the United States National Association for Preventing the Pollution of Rivers and Waterways appointed for that purpose. This report was presented by Mr. George C. Whipple, one of the members of the committee, at a conference on the pollution of lakes and waterways held at Cleveland, Ohio, in October last, and deals with standards of purity for rivers and waterways, and we are indebted to our contemporary *Engineering Record* for the text of this report, which we print on another page. A comparison of the two reports makes very interesting reading, and it will be noticed that the Royal Commission go further than the American Committee in fixing a definite test as an index of the actual state of a stream or the amount of dissolved oxygen taken up in five days. In both cases, however, the degree of dilution afforded by the stream or waterway is taken as a factor to be considered in fixing any definite standard, and where a higher degree of dilution has caused a relaxation of the standard, the Royal Commission recommend that such relaxed standards should be subject to revision at periods to be fixed by the proposed central authority, and these periods should be shorter than those prescribed for the general or for the more stringent standards. The formation by Parliament of a central authority and of subsidiary rivers boards, as previously recommended by the Royal Commission, would provide the means for putting these standards of purity into practice, and thereby preserve the reasonable purity of our streams and rivers. These rivers boards must, however, have full control of the water supplies in their respective areas, as it will frequently be necessary to come to a decision as to whether the purity of the sewage effluent should be increased in order to reduce the work which would otherwise be placed upon a water purification plant at some place lower down the watershed, or whether it might not be cheaper in the end to abandon the use of the water for drinking purposes rather than attempt to reduce the pollution to the required extent.

The protection of water supplies is becoming a matter of urgency in other countries as well as in our own and in America. A very stringent law has recently been drafted in Prussia, in which it is proposed to make the person or persons who pollute a river responsible for the injuries they may cause thereby. Existing rights to underground water supplies are also to be restricted in cases where the extraction of water in one place deprives a neighbour of his water or even reduces it, or where it affects the use of the water, or lowers the water level of another owner. On the top of this it is even proposed among the penalties that where a town violates the law, the head of the community may be committed to prison! In Germany, as in the United States of America, the difficulties are rendered greater by the fact that a number of the rivers are not confined to one State, but pass through several on their course to the sea, and it is suggested that any laws that may be established should deal with the country as a whole, and not be promulgated separately by the various States. In this country, fortunately, this complication does not arise, and all we need is prompt action on the part of the Government to put into force the recommendations of the Royal Commission on Sewage Disposal.

* * *

Cornish Roads: Important Proposals.

At a recent meeting of the Highways Committee of the County Council of Cornwall a comprehensive scheme for the reorganisation of the road system of the county was submitted by Mr. A. E. Brookes, county surveyor. Mr. Brookes recommended a classification which would create a system of main roads consisting only of the more important highways and their connecting links, the roads needed to complete the system being "mained" where necessary. Roads now classed as "main roads," but not belonging to this system, would be dismained, and two classes of secondary roads created, A and B, with county subsidies of £30 and £20 a mile respectively. The increase in county expenditure, about £3,600 a year, would be in part a relief of local rates, and in part an expenditure for the sake of greater efficiency. The scheme, in the form in which it was submitted, was not accepted by the committee, but Mr. Brookes was instructed to prepare a scheme without secondary roads, which will be discussed at a meeting to be held early next January. We do not know whether both schemes will be taken into consideration, or the new one only, but it is clear that the matter of highway organisation in Cornwall is being taken up in a manner which is bound to have good results. To enable our readers to "place" Cornwall, they may be reminded that the county is considerably larger than Wiltshire in area, a little smaller than Essex, about 95 per cent of Suffolk. The population is about that of Monmouth, considerably more than Berkshire, Hertfordshire, or Cumberland, but less than that of Suffolk. In rateable value it ranks near Wiltshire, a little more than Cambridge, and a little less than Monmouth. As regards climate by far the most important factor is its position relative to the Atlantic and to the Gulf Stream, while in latitude it lies, roughly, about midway between Northumberland and South Central France, or, to take wider limits, midway between Sutherlandshire and the Pyrenees.

* * *

A Donegal Appointment.

A striking example of the familiar process known as putting the cart before the horse is afforded by the proceedings of the Donegal County Council in appointing a surveyor for the southern division of the county. Their choice fell upon a gentleman whose name was duly submitted to the Local Government Board, and that authority has now written to the council pointing out that it was clear from the information furnished that the candidate had not been regularly trained as a civil

engineer, and was not qualified for the appointment. They therefore requested the council to make a fresh appointment. It is at this point where the action of the council showed a curious inversion of the common-sense procedure by which people are ordinarily guided in these things. It was moved, seconded, and ultimately carried that a committee should be appointed to go into the qualifications of the gentleman whom they had appointed to the office. In other words, the council apparently consider it the proper thing to do after they have appointed an officer that which it was manifestly their duty to do before they had expressed their confidence in him by their votes. We know nothing about this particular case except what has appeared in the Irish newspapers, but we notice that one speaker made the significant statement that "when this appointment was before the council they had a fully qualified candidate before them, but they preferred to appoint a gentleman who made no pretence to being qualified for the post." Whether this is a correct view of the matter or not we have no means of knowing, but it is obvious from the attendant circumstances that the council have placed themselves in an anomalous if not a ridiculous position, from which they will have some difficulty in extricating themselves with anything like credit or satisfaction.

* * *

Motor v. Team Haulage.

To the general question whether motor or team haulage is better adapted for municipal engineering work there can never, of course, be an answer. The varying conditions of work, the widely divergent character of different districts, and the difference in the quantities of material to be dealt with are a few only of the factors which render it impossible to make general statements on the subject. The value of the argument from experience in considering any given case is therefore of more than usual importance, and those who have to advise for or against the adoption of motor haulage in their own districts can evidently derive the greatest assistance from careful statistics of the results achieved in practice in a similar district and under identical circumstances. Herein lies the chief value of the paper by Mr. George Symon, the surveyor to the Blaydon Urban District Council, which was read on Saturday last before the Institution of Municipal Engineers at Newcastle. Mr. Symon is careful to state that he would not venture to give advice of a general character, but his paper (which will be found elsewhere) contains the fullest particulars of his own experience. A perusal of this paper shows that the circumstances prevailing in the Blaydon district are peculiar, and this must be borne in mind when considering Mr. Symon's conclusions. It has there been found that steam haulage is not only cheaper than team labour, but also that it is less damaging to the roads for a given quantity of material carried. One of Mr. Symon's conclusions, however, may be taken generally, and that is that mechanical haulage will show to greater advantage in proportion as distances are increased or gradients become steeper.

* *

Doncaster and Town Planning.

The very special character of the circumstances and requirements of the Doncaster rural district in regard to town planning and the provision of housing accommodation was emphasised at the meeting of the Royal Sanitary Institute held at Doncaster on Saturday last. The sinking of no fewer than thirteen new collieries in the vicinity of the town raises many difficult and urgent questions in regard to the housing of the workers. In connection with some of these new enterprises the owners of the collieries have acquired sites upon which model villages can be laid out. This is all to the good; but, inasmuch as the population to be provided for in the near future will not fall far short of 120,000, it is evident that the problem is not capable of solution by private benevolence or the interest of the jerry builder. This would appear to be a case for the application of the Town Planning Act, but, as was pointed out by one of the speakers, the procedure under that statute is very cumbersome. If an immediate start were made, it would be two years before a scheme could be finally approved, and by that time much mischief would have been done. Mr. H. Percy Boulnois, M.Inst.C.E., who presided at the meeting, said that it was evident that the time was more than ripe for dealing with the area, and this opinion was reflected in a resolution which was subsequently passed urging an application to the Local Government Board with a view to special measures being taken to facilitate the immediate operation of the Town Planning Act in the Doncaster rural district. The circumstances certainly seem to be such as to call for special treatment, and it will be interesting to see what view the board will take of the suggestion contained in the resolution referred to.

* * *

The Survey of India.

Considering the great importance of the work done and the rapid progress made, it would be difficult to name any undertaking of greater value to the empire, in proportion to the sums expended, than is that carried out by the Survey of India. The topographical surveys now in progress, some of them in wild, undeveloped countries, provide the engineer with information on which he can base an opinion as to the nature and scope of the works which he may be called upon to carry out in order to develop the resources of these regions, and provide as well the materials needed for the preparation of preliminary estimates of cost. To those who are concerned with problems of irrigation, water-supply, and communications by road and rail, the work of the department is equally valuable as regards both the work of the public works officer and that of the municipal or district board engineer. The survey department has encountered the difficulties inseparable from the formation and working of an organisation composed of so many and such diverse elements, that there can be no doubt that it is of great service to Indian progress, bringing out as it does some of the best elements of native zeal and competence, and linking Englishmen and a score of native races in a great common task. Some notes on the report for 1910-1911, which will be found on another page, will doubtless be of interest to our readers generally, and especially to those who are working near the outposts of empire.

* * *

Fair Play?

In the interests of all concerned we are always glad to give publicity to cases of hard or unfair treatment being accorded to surveyors. The latest instance of the kind has occurred at a place (for the present at any rate it must remain nameless) which has had no fewer than six surveyors in eight years! This fact alone is sufficient to raise grave suspicions as to the conditions under which the surveyor's work has to be done, and inquiry shows that these suspicions are abundantly justified. The salary has been £120 per annum, without allowance for office or travelling, and the surveyor has been responsible for the maintenance of over 150 miles of roads at an annual cost of £7 per mile. This would appear to be a sufficiently difficult task in itself, but, coupled with excessive and ignorant interference by individual members of the local authority, it is not surprising that a succession of surveyors have with one consent abandoned the attempt as hopeless. Parsimony in highway maintenance and administration is never a wise policy, and it is particularly foolish under present-day traffic conditions. If this note should by any chance be brought to the attention of the authority referred to, we hope that they will mend their ways and highways!

Intercepting Traps in House Drains.

ROYAL SANITARY INSTITUTE DISCUSSION OF DEPARTMENTAL COMMITTEE'S REPORT.

(*Conclusion.*)

The discussion on the report of the Departmental Committee of the Local Government Board, opened by Mr. H. Percy Boulnois, M.Inst.C.E., at a meeting of the Royal Sanitary Institute on the 12th inst., was brought to a conclusion on the 19th inst., Sir Maurice Fitzmaurice, C.M.G., M.Inst.C.E., chief engineer to the London County Council, again presiding.

Mr. H. C. H. Shenton (Westminster) said it seemed to him that the report they had been discussing was based upon evidence which was really overwhelming in proving that the trap was open to objection, and it almost seemed a waste of time to go on discussing the merits or defects of the trap in face of the evidence collected. He urged at a former meeting on the same subject that the speakers should try and apply the findings of the report, for it seemed they would certainly have to be applied, and he thought there would be considerable profit in discussing the matter from that point of view that night. The intercepting trap was stated in the report to be objectionable and unnecessary, and as long as the fittings and gullies were properly trapped there was little risk of drain and sewer air getting into the house. They would see that every sink or bath waste pipe, and everything except the water-closet, was trapped twice—at the gully as well as inside the house. The water-closet had only one trap, and he suggested that if the interceptor on the main drain was taken away the water-closet certainly ought to have more than one trap. There were plenty of instances of traps becoming unsealed, particularly in the case of houses that had been left empty for some time, or in the case of a closet in a house which was not used, and he suggested that it would be a serious thing to have sewers ventilated in that manner. It was a point, he thought, that ought to be considered.

Mr. C. H. Cooper, borough engineer of Wimbledon, said the crux of the whole question appeared to him to rest on the matter of sewer air—at least the whole report was based on that. The arguments in the report were based on the investigations of the bacteriologist, and whether they could rely on the bacteriologist or not was a question that seemed to him to be very much governed by chemistry, a science which they had had with them longer than bacteriology. He remembered very well a sewer case fought nearly thirty years ago in which the discharge from a bone-boiling works formed a very important point. This discharge smelt most abominably. It was analysed by the late Dr. Tidy, who gave his analysis, and in the course of cross examination he was asked whether he could show any difference between the analysis of that liquor and that of beef tea, and he said he could not. They had in paragraph 76 of the report the result of the bacteriological analysis of sewer air. It said: "This is established not only in the case of good sewers and those which are well ventilated, but also in the case of bad sewers and those containing more or less stagnant sewage with large deposit, and those in which ventilation is small or absent; indeed, in this latter kind of sewage the number of sewer-air microbes would appear to be a minimum." Then it went on to say that those which might be pathogenic were very rarely present in sewer air. That was to say, in a sewer that contained stagnant sewage and a lot of sediment they found a minimum number of bacteria. Was that evidence any use whatever to base a report like that on? They all knew the effect on themselves of going down these badly ventilated sewers, and he had a rather sad case among his own staff some eleven years ago. A young man in the drawing office happened to sprain his wrist, and, being unable to do his usual work, went out with two assistants to examine a sewer in which there was a good deal of stagnant sewage. The result was that all three were affected. The young man he had referred to ceased work the third day after that was on May 24, 1901—and on June 15th he died of septicæmia. They could get any number of these cases, although the report said it was not so. Take his own sludge works—time after time they had men engaged in sludge pressing who had to give up, although they would not give up until the very last. The report had referred very rightly to the death-rates in Germany; if anything, these showed, he thought, a larger decrease perhaps than in this country. He had not been able to work out the death-rates here, but in this country, taking the period when intercepting traps came in—1871—they got a decrease of 23 per cent subsequently. But in considering Germany they must remember that the German in years gone by was not living under such favourable circumstances as the people in England. When, in the seventies, he was serving his time, it was quite impossible to get the German clerks in the city to pull the plug of the water-closet after use, whereas English people, who were more accustomed to sanitation, always did so. There was no doubt that prior to 1870 or 1880 their sanitation was much better than that of other countries, so that in comparing the German death-rate prior to 1870 with the English death-rate they must remember that fact and expect to find that the rate in England was lower. It seemed to him a great fault in the report was that of making light of the danger of sewer air. To found the argument on bacteriology and chemistry that sewer air was not dangerous was, he thought, altogether wrong, and they did not want the statistics confined to a small number of people, but as large an area as possible in order to arrive at the truth of the question. As regarded stoppages in intercepting traps, the trap was like any other device which required attention, and if it were not attended to it got out of order. He had prepared a diagram which showed a form of back drainage which had been in use at Wimbledon for many years. It ventilated not only the main sewer *viâ* the back drain, but the manholes were so arranged that they could get a rod down in the back drain for cleansing purposes. There was a great deal of opposition to it for a time, and one large builder kicked very much against it. About three years afterwards, however, he admitted to him (Mr. Cooper) that the drainage of those houses was costing him less than that of any other houses he possessed, and that he had never had to make an opening in it. That was a case where intercepting traps were applied to every house, although they were only small houses. Mr. Johnson, their sanitary inspector, who was present that evening, would tell them how the drains had worked since they had been in.

Mr. H. Johnson (Wimbledon) said the portion of the report which he would like to deal with particularly was in regard to stoppage in the intercepting traps. Appendix II. of the report dealt with Wimbledon. As the credit of designing the system of sewers in that borough lay with Mr. Cooper, he was quite unprejudiced, but as inspector for the past sixteen years he could give accurate figures as to what had been found. If in Wimbledon the percentage of stopped traps was only 1·5, why in other districts should there be figures of 15·8, 25·3 and 24·1? Where such a condition of things had been discovered he maintained it was the duty of the authorities to institute an inquiry as to why such should be the case. If a percentage as low as 1·5 had been found in Willesden, the probability was that the committee would never have been heard of. The questions of the ventilation of sewers and the interception of house drains were very closely connected, and one could not speak of one without the other, but he did say emphatically that it was not necessary in order to ventilate public sewers that it should be done through the soil pipes of the house drains. The Wimbledon system showed that it was quite possible to design an effective scheme and ventilate the sewers by means of ventilating pipes put up by the local authority. Some speakers had said that the drains and sewerage system were all one, and that it was no hardship on the owner of private property if he ventilated the public sewer, but the owner of private property was able to see whether his drainage was perfect, and if it were not he could remedy it, whereas if the public sewer were not, he was unable to remedy it, and they all knew there were "sewers" and "sewers." In the report it was said that the fresh-air inlet was open to abuse. That might be so if the intercepting trap was of bad design, if there was misuse, or if

there was bad workmanship. They recognised in Wimbledon that the mica flap would always be out of order, and consequently they never fixed one. A 4-in. pipe was brought up as near to the ground surface as possible, protected by an iron grating, and the outlet shaft was as high as possible, and their experience had been that so long as there was movement of air there was little foul air in the drain. With a population of 30,000 not 10 per cent of the houses had baths; they had simply a water-closet and sink, but the number of complaints of foul air coming from the fresh-air inlet were extremely few. In regard to stoppages, he had had occasion to examine the drains of 1,303 houses in the same neighbourhood. He not only examined the manhole, but the houses where there was an access cap and a manhole at the back, and in slightly more instances they found the stoppages were between the back manhole and the front. If they had examined the front manhole a little later in all probability they would have found the obstruction there, and the intercepting trap would have been blamed for what was really not its fault. It had been borne out by other inspectors who had since examined the back manholes that they had found as many stoppages in the back manholes where there was no intercepting trap as in the front where the intercepting trap was, and the great majority of the stoppages were undoubtedly caused by misuse. If for the misuse of a sanitary appliance they were going to scrap it, then all drains would have to be scrapped. Did anyone suggest that because they found a stoppage in a drain they should scrap it? On their surface-water sewers there was no intercepting trap, and these were the only ones in regard to which they received complaints. He, like Mr. Cooper, had been struck with paragraph 76 of the report, which, if taken to its logical conclusion, meant that the more they ventilated sewers the worse they became from the bacteriological point of view. He was satisfied that sewer gas did have a harmful effect on human beings. For many years his father suffered from tonsilities and septic quinsies, at intervals of two or three months. He knew there was a sewer under his house because he had been foolish enough to allow one to be constructed there. A specialist whom he consulted told him the origin of his illness was drain or sewer air, but, believing that the sewer was perfectly airtight, he could not accept the explanation until he was persuaded to have the sewer tested by smoke, with the result that it was discovered that, almost under his desk, there was a badly-made joint. That having been put right, his father had never suffered since. It might be a coincidence, but it was no use telling his father that sewer gas was not harmful. He did not think the committee were justified in coming to the conclusion they had on the question of stoppages; if they had taken a larger number of towns a different conclusion would have been arrived at. The option given to local authorities in the matter of by-laws was, however, one excellent feature of the report and would, he considered, have good results.

Mr. W. Jennings (Lambeth) said he was sensible of the honour of being permitted to say a few words on that most interesting and abstruse subject which had occupied the minds of sanitarians for the past quarter of a century, and the earnest deliberations of a Royal Commission for four years. He had, by the chairman's permission, ten minutes at most to compress his remarks, which could obviously be greatly extended without exhausting the subject. He recognised that many eminent sanitarians had already expounded their views, and he did not purpose traversing the same ground, although he was deeply interested in the questions for and against the intercepting trap. He left the discussion on that, and passed on to a still more important subject—*viz.*, the disconnection of sanitary fittings from house drains. Competent authorities were practically agreed that the danger lurked in the smaller private drains rather than in the larger public sewers, yet while great importance and attention had hitherto been paid to the disconnection of the private from the public drain, little or none had been given to the disconnection of water-closets from soil pipes or house drains, and most illogically, while it was deemed imperative to doubly trap, disconnect and ventilate the waste pipes of baths, lavatories and sinks, the most important sanitary appliance, and the most frequent source of danger—*viz.*, the water-closet—was not disconnected at all. In hotels and mansions it was the present-day custom to find installed side by side lavatories, baths and closets fixed under the conditions he had named, and he submitted that it was the duty of sanitarians to make secure the first line of defence, and render the house impregnable to any incursion from the house drains, before considering the outworks, as they might term the public sewer, which, although of great, was admittedly of secondary, importance. In olden days an Englishman's house was his castle, and, according to the imperial lexicon or dictionary, a castle was a fortress, or a house fortified for defence against an enemy; and it behoved all sanitary engineers first of all to fortify the dwellings of the inhabitants of the kingdom against the incursion and ravages of the enemy—*viz.*, drain air. Without desiring to appear in the *rôle* of a pessimist, he would briefly refer to the awful epidemic of cholera which had broken out among the Turkish forces. God forbid that the disease should ever land on these shores; but it was the duty of all of them to be prepared for such an eventuality and to take such steps as would enable them to overcome and defeat such a visitation should it unfortunately arise. He hoped his remarks might engender further consideration of that vital subject.

Mr. Edward Willis, engineer and surveyor to the Chiswick Urban District Council, said a considerable amount had been said that evening as to Willesden being the cause of this enquiry, and no doubt it would be much maligned in consequence, but he believed they had done very great service in bringing together so much evidence, which was undoubtedly useful, although many present might differ from it. What was the *raison d'être* of these discussions? Surely they did not expect to bring better evidence than a Departmental Committee with unlimited funds at its disposal had brought forward? Then were they entirely to ignore the findings of the committee? He held no brief for Willesden, although he had had the pleasure of serving in the locality for many years. He was not at all connected with the evidence that had been given before the committee, but prior to the enquiry he had studied the question of the intercepting trap, primarily because he considered that the shape was wrong, and as a building surveyor in the neighbourhood of Willesden for some years he had the opportunity of examining a number of houses and testing intercepting traps with actual excreta under ordinary conditions. They were in drains which had been properly tested and properly laid, and in the course of his experience he found a number of these traps he could not give the exact percentage because at the time he did not know anything about an enquiry—choked, primarily with paper and rags, and only on one or two occasions was it due to the stopper falling into the trap itself. He had had an experience of finding the cement had got into the traps, simply because the manhole covers were not put on at the time the drain was laid in many districts, and in some cases the actual position of affairs was that the flow had only 2½in. to pass over the trap. When he tested with a 2-gallon flush he had never succeeded in removing the excreta and paper, and when he tried a 3-gallon flush, it was only occasionally that that was possible, and after several flushings, but in every case where he tested with a pail of water or a pail of slops the excreta and the paper were entirely cleared. That brought them to a very important point in regard to the means adopted for flushing closets, whether interceptors remained or not, and, in his opinion, there was room for great improvement in the present methods. He had two experiences with regard to rats getting through the traps, in one of which he had a witness, while in the other case he was the only person in the manhole. In the latter case he had sent his assistant to arrange for the drains to be flushed, and he saw the rat come right through the trap, and the same thing occurred a second time, when he had a witness present. Therefore, he was afraid they must disabuse their minds of the idea that the intercepting trap was a perfect bar against rats, and they had to contend with a most serious problem, especially when they had traps beneath a closet on the ground floor. He thought that in a large number of cases intercepting traps would be done away with after this report, and his personal opinion was that for many reasons that would be a benefit. He admitted there were reasons which would lead one to the opposite opinion, but he thought the maximum opinion was in favour of removal of the trap. If they removed the trap they must give some additional bar against rats, and that point had been dealt with by Mr. Jennings. In the future, if those traps were done away with, they would have to provide a double trap to every water-closet in a house, which they practically got now in the case of valve closets. It

did not think they should pass lightly over the evidence which had been given before the Departmental Committee. The witnesses had no axes to grind; they were asked to give impartial evidence, and their status in the profession was sufficient to carry great weight, and not only on the question of intercepting traps, but in regard to sanitation generally and sewerage construction the evidence would be most useful. The evidence in connection with the discharged gases from flowing sewage was, he thought, particularly useful. It clearly pointed to the fact that splashing was the primary cause, not only in drains, but in sewers, of the discharge of offensive gases. He could not agree with one of the witnesses who said that sewer gas was not to be feared if it gave off no odour—that did not agree with an experience he had had with an assistant in going through a 580-ft. length of 3-ft. sewer. They both found their lights beginning to burn dimly when they were about a quarter of the way through, and his assistant wanted to stop and rest, but he (the speaker) managed to push him on in front and succeeded in getting out at the other end. The sewer was perfectly inoffensive and perfectly clean, except for a slight flocculent accumulation on the sides, but it was a proof that there were dangerous gases in it, and he thought therefore that particular clause in the report should be taken *cum grano salis*.

Mr. W. D. Scott Moncrieff (Westminster) said he did not think it was possible for those who were advocating getting rid of the trap to ignore such arguments as had been given that evening by Mr. Cooper and his inspector, Mr. Johnson. His recollection went back to the construction of one of the first disconnecting traps in Scotland, by Dr. Ferguson in Glasgow forty years ago. The idea of disconnecting was so clear in the minds of sanitarians at that time that it was taken up as a matter of course and in the belief that sewer gas was dangerous. It was quite clear that if there was no danger in the air that escaped from sewers there was little to be said against getting rid of the trap, which, in its very nature, had certain obvious mechanical disadvantages. But he thought that was a large order. On the evidence presented they were asked to believe that sewer gas for all practical purposes was a negligible quantity as regarded public health. It was generally recognised that the ventilation of sewers themselves was still an unsolved problem, but until the evidence was available the disconnection of the sewer from the house was accepted as an absolutely solved problem, and it seemed to be a very dangerous proceeding to fly in the face of what they had at present and take the very serious step of making great alterations on evidence which might very likely be upset before many years had passed. Since its establishment the Royal Sanitary Institute had committed itself to this system of disconnection, and if they adopted the views of the committee it might happen that discoveries might be made later on—through no fault of the bacteriologists or chemists, but simply from the state of knowledge of the time—and some other terrible creature with a long name found. The disconnecting trap would then have to be put back until some disinfectant had been discovered to deal with the creature. (Laughter.) What Mr. Cooper had said with regard to the difficulty of analysing the actual pathogenic conditions connected with a particular smell was well known, and Dr. Rideal, in one of his text-books, had said that they might take an exceedingly small quantity of perfectly fresh broth or similar substance, put it into sterilised water, and, with a suitable organism, produce a most offensive smell. One might fairly challenge the medical men who had signed the report from the bacteriological point of view, or had suggested the view by the evidence they gave—not to take a person who was accustomed to sewers, but a delicate person susceptible to sore throat, and subject them to a whiff of sewer gas and see what they would say. There were a vast number of people in the country who were not strong, and in many situations there were sleep inclines, as in London. Under certain conditions of the atmosphere they would have a passage of very foul gas from the ventilating pipes very near the level of the houses in which nine-tenths of the people were sleeping. Putting one gas against another, he thought there was little to choose between them, but, speaking for himself, he would prefer not to have the gases at the level of the part of the house where he happened to sleep, and at a time when the vital forces were naturally lower and less able to stand them. It had always appeared to him curious that certain experiments made some years ago by an Italian bacteriologist had been ignored when dealing with this aspect of sanitation. This Italian bacteriologist made experiments on animals which were immune by inoculation from enteric fever, and he discovered that the immunity was destroyed by their being exposed persistently to the presence of sewer air. If an immune animal could be rendered liable to enteric fever, how liable might a large number of the more delicate proportion of the population of London be to the intrusion of these gases was a question to be considered. As had been said, it was a large order to accept the view that there was no danger.

Dr. C. Porter (Marylebone) commented on the fact that of the three medical officers who spoke at the opening discussion two were in favour of the intercepting trap, Dr. Butler being against it. He agreed with Dr. Butler, and, like him, had been brought up, so far as the intercepting trap was concerned, in the orthodox faith; but before he heard of the report he was strengthened in the doubts he entertained with regard to the trap, as the result of his work in the Midlands, and more especially in Leeds. Leeds was looked upon as an entirely trapless city, but as a matter of fact traps were insisted upon under the by-laws, and when he was there he brought pressure to bear on the owners to instal them, and had also to listen to the complaints of inspectors and others in regard to traps. He need not say what was stated in the report with regard to the health conditions of houses in Leeds which were without traps. Living in Leeds, one had a tendency to become heterodox, and some time ago he told Dr. Parkes that he saw no necessity for the committee, because he did not think anyone believed in the trap. Dr. Parkes replied that a great number of people believed in the trap, and that he himself did, and, of course, he (the speaker) rapidly changed the subject. At the previous meeting Dr. Parkes drew a terrible picture of the typhoid bacillus finding its way through the soil pipe and down the drawing-room chimney; but he still believed in the accuracy of his own conclusion that the trap was really no protection at all, that it was an apparatus difficult to choose and to lay, that it was so constructed that it was difficult to flush, and that it would act as an obstruction to anything going from the drain to the sewer. Dr. Boobbyer said he believed in the intercepting trap, because in the far-famed Nottingham Park the water-closets sometimes dried up, and Dr. Parkes' reason for being in favour of it was that Mr. Patten Barber in his experiments used artificial fæcal matter which contained clay, in addition to what he said about the typhoid bacillus. Neither of those gentlemen gave one valid reason in favour of the trap, and he very much preferred to stick to the logic of the report which Mr. Boulnois had so ably summarised.

Mr. A. A. G. Malet (Local Government Board) said he was probably not letting out any secret when he said that two of the members of the Departmental Committee were brought up in the orthodox style. They were told that the report they had issued was not orthodox, but he could only say that they followed what they thought were the conclusions shown by the evidence before them. Their report was certainly not written either to bolster up or pull down the intercepting trap, and he was surprised to hear some speakers claiming the report as something written precisely on their side or against the other side. The committee had absolutely no intention of taking up a position of that kind; they had no wish to show any preference either one way or the other. Speaking personally, it seemed to him that one of the most important points in the whole report was that if the evidence was true, sewer air was less dangerous than drain air. He did not wish to say that sewer air was not dangerous at all; he only said it was less dangerous than drain air. If that was accepted it followed that a combination of sewer air and drain air could not be worse than drain air alone, and that practically meant that in ordinary circles the need for an intercepting trap was not a vital necessity. Then they came to certain circles where an intercepting trap might be necessary, and in such cases it should be left to local conditions to decide whether a trap should be placed or whether it should not. One gentleman who had recently spoken had welcomed that recommendation, and he (Mr. Malet) ventured to say that it was quite a natural conclusion to come to. If they accepted the fact that sewer air was less dangerous than drain air, then the fact to which one gentleman had referred, that traps might evaporate and air emanations get into the house in conse-

quence, did not appear to be very important, because if the trap ventilated a series of flats they would still get emanations from the drain into the house, and if sewer gas was not so dangerous as drain gas, and the trap was taken away, they got both sewer air and drain air in, and that did not make it any worse than getting only drain air in. The vital point of the whole thing was whether sewer air was less dangerous than drain air. What they found in the course of their investigations was that if there was any undue pressure in a drain it was only the weakest trap that went; there might be twenty traps in a drain, but in case of undue pressure it was only the weakest trap that would go; the others remained in quite satisfactorily. If that were the case it was hardly worth while thinking what should be done when the trap was taken away, but it seemed to him that a weak trap might be put on the drain—they might take the lowest connection from the closet and might insert between the ordinary house fitting trap and the connection from the sewer pipe a puff pipe, and if they had undue pressure the weak trap would go, and the emanations would go through the puff pipe into the open air, or wherever they liked to take it. It would be less dangerous than going into the house. No one wanted sewer air or drain air in their house; it was a thing to be avoided by all possible means. A lot of evidence went to show that sewer air was chiefly dangerous from the point of smell. In their report they drew particular attention to the question of smell, and they said that every means should be taken by the local authority to see that no smells should occur, and that no sewer air or drain air should get into a house, and they suggested in one place that cast-iron pipes should be used. The two most important points were those relating to smells and splashing. It was an important object in life to keep their drains tight, and to see that smells should go somewhere where they would do the least possible harm, and they could not be too careful in considering where these upcast shafts should be taken to. They should be taken to places where the least possible nuisance and inconvenience was caused. As to splashing, they knew it was an accepted fact that splashing was dangerous in foul air, both in regard to the germs and the organisms that were given off. They knew that in the case of a sprinkler going round a sewage filter, if the sewage were at all septic or foul, the greater the spray the greater the smell. Personally he had been rather impressed by the evidence they got from Germany, where all pipes were taken up inside the houses owing to climatic conditions, and where they were told that only one town—Cologne—ever had intercepting traps, and there they had become such a nuisance that they had been taken out. They also learned that whenever they laid earthenware or stone pipes they always made the joints with some bituminous compound, and not with cement, a point which might be worth considering.

Mr. F. Osborne Smith remarked that the report was somewhat perplexing and deserved careful consideration. It was certain that they must reconsider their present accepted ideas with respect to drainage. This, of course, did not necessarily mean that they were to accept the evidence and conclusions deduced therefrom without question. Personally, he took exception to several points—the removal, for instance, of the fresh-air inlet to overcome one of the disadvantages of the interceptor. That, he considered, would be fatal in several ways. Let them, as an example, take a house with one soil pipe, a ground floor and upstairs water-closet, and a mica flap fresh-air inlet; the top water-closet was flushed, and the air was driven in front. Where could it go? Obviously it must go somewhere, and it went through the ground floor closet trap, and drove the water of the trap in front of it. How much more would that happen without an inlet. Of course, the flap was acting well. This had happened several times in his own experience. Another point in the report was the sealing down of the lower portion of the drain so that a stoppage might become evident sooner than it did under the present arrangement. If they assumed that a stoppage had occurred in the trap, how was it to be removed without flooding the brick chamber? One of the advantages claimed for this sealing was that it prevented the flooding and consequent removal, which was objectionable. It was known that the interceptor frequently became stopped. Why was this? Some people said it was because dirt, &c., entered through the fresh-air inlet, but if this was so the inlet was obviously in the wrong position. Others argued that it retained legitimate solids in such quantities that they stopped it. In that case two facts were noted—either there was an insufficient flush of water to clear it, or the velocity was so small that there was no force to carry the solids through. That could be increased in various ways. The quantity of water might be increased, although this was sometimes difficult. Reducing the size of the trap would increase the velocity through the trap, and the gradient of the drain might be increased, which would also increase the velocity. Most of the traps which were found to be stopped would, he thought, also be found to be larger than was requisite for the amount of matter that was to pass through them, and the drain was laid with too little fall. Interceptors and drains in the past had generally been of too large a size, and until recently it had been considered essential to have 6-in. drains and interceptors for all main house drains. These were the cause of half the trouble. The interceptor was said to contain decomposing sewage which was responsible for the smell in sewers. Where did this decomposing sewage come from? It did not come from the water-closet, because clean water was used to flush it out of the closet apparatus. It came from the gullies which received the waste from scullery sinks and baths. These gullies were seldom cleaned out, and rarely flushed, and it was well known how offensive they became. If the waste pipes were examined it would be found that they were lined with a filthy slime, which was quite as offensive as the soil pipe, if not more so, and yet they had abolished the traps at the feet of the soil pipes long ago, and retained those at the feet of the waste pipes, which were literally young cesspools. The interceptors which were at the feet of soil pipes were really clean compared with the present gullies, many of which were actually selected because they retained the filth. Waste pipes had long since been made with pipes and joints similar to those used for soil pipes, except in size. Why not treat them as soil pipes—they were quite as foul—and remove the cesspools at their feet? They would then have the full value of their discharge to flush drains, there would be fewer traps to become broken and defective by frost or other causes, and they could retain one trap—the interceptor—to protect them and their houses from the foul air of other people's drains; it was quite enough that they should deal with their own. All sewers were not as clean as they should be, and it was unfair to judge all sewers by those which were clean. Some sewers were as sweet as could be desired, while others—well, the least said about them the better. It would be interesting to know if all the advocates of the trap had sewers beyond reproach. He was afraid not. He did not desire to mention names, but he knew of some which were practically half full of silt. Were they to ventilate those elongated cesspools through their house drains? He hoped not. The report stated that in some cases the trap would be necessary. In that case, why not take the bull by the horns and see that they got an efficient trap, and then they would rarely hear of stopped traps. The practice of ventilating drains by flushing them with foul air from other people's drains did not appeal to him. There was plenty of fresh air, and it should be passed through the drains to sweeten them and dilute the foul air which might be in them. To do this the fresh-air inlet must be at a low level, and not above the roof. In the event of the fresh-air inlet acting as an outlet at intervals, it would generally be of short duration. As a matter of fact, the poor fresh-air inlet was frequently the scapegoat of the scullery gully, which he had referred to, and which was frequently adjacent to it in the front areas of town houses.

Mr. A. J. Martin (Westminster) observed that, in matters of this nature, he liked to make sure of his premises, and what he was talking about, and he had taken the simple precaution of looking up the word "trap" in the dictionary, with the result that he read, "a trap is a snare." (Laughter.) He did not suggest that every intercepting trap was a delusion and a snare, but he feared a good many of them had something of that about them. He listened to the interesting discussion the previous week, but he confessed he was disappointed, because he had hoped to gather from the supporters of the intercepting trap some real arguments in favour of it. The best he heard was that made use of by Dr. Boobbyer, who stated that the trap was useful because it pandered to the prejudice of an ignorant public. Dr. Boobbyer did not say so in so many words, but it was manifestly the idea in his mind. In the days before they had the benefit of the Insurance Act a prudent man who wished to

protect himself against evil went to a wise woman, who gave him a charm to hang round his neck. It appeared to him that the intercepting trap was very much in the nature of a charm. Although it was too large to wear round one's neck, they stuck it on to the house drain. He was not sure whether in many cases it would not do as much good to put it into the garden and grow geraniums in it. In laying a sewer the point the engineer aimed at was that it should be self-cleansing; that the liquids and solids should pass through it instead of lodging in it; and also that it should be self-cleansing as regarded the air it contained. They took care to lay their sewers and house drains up to the standard, and then put in a contrivance which held back a large quantity of decomposing solid matter, and brought about stagnation in the drain and sewer. What he was impressed with most in the discussion was the awful straits to which the advocates of the trap were reduced in their efforts to justify its existence. The case of the rat seemed to be the weakest that could be placed before an intelligent audience. If anything could be weaker, perhaps, it was the elaborate description given by Dr. Parkes of the pilgrimage of the adventurous typhoid organism from the soil pipe and down the drain, and up the next soil pipe, and then by some mysterious means down the throat of the inhabitant of the neighbouring house. He allowed that this was possible, but it was a remote possibility, and when persons were driven to such an argument they must surely have a very bad case. They had listened to an eloquent disquisition that evening on the danger of sewer air getting into a dwelling-house if the intercepting trap was left out, but who in his senses was going to put a ventilating pipe into a place where the gas could get into the house? Looking at the subject as a whole, there did not seem to be a doubt that the objections to the trap were real, while the advantages were problematical, and it seemed to him, therefore, that a very heavy blow had been dealt at the idea that the trap was a necessity in every case. The supporters of the trap claimed that the objections to it were due to wrongful construction, and so on, and they pointed to defective drains and sewers as necessitating the continuance of the trap. But if they assumed advantages for a properly fixed trap they must also be fair and assume perfect drains. It had been urged that, as the report of the Departmental Committee alleged that the trap was no good, they should consider what steps they should take to get people to do away with it; but he would ask if such a course would not reflect seriously on the sanity of their profession. They would, it appeared to him, absolutely stultify themselves if they were now to put up a contrivance which down to a few days ago they were compelled to put in. The report contained nothing to justify such a step; it simply pointed out that there was a good deal to be said on both sides, and the logical outcome seemed to be that they should give local option to householders to say whether they would have traps or dispense with them. Valuable as the report was, he did not think they ought to apply the far-reaching conclusions on so small a foundation of fact. He accepted the investigations absolutely so far as they went, but he did not think it was altogether safe to rely on the [illegible] and class of investigations of sewer air. They ought also to have regard to results, and they ought to have evidence from more than the forty or fifty gentlemen who had been before the committee. There was a large body of experience in the country, and this might easily be collected. He would like to suggest whether it might not be well for the council of the Royal Sanitary Institute to join perhaps with other bodies in addressing inquiries to local authorities, putting certain definite questions on the subject, and then arrange for the answers to be summarised.

Mr. A. P. J. Cotterill (Westminster) said that [illegible] intercepting trap he could not help feeling that there [illegible] the expression used by one speaker that sewers were "sewers," and he thought it was because of that that they found it [illegible] some sewers [illegible] the need of the trap. [illegible] would point to the fact that the trap [illegible] fixed it, and there was no reason why it should. The percentage of blockages in Willesden had been given, it being added that in no case was there evidence of the stoppage until the traps were exposed to view. But where was the sewage going? With regard to [illegible] he was bound to say that in the majority of cases these were placed in the wrong position, and his opinion was that they ought always to be at the top end of the drain, so that the fresh air would be drawn in by the partial vacuum caused by the receding sewage. Any retention of sewage in a trap was not the fault of the trap, but of the people who fixed it, and there was no reason why the trap should contain sewage. If they did away with the intercepting trap they would not do away with the bad [illegible] a large [illegible] there not carried too far. Years ago there were people who absolutely refused, as long as they possibly could, to have a connection made between their drains and the sewer on the ground that it was more dangerous than having a cesspool on their premises. That objection had ceased as a result of the improved condition of the sewers, and it was when they so improved the sewers generally that they would find householders prepared to dispense with the trap. He thought progress could be made in the direction of the improvement of house fittings. Drains were things which the ordinary householder preferred to think as little about as possible, and how many of them had a regular inspection of their intercepting trap? Even local authorities themselves, except in one or two instances, did not pay any regular attention to the house trap, and yet it was very important that that should be done. The stoppages mentioned in the course of the discussion were all such as could have been prevented, the accumulation of cement in the drains being one thing which could be avoided. For his own part, he abominated the fresh-air inlet, and he would do without it as often as he could. In his opinion there was no need to carry currents of fresh air through the drains. In their report the committee stated that the more fresh air was brought into a drain or sewer the larger the number of microbes they brought into existence—in other words, they were creating the very nuisance they were trying to abolish. A clear vent was undoubtedly necessary, and his view was that was all that was required. In the present state of public opinion, to say nothing of the present state of the law, even with this very strong report in their hands, none of them would be justified in asking for the abolition of the intercepting trap, but he thought its omission might be permissive in cases where by-laws were being revised. It might be desirable on old systems of sewers, but people should not be tied down to its retention in new systems.

Mr. T. A. Gorinot (Marylebone), who stated that he had had a somewhat extensive experience in the building trade, said that when he started out his first impressions were that there was no necessity for traps at all. He constructed drains on that principle, but when he eventually settled down to a particular branch of the trade he became impressed with their absolute necessity. If they did not have intercepting traps, why have any traps at all? It was said that the trap was an obstruction to the drain; but did they mean to tell him that without the trap there would be no obstruction of the drain? When he was working as a boy he found more drains without traps stopped up than those which had them. He would prefer the air generated by the drain of a single house to the accumulated air of a whole town. As regarded the fresh air inlet, if they had a certain amount of decomposition going on it was better to have the introduction of fresh air and proper ventilation of the drainage than have the air of an elongated cesspool introduced to a house. No one, it was suggested, would be stupid enough to put up a ventilating shaft where people could breathe the air from it, but in London it was impossible to erect such shafts at any reasonable distance from windows. If the intercepting trap was an evil, he looked upon it as a necessary one.

Mr. W. Firth (Shoreditch) said that, although it seemed to be assumed opponents of the trap were in the majority, he thought it would be found to be otherwise if a poll were taken. In spite of misrepresentations and of the pressure brought to bear on them, the committee had not been able to recommend the abolition of the trap. The alleged disadvantages of the trap were set out on page 3, paragraph 9 of the report, but he thought that was only begging the question. A proper trap did not cause stoppages any more than any other because it was an intercepting trap, and there was no reason why it should. The percentage of blockages in Willesden had been given, it being added that in no case was there evidence of the stoppage until the traps were exposed to view. But where was the sewage going? With regard to fresh-air inlets, he was bound to say that in the majority of cases these were placed in the wrong position, and his opinion was that they ought always to be at the top end of the drain, so that the fresh air would be drawn in by the partial vacuum caused by the receding sewage. Any retention of sewage in a trap was not the fault of the trap, but of the people who fixed it, and there was no reason why the trap should contain sewage. If they did away with the intercepting trap they would not do away with the bad [illegible] a large [illegible] there not

being sufficient water to sewer the excreta through the pipe. They had been going wrong for many years. The ordinary wash-down closet made a big stir, but half the water went out before the excreta, and two-thirds of the water was through the intercepting trap before the excreta reached it. With the old-fashioned valve closet, however, there was a large body of water, which carried the excreta right through the trap and into the sewer.

Mr. P. Dodd, borough engineer and surveyor of Wandsworth, in a written communication, said he was one of those who had held the opinion that from an engineering point of view the intercepting trap was not a necessity, but he had always been led to believe that from a public health aspect it was and is an absolute necessity and ought to be retained, because, among other reasons, the trap was a seal against disease germs passing from an infected sewer or house drain to the non-infected drain of a neighbouring house. Moreover, it prevented the foul air of the sewers from escaping to the house drains. But, according to the report of the Departmental Committee of the Local Government Board, the use of the intercepting trap was not a necessity on bacteriological or epidemiological grounds, and, again, it stated that it was a well-known fact that soluble gases could be taken into solution on one side of a column of water and given off on the other. If these conclusions were correct, the theory of the trap being a seal against disease germs travelling from one house drain to another was wrong, moreover, the trap was not apparently a barrier against sewer gas passing from the sewer to the house drain, because when the water in the trap had absorbed all the sewer gas it could possibly hold the surplus gas passed through the water trap as if there were no barrier to prevent it from doing so. Under those conditions we had foul sewer and drain air on both sides of the trap. The question was no doubt one of serious public health importance, and it seemed that before taking any drastic measures further investigation would be needed. In the borough of Wandsworth they had at least 50,000 traps fixed on house drains, and it would not only be inexpedient but unreasonable to ask the owners to remove the traps which they had been compelled to provide under the existing by-laws. Seeing that the report states that the offensiveness of sewer air was sometimes pronounced, it was obvious that the real point was to get rid of the foul air both in the sewers and house drains. When we had impure air to deal with in any large crowded public buildings or in some of the badly constructed dwelling-houses, the remedy invariably suggested was the supply of fresh air. The same remedy should be made to apply equally to the more or less foul and contaminated air conveyed by the sewers and drains to the immediate vicinity of our dwelling-houses. The report states that "It is obviously important that public health authorities should make every effort to secure that both sewers and house drains are so designed and constructed that the opportunities of their contributing smell to the atmosphere shall be reduced in every possible way." It seemed that the best way, not only to reduce but to abolish the smell, was, if possible, to prevent the sewage from becoming septic, and at the same time to cause the drains and sewers to be filled with fresh air. If the intercepting trap was to be retained, then the best type should be adopted, standardised and approved by the Local Government Board. He had an opportunity that morning of inspecting and seeing the working of a little automatic apparatus which he believed would immediately be placed on the market, and which he thought would revolutionise our present system of house drainage. It was an automatic self-cleansing trap, drain-flusher and fresh-air distributor combined. It was claimed that the trap would not only be always clean, but the apparatus would flush and ventilate the house drain and sewer, and would meet the objections of those who were against the abolition and those who were against the retention of the intercepting trap. Furthermore, it was claimed that the apparatus was a solution of this much-vexed question.

Mr. H. Percy Boulnois said that if he attempted to reply to the discussion it would mean keeping them there for another hour. He did not think they were any nearer a conclusion than before, but the discussion had been useful. If the trap was to go—and he thought it would—what precautions were they to take beyond those they had already taken? First of all, their sewers must be reconstructed of proper size, with proper self-cleansing gradients and with sufficient ventilation. The drains must be connected at a proper level with the sewer in order to prevent splashing—a most important matter. Then they would have to be very carefully laid in order to guard against leakage, and the soil pipes carefully constructed and connected with the drain; all sinks, baths, rain-water pipes and wastes must be disconnected and trapped and—he agreed with both Mr. Jennings and Mr. Shenton—the water-closets double sealed. Then, again, if the trap was to be done away with, he thought that iron pipes would come into almost general use; he believed in them most thoroughly. It was only a question of 25 or 30 per cent. greater initial outlay, and there was a sense of security about them to make him happier to live in a house in which they were fixed. But what he did hope was that they would get an improved flush, for all the experiments which had been carried out showed that half the difficulties arose owing to the ridiculous 2-gallon flush. It was a retrograde step of the water companies and of the Metropolitan Water Board to insist on that, because the only result was that people flushed the water-closet two or three times, and used 6 or 8 gallons of water instead of 4 gallons, which should be the flush—or three at the least. Two gallons were absolutely insufficient. The Royal Sanitary Institute could, of course, investigate further, but was it worth it? They had a committee which, without fear or favour, had investigated the matter for four years. They had examined a number of witnesses, but he regretted they did not examine more sanitary inspectors. They only examined two. Several sanitary inspectors had taken part in that discussion, and had been very practical in what they said, and, indeed, almost more practical than anyone else who had spoken. Now that the committee had done all that work, what further work could they do, and what was the use of pressing it further? Mr. Martin had suggested that they should send a circular to all the surveyors in the country; but what would be the result? One half would condemn the trap and the other half would say they would not do without it. He thought they must accept it that the trap, although not absolutely condemned, had been found in places to have caused trouble; therefore the by-laws in future must be permissive, the Local Government Board would have to withdraw their prescription, and it must be left to the responsible officers of a town to deal with the place on its merits and act accordingly. If the trap was done away with they must obtain additional security. Personally he was brought up in the belief that the trap was a means of protection against the common enemy the public sewer. The object was to keep their neighbour at arm's length, because if there was any truth in the germ theory it was felt that germs might pass into drains and poison people. He did not think Dr. Parkes was to be laughed at on account of his opinions. The whole of Dr. Porter's speech was a cynical derision of the whole thing, but he (Mr. Boulnois) thought there was a great deal in what he said, and he thought the idea would still lurk in his mind, notwithstanding the statement in the report that sewer air was almost the purest that one could breathe, and that the microbes were really obtained from the air itself. They must remember that they had been struggling with sanitation for the past forty or fifty years, and the proof of the pudding was in the eating. No one could deny that people were healthier than they were, and suffered less from zymotic disease, and that that was undoubtedly largely due to the improvements in drainage.

Votes of thanks to Mr. Boulnois for his paper, and to Sir Maurice Fitzmaurice for presiding, were passed, and the proceedings then terminated.

SOME COMMENT ON THE REPORT OF THE DEPARTMENTAL COMMITTEE.

By R. Harris Reeves.

The following comments are made by the author, not as destructive criticism, but with a view to bringing into light for discussion some of the vital points dealt with in the report, as illustrating his view that it does not satisfactorily correlate the experiences of the engineer, chemist, bacteriologist, meteorologist and sanitating engineer:

The usefulness or otherwise of the report of the Departmental Committee of the Local Government Board on the Intercepting Trap in House Drain-

hinges, not on the trap, but on its use in obtaining good or bad sewer ventilation.

What the majority of medical men, health committees of councils, and the general public wanted was some sound solution of the sewer emanation difficulty. To deal with the question on the lines adopted in the report is simply putting the sanitary clock back, as it were, a quarter of a century. Had this committee gone through and examined the work done twenty years ago within 1 mile of their office, and investigated the work and experiments carried out at that time, as well as those of recent date, there would have been no necessity for this report to be issued.

By the publication of this report a very curious state of affairs has been brought to light. Not a single person or firm trading or dealing commercially with the subject has been called. This, to me, is most astonishing, as the President of the Local Government Board owes his position solely to the help of the commercial classes, and in this report he has entirely ignored their existence and their ability to throw any light on the subject.

One point which seems to have been entirely overlooked is the difficulty that local authorities will have to encounter through its recommendations and conclusions. For instance, persons may take the views of this committee, and in erecting a large house omit to provide an intercepting trap. The neighbours on each side of the building already have traps and inspection chambers fixed to their house drains. Then the one house drain without the trap would allow the sewer air to go through the drain and up the soil pipe, where it would, at certain times, be freely discharged in large volumes. Now a discharge of sewer emanations from a soil pipe entering the next building would in all probability cause sickness and even death to the inmates. This being proved, the council would be liable for the damage, the primary source of the evil being the sewer constructed by that council or local authority.

The local authorities having no intercepting traps to the house drains have no limits to their obligations in protecting householders from sewage pollution.

Any experts proving by analysis or photography that impurities came through the untrapped drain from the sewer would undoubtedly win the case in a court of law for their clients.

The Government itself spends money very freely on science, but when there is an opportunity of applying such knowledge commercially and to the benefit of the public, they invariably give it the cold shoulder.

The views of the various expert witnesses make interesting reading for students of sanitation, but the whole production shows a complete lack of business acumen.

From a common-sense point of view is it correct to allow emanations from sewage and putrid matter to collect in sewers, and then to find their way through drains and soil pipes to the tops of houses to disperse, when they can be dealt with effectually in the sewer? Prior to the Local Government Board Model By-laws a very large amount of work was done by way of experiments and appliances to prevent sewer air contaminating the air of dwellings, especially the air of bed-rooms where people were sleeping. But on the introduction of the trap by such an authority as the Local Government Board these improvements were abandoned.

It is only by comparing the zymotic sickness and death rate at that time with that at the present when sewer gas entering a house is almost an impossibility, through the efficient seals provided and enforced by the medical officers to the various councils—that we can judge the value of the intercepting trap from a public health point of view.

The death-rate in London from zymotic disease in 1853 was per 1,000, but in 1881 it reached 13·657, being an excess of 2·599 over that of the previous year.

The expenditure of the Asylums Board when these cases were treated was, in 1880, £252,000, but in 1881 it reached £502,600, or an excess of £250,000.

In 1881 the death-rate from small-pox was 223 per 1,000,000 of inhabitants.

In 1882, 224 per 1,000,000.

In 1883 the rate per million from small-pox was practically the same, and large sums were required to provide hospitals and staff to cope with the cases. At that time the source of the disease was considered in all probability to be the foul air from the sewers entering bed-rooms through untrapped drains. The then Main Drainage Committee, on the advice of Mr. Dibdin, their chemist, chemically treated the whole of the main sewers under the control of the board, with a view of preventing the discharge of sewer gas from the sewage in transit. The cost of this work was £110,000. It was a rough but effectual experiment, and the effect was a cessation of the outbreak, and the following year the hospitals were empty of cases. As a proof of how little the staff had to do, an application was made and granted to allow a band to play on the ships and hospitals to relieve the monotony of the staff.

In 1886 (when the sewage was treated) the death-rate from small-pox was 1 per 1,000,000.

In 1887, 2 per 1,000,000.

In 1888, 2 per 1,000,000.

Thus, by taking the whole facts, it will be seen that it cost four times the amount of money to cure the disease as compared with the cost of preventing it.

On going through papers dealing with the subject, I came across one with reference to the ventilation of the main intercepting sewer of the Water of Leith Purification and Sewerage Commissioners.

In this paper, which was read before the Incorporated Association of Municipal and County Engineers, is ample proof that Edinburgh was the first city to deal largely with the question of sewer ventilation on the lines of attacking the evil in the sewer itself. The principles then adopted have been proved to be correct by this report of the Departmental Committee, although no notice has been taken of the work.

Taking the medical and bacteriological side of the question, Sir Henry Littlejohn, I believe, had experiments made by Edinburgh University experts to prove that the air in sewers was sufficiently purified to warrant the Edinburgh Council paying for the work done, and that they were working on correct lines in this matter. Unfortunately, these tests were never published. But, to my mind, they were more thorough and advanced than any mentioned in the recent Local Government Board report.

The late Mr. Cooper, burgh engineer of Edinburgh, and others associated with him, did not believe in the value of shafts. That they were correct is borne out by Mr. Mawbey's evidence and observations in Leicester. He says (page 43 of the report):—

"Thus, in 1,042 observations on 30 sewer ventilating shafts (6 in. by 4 in.), each observation lasting 15 minutes, the anemometers recorded 619 down currents and 1,002 up currents. Many shafts, therefore, acted both as air inlets and air outlets during each observation, while some never acted as outlets. Similarly, with 20 shafts of larger size, in a total of 575 observations, the instruments recorded 449 down currents and 547 up currents."

The bacteriological experiments, as recorded in this report, by the various pathologists and medical men, are undoubtedly correct. But, to my mind, they appear to be so confusing in their application that they do not help us one step further to obtain perfect ventilation in a sewer.

We find that pathogenic germs are the lowest form of vegetable life. Taking a common-sense view of the facts, we know that increased vegetation is produced by a manure which is most suitable for its cultivation. For instance, nitrate of soda is an excellent manure. But if you plant a vegetable in this alone will it mature? The same law and facts apply to the growth of pathogenic germs under the influence of sewer emanations. In this report it is stated that bacteriologists found more germs or bacteria in the outer air than they did in the sewers on which their experiments were carried out. Taking the outer air as the earth, and the sewer air as the manure, my point is that the bacteria would neither grow in the sewer air (manure) nor in the pure outer air (earth). But by adding a certain proportion of the manure to the outer air the cultivation of the bacteria would be greatly increased, thus accounting for the fact that more were found in the outer air than in the sewer.

On page 35, paragraphs 104 and 103 of the report details are given of some experiments carried out on animals to ascertain the injuriousness or otherwise of sewer air. It was sought to ascertain whether animals became more susceptible to certain pathogenic germs with which they were experimentally inoculated if put to breathe in surroundings defiled by putrid gases. It was found that microbes were much more virulent with animals which had been exposed to putrid gases than with control animals not so exposed. The total number of animals subjected to the putrid effluvia was 179, and of these 143, or 80 per cent, died after inoculation; while of 133 control animals similarly inoculated, only 3, or 2¼ per cent, died. M. Depépine's

experiments do not show the results of inoculating the animals after breathing the sewer air. Rats, from their nature, could withstand the effects of breathing this sewer air. But can these animals, without inoculation, be compared with human beings so exposed?

The value of the Bristol evidence can be determined by the following facts: A cutting from the *Daily Express* of May 8, 1912, showed that small-pox was prevalent in Bristol. Small-pox epidemics have been known to have been stamped out by preventing the public from inhaling emanations from sewers. As for diphtheria and throat troubles, the medical officer of Bristol some years ago established a special laboratory for bacteriologically testing the throats of infected patients as the cases occurred. He also provided his fellow medical men in the city with swabs for this purpose. The results were published in the "Proceedings" of the Society of Medical Officers of Health, and showed conclusively that these cases were due to the non-ventilation of sewers, if compared with the results at other places where ventilation existed. As to Mr. Steele's report on the pneumatic action of the sewer—although he does not seem to have grasped the question in that light—I should like particularly to refer to the evidence published in my work. "Sewer Ventilation and Sewage Treatment," pages 7 to 33, particularly to the remarks *re* the chimney shaft on page 23. As this was written some twenty years before Mr. Steele's observations, I think I may say that by comparing the two you will find that the committee was a long way behind what was done at that date, and that when the Water of Leith Commissioners first decided to ventilate their sewers (on the principles they adopted) they had better evidence than is contained in the Local Government Board report.

The weakest point in the report, from a public health point of view, is that no attempt was made by analysis to show how much or how little the heavier gases constituting sewer air were found in the sewers or drains. Yet authorities describe the action of two of these gases on the public health as follows:

CARBONIC ACID.

"When so far diluted with air as to admit of being received into the lungs, carbonic acid operates as a narcotic poison, producing drowsiness, entire loss of muscular power, rapidly followed by insensibility and coma. When the gas is respired in the lowest poisonous proportion, the symptoms come on very gradually, and the transition from life to death is usually very tranquil."

SULPHURETTED HYDROGEN.

"The gas has a peculiarly nauseous odour, resembling that of rotten eggs and so diffusible that a single cubic inch escaping into the atmosphere of a large room is soon perceptible by its smell in every part. When respired it proves fatal; and it is very deleterious, even though largely diluted with atmospheric air. Nausea, giddiness, headache, and a peculiar faintness, with loss of appetite, are the usual symptoms produced when an atmosphere even slightly contaminated by sulphuretted hydrogen has been breathed for any length of time." These facts are entirely overlooked in the report.

The statement that 25 per cent of the traps examined were found to be blocked I should take *cum grano salis*. The incorrectness of this could be well verified by the Association of Sanitary Inspectors.

The following evidence shows conclusively the value of the intercepting trap, as well as that of the work of sanitation, in keeping the public clear from sewage contamination, especially in our dwellings, where women, as a rule, spend the greater part of their time

GOVERNMENT WANTS MORE FOR ITS ANNUITIES.

People nowadays live longer than they used to, and it is proposed, in consequence, that the cost of government life annuities should be increased.

Mr. J. Blakey, actuary to the National Debt Commissioners, has prepared a report on the mortality of the 19,367 persons who purchased Government annuities between the years 1·75 and 1·04. According to the experience of 1890-75 the number of annuitants who ought to have died within five years was:—

Men.	Women.
632	1,134

The actual number of deaths, however, was

Men.	Women.
618	1,027

It will be seen that about 10 per cent of the women refused to die within the actuary's allotted time. A woman who buys an annuity at 60 may now be expected to live until the age of 82·61 instead of 67·67, the old estimate.

Annuitants who survive in defiance of actuarial tables get the better of the bargain with the Government, and Mr. Blakey recommends that both men and women shall pay more.

Under his new scale, a man of forty would pay £1,783 instead of £1,687 for a £100 annuity, and a woman of forty would pay £1,917 instead of £1,867.

Possibly these annuities will again increase as improvements continue to be made in obtaining a pure atmosphere in our dwellings and streets.

The following particulars of some tests recently carried out on the sewers of a large metropolitan borough will show what can be done to remove sewer emanations effectually:—

MANHOLE No. 1.

1st test.	Velocity of air current,	400 ft.	per minute.
2nd "	" "	406 "	"
3rd "	" "	386 "	"
Average	" "	401 "	"

Volume of fresh air passed into sewer by this ventilator per day, 192,960 cub. ft.

Volume of oxygen passed into sewer by this ventilator per day, 38,592 cub. ft.

Weight of oxygen passed into sewer by this ventilator per day, 1 ton, 15 cwt., 44 lb.

MANHOLE No. 2.

1st test.	Velocity of air current,	360 ft.	per minute.
2nd "	" "	360 "	"
3rd "	" "	400 "	"
Average	" "	373 "	"

Volume of fresh air passed into sewer by this ventilator per day, 178,560 cub. ft.

Volume of oxygen passed into sewer by this ventilator per day, 35,712 cub. ft.

Weight of oxygen passed into sewer by this ventilator per day, 1 ton, 12 cwt., 84 lb.

MANHOLE No. 3.

1st test	Velocity of air current,	320 ft.	per minute.
2nd "	" "	300 "	"
3rd "	" "	367 "	"

Volume of fresh air passed into sewer by this ventilator per day, 158,400 cub. ft.

Volume of oxygen passed into sewer by this ventilator per day, 31,680 cub. ft.

Weight of oxygen passed into sewer by this ventilator per day, 1 ton, 5 cwt., 100 lb.

I would state that the atmosphere at the time of the tests was a still one, so that the gratings were not acted on in any way by the wind pressure. I think these results conclusively show that the correct way to get rid of emanations from sewage is by ventilating down to the sewer through the open gratings; not up from the sewer through vents, as is the usual practice. The amount of additional oxygen obtained from the atmosphere in this way, as compared with the full cost of working the apparatus at 2d. per day, I think is a point worth the due consideration of all municipal authorities and their officials.

Sewerage Works Fatality.—On Thursday of last week two workmen were buried in a deep trench in the village of Old Colwyn, North Wales. The main sewer was being reconstructed when the upper portion of the trench collapsed. Mr. William Jones, the surveyor to the Colwyn Bay Urban District Council, two of his staff, four doctors, and some others were quickly at work, and, hearing the faint cries of the entombed men, they laboured heroically to remove the heavy mass of soil in time to save life. An elderly man named John Lloyd was first pulled out, and between his gasps he was heard to say, "Never mind me, boy. Look after the other man." He died while the rescue work was still going on. After arduous labour the second man, Morris Edwards, was reached and taken by the doctors to the cottage hospital in a serious condition.

Talbot Car's Fine Performance.—The Invincible Talbot celebrated the conclusion of the Olympia Show lately by an attack upon the records at Brooklands. The car, which was a 25-horse power, with the ordinary standard engine, catalogued and supplied by Messrs. Clement Talbot, Limited, first of all put up the terrific speed of 113·28 miles per hour. The flying kilometre was done at 112·81, and the mile at 111·73 miles per hour, while the fastest lap (about 3 miles) was completed at 109·43 miles per hour. The character of the Talbot performance can be gathered from the fact that the previous record for 4-in. engines was beaten by no less than 26 miles per hour, and, with one exception, the 25-horse power Talbot secured the record of being the fastest car that has ever travelled on the Brooklands track. A little item of interest to every motorist was that at the conclusion of the trial the Palmer tyres, with which the car was fitted, showed not a mark testimony to the wonderful springing of the Talbot and the value of the Derihon shock absorbers. The car was fitted with the Stewart-Talbot carburettor and Bosch ignition

Standards of Purity for Rivers and Waterways.

AMERICAN COMMITTEE'S REPORT.

[In December, 1911, Mr. George C. Whipple, Mr. George Wisner, Dr. A. J. McLaughlin, Dr. Edward Bartow, and Mr. Harry W. Clark were appointed as members of a committee of the United States National Association for Preventing the Pollution of Rivers and Waterways charged with the duty of making a tentative report on the feasibility of establishing standards of purity for waterways applicable to different conditions. The report of the committee, presented by Mr. Whipple at a conference held at Cleveland, Ohio, last month, is reproduced herewith.]

This committee finds that, on account of the increasing population of the country, it is and always will be physically impossible to maintain waterways in their original and natural condition of purity. A reasonable degree of cleanliness should nevertheless be demanded.

The discharge of raw sewage into streams and harbours should not be universally prohibited by law. The method of disposal of sewage by dilution is recognised as sound in principle and safe in practice if carried on with proper restrictions.

For each waterway at any given point there is a limit to the amount of permissible discharge of waste matter, depending upon the use that is made of the river and the character of the territory through which it flows. No universal standard of purity can be wisely established or maintained. When the extent of the pollution is such as to affect the public health in any way by any reasonable use of the river, the sanitary aspect of the situation should control and the degree of pollution should be regulated accordingly. The courts must decide what is "reasonable" use. When the extent of the pollution is such as to cause sensible offence to public decency in the course of any reasonable use of the river, this aspect of the situation may properly control. When the extent of the pollution is such as to cause material injury to fish or shellfish industries, or to the ice industry, this element may control. When the extent of the pollution is such as to cause the silting up of the channels of navigable streams, this element may control.

Even when the demands of public health, offence to decency and interference with navigation are such as to place a limit to the pollution of the stream, the economic aspects of the case should be considered in regulating the amount of permissible discharge of waste matter, the fundamental principle being that the results accomplished shall be reasonably commensurate with the cost of prevention of the pollution.

While no universal standard of purity applicable to all rivers and waterways can be established, it is believed to be feasible to establish and maintain appropriate standards of a general nature for waters that fall within certain particular groupings. The committee has this matter under advisement, but is not prepared to report upon it in detail at this time.

DISCHARGE OF SEWAGE.

Inasmuch as the safety of public water supplies is the most important element in the problem of stream pollution at the present time, the following general principles should govern the discharge of sewage and waste matters into rivers and waterways:—

Streams from which water supplies are taken without purification should not receive any fæcal matter, sewage, sewage effluent or wastes that will render the water a menace to health, or otherwise impair its natural quality.

Streams from which water supplies are taken and used after purification should not receive fæcal matter, sewage, sewage effluent or waste matters in such quantities that the contamination of the water at any waterworks intake would put an unreasonable burden upon the purification works, or in quantities sufficient to produce the conditions referred to in the next paragraph.

Streams not used for water supply may receive sewage, wherever used, in such quantities that it will not sensibly offend decency in the reasonable public use of the stream, or cause interference with navigation or with valuable fish industries or the ice industry. When this cannot be done the sewage or waste should receive such treatment before discharge as to bring the effluent within this rule, due regard being given to the relative cost of the processes required and the benefits to be derived.

Large lakes from which water is used for a public water supply without filtration should not receive any fæcal matter, sewage or sewage effluent within a distance of several miles from the intake, depending upon local conditions as to currents, and suitable provision should be made for disinfecting the water supply.

Large lakes from which water is used for public water supply after filtration should not receive fæcal matter, sewage, sewage effluents, or other waste matters in such amounts or at such places that the water reaching the intake would be contaminated to the extent that an unreasonable load would be placed upon the filter, or in quantities sufficient to produce the conditions referred to in the next paragraph.

Lakes not used for water supply, harbours and tidal estuaries may receive sewage if discharged in such a manner as to be quickly and thoroughly diluted, so that its entrance will not sensibly offend decency in the reasonable use of the water, or interfere with navigation. Where this cannot be done sewage should receive such treatment before discharge as to bring the effluent within this rule, due regard being given to the relative cost of the processes required and the benefits to be derived.

The data for deciding what is a reasonable burden to place upon a water-filtration plant have not yet been secured. It is recognised that water-filtration plants are not infallible, and that for this reason the work that they are called upon to do must not be too great. Until this fundamental question is settled it will not be possible to formulate reasonable standards of purity for streams necessarily used both for sewage disposal and for water supply. Often greater economy can be secured by abandoning water supplies from polluted streams than by attempting to reduce the pollution to the required extent.

While recognising that the pollution of many rivers and waterways is inevitable, and that absolute prevention of pollution is impossible, it is deemed imperatively necessary that some control over the discharge of waste matter into rivers and waterways be maintained. The committee heartily endorses, therefore, the movement that is being made to keep the pollution of streams within reasonable bounds.

The committee recommends the adoption by the association of these fundamental propositions, believing that they will serve as a basis for the establishment of more detailed standards later, and will be helpful to those who at the present time are engaged in formulating policies in regard to this matter. The committee also request that it be allowed to continue its work for another year.

Greenock and Port Glasgow Electricity Scheme.—Approval has been given by Greenock Corporation to a proposal to apply to the Secretary for Scotland to authorise the borrowing of £60,000 for the purposes of this undertaking, to meet the estimated expenditure within the area scheduled in the Port Glasgow Provisional Order. The engineer estimated the total cost of the Port Glasgow scheme at about £21,529.

Northampton Polytechnic Institute.—The Northampton Polytechnic Institute, Clerkenwell, announces a number of changes in and extensions of their equipment. In the mechanical engineering department a new steam plant has been laid down, while in other departments other important additions have also been made. The artistic crafts department, which had a very successful session last winter, is being continued on the same lines. The half-time trade courses in technical chemistry inaugurated last session are being further developed. In these classes the students, all of whom are engaged in commercial workshops, are in attendance from 9 a.m. to 1 p.m. and spend the afternoons in their employers' workshops. The experiment appears to meet the needs of the particular trades concerned, and if it continues to be as successful as in the past year it will probably be extended to other trades.

Mechanical Haulage.*

By GEORGE SYMON, Engineer and Surveyor to the Blaydon (Durham) Urban District Council.

As the papers to be read bearing directly upon our duties are not at the present moment too numerous, I venture to introduce a few remarks on the subject of "Mechanical Haulage" which may be of interest to some of our members.

One of the heaviest items of expenditure in connection with our work is the cost of conveying materials; this is especially so in the case of road and street work, and also in connection with such items as new sewage disposal works, &c.

During the summer of 1905 the Urban District Council of Blaydon, after numerous inquiries by me and some exhaustive reports thereon, decided to purchase a steam motor, and proceeded to do so, the results of which I now propose to describe to you. I will first, however, give a brief description of our district and the reasons for this somewhat unusual departure from the ordinary routine.

The Blaydon District has an area of 9,314 acres and a population of 31,148. Its rateable value is for poor-rate £110,074 and general district rate £90,183. It consists practically of a ridge forming the watershed between the rivers Tyne and Derwent, extending from their point of confluence at Derwenthaugh westward some 8 miles to the county boundary. In altitude it ranges from practically sea level up to 850 ft. above ordnance datum. There are 30 miles of main roads and 37½ miles of district roads, besides streets and public footpaths. The traffic on the majority of the roads is heavy; that on the main roads [illegible] like everywhere else, is tending to increase.

There are several villages spread over the district, the chief centres of population being Blaydon, Winlaton and Chopwell, the distance between the first and last mentioned being about 6 miles by road.

On the council coming into existence in the year 1895 they found a legacy of neglect awaiting them, which neglect and its effects they and their successive surveyors have ever since been endeavouring to overtake. This applies with peculiar emphasis to the state of the roads, which were in a truly deplorable condition.

The district being a coal-bearing one throughout, and there being thus no igneous or other rocks suitable for use as road metal to be found, or at least not in reasonably get-at-able positions, practically the whole of the metal required for the construction of the roads (they had to be constructed, as the existing roads consisted practically of long, narrow spaces, having little or no metal upon them) had to be brought by rail or by water, and many of the roads being a considerable distance from railway depots, the cost of carting was heavy, as much as 4s. per ton being paid for that item alone; hence the reason for searching around for some possibly cheaper mode of conveyance than that of team labour.

The fact that the council were then also being pressed by the county council to proceed with several somewhat extensive schemes of sewerage and of sewage disposal, which would necessitate the carriage of large quantities of heavy materials for long distances, also assisted in bringing about the purchase of the motor.

The motor that they ultimately decided—after many inquiries and comparisons—to purchase was a steam cart, by Mann's Patent Steam Cart and Wagon Company, of Leeds. There were several other very good types of vehicles examined and discussed, each of which had their good and suitable points, and, of course, also their drawbacks, and among the reasons which influenced the decision arrived at are the following—viz.:—

(1) It is a cart as distinguished from a rolley.

(2) It is made to tip.

(3) It can be turned completely in a circle of 36 ft. outside diameter—or by manœuvring on a road 20 ft. in width.

(4) The lowest part of its body is 11 in. clear of the road under it.

(5) Its extreme length is 14 ft.

(6) Its extreme height is 8 ft.

(7) Its extreme width is 6 ft. 7 in.

BLAYDON URBAN DISTRICT COUNCIL.

STATEMENT SHOWING EXPENSES OF THE STEAM CART.

Purchase of the Cart was £475 15s. 10d. each.

Year Jan. to Dec.	Renewals.	Maintenance	Raising steam.	Travelling.	Hired work.	Insurance	Wages	Total expenditure	Receipts.	Difference or gross gain.	Net gain (+) or loss (−)*
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1906	5 18 9	71 14 7	15 8 11½	14 4 2½	—	1 10 0	90 12 7½	214 5 8½	383 9 9	1 8 14 0	60 18 5½ +
1907	1 15 10	84 2 3	20 0 11	20 7 8½	1 8 1½	1 10 0	121 5 9	254 8 2½	493 13 11½	130 5 2	65 9 7 +
1908	1 8 6	56 11 0	15 9 4½	16 14 8½	—	1 10 0	118 15 4	257 18 6½	432 12 6	112 2 7½	54 6 8½ −
1909	17 7 11	115 8 4	15 16 6½	15 8 4		1 10 0	140 14 1½	316 4 5½	352 12 9	50 11 1½	27 3 7½ −
1910	6 1 1	111 19 6½	14 14 4½	16 0 9		1 10 0	124 2 4	274 8 0½	496 5 5½	66 17 4½	96 1 9½ +
1911	19 12 0	94 5 11½	15 15 6	28 0 2	4 10 0	1 10 0	144 1 5½	307 15 9	428 2 1	141 10 4	63 14 9 +
(Years)	13 3 8	100 17 4½	15 4 3	143 2 1½	5 18 1½	9 0 0	740 9 6	1,597 15 4	2,573 15 6	676 1 2	235 1 3½ +
Average	7 3 10½	100 2 10½	15 7 4½	19 7 0	19 8	1 10 0	121 14 10½	266 5 10½	378 19 5	112 13 6½	39 3 6½ +

* A total gain of £77 3s. 7d. has been realised in the 7 years, or an average of £11 0s. 6d. per year, the cart having been in use for a period of 7 years.

N.B.—The cost of water has been omitted in the above, the water used being paid for at the rate of 1s. per 1,000 gallons, which would be approximately one-half per cent.

(8) Its extreme weight in working order is 4 tons 19 cwt.; this includes steam up on a full boiler.

	cwt.
Then water tanks (100 gallons) ...	9
Fuel (chiefly coke) about	3
	12 cwt.

[illegible] load of 5 tons 11 cwt. without a load.

(9) It has a range of action of 6 miles.

(10) The diameter of travelling wheels is—back 3 ft. 11 in., front 2 ft. 9 in.

(11) The width of travelling wheels is—back 10 in., front 5½ in.

(12) It was constructed so as to comply with the Highways, Locomotive and other Acts, and Local Government Board Regulations in force at that time.

(13) It can carry a load of 5 tons on a gradient of 1 in 7.

(14) It could also pull a trailer carrying 2½ tons in addition when on fairly level roads.

(15) It can travel 5 miles per hour on high gear.

(16) It can travel 2½ miles per hour on low gear.

(17) It can travel either backwards or forwards on either gear.

(18) The fly-wheel can be used for transmitting power by means of a belt, its diameter being 2 ft. 6 in. by 4½ in. width of face, the number of revolutions per minute being 200 to 300.

It must not be inferred from all this that it has no faults; on the contrary, it has several drawbacks, which I need not mention here and now.

It has been found that it not only conveys materials cheaper than could be done by team labour, but that less damage is done to the roads by its use than if the same materials were to be carried thereon by ordinary team labour.

* Paper read at a Northern District meeting of the Institution of Municipal Engineers held at Newcastle-on-Tyne on Saturday last.

We find that there is little if any difference in cost as between the motor and ordinary team labour when the distance traversed does not exceed 1 mile. In travelling long distances or up steep hills the motor shows a distinct advantage.

If the council had purchased two or more motors the results would have been more beneficial to the ratepayers so long as there was sufficient and constant employment for them, as we have had two men constantly with one motor, whereas three men could have managed two, or four men three motors, as the existing extra man is only to assist in filling, &c., and his presence with the motor is not now required by law.

Besides all this the steam motor could be worked all night as well as all day in an emergency, seeing that it does not get tired. Nevertheless, it had to be re-tyred in the year 1909, with the result that on that year's working we had a loss of £25 13s. 7½d. That was the only year during which no profit was made.

Being anxious to know the exact financial results of this venture, I had a set of forms prepared upon which to keep careful daily, monthly and yearly records as to time spent upon and cost of lighting up, travelling to work, and actually at work, as well as quantities and cost of fuel, oil, &c., used.

After a close observation of this kind for six years I find that there has been a nett gain during that time of £235 1s. 3½d., as per the foregoing tabular statement, which gives fairly full particulars as to mileage and the various items of expenditure.

The figures given in respect of earnings are arrived at by taking as a basis the cost of carrying the same material by team labour on piecework, which again is based on the nett value of labour of one horse, cart and man at 1s. per hour. The sum of £77 15s. 7d. is deducted from the earnings annually, that being the payment necessary to liquidate the original cost of the cart plus 3½ per cent interest, spread over a term of seven and a-half years, being the assumed period of life of the cart. The amount allowed is thus equal to 13½ per cent per annum for depreciation. (The first half-year's instalment was paid immediately upon arrival of the cart, which explains the apparent discrepancy between the seven and a-half years stated in this paragraph and seven years in the tabular statement.)

In conclusion, I could not venture to give advice respecting steam *v.* team haulage, but would remark for the benefit of anyone thinking seriously of the matter: –

(1) See that the boiler tube plates are properly stayed.

(2) That the various parts and fittings of the whole are get-at-able without pulling the machine to pieces. This refers especially to the mountings, which have apparently been designed from a diametrically opposite point of view.

(3) That sufficient spare seat seats are available for two men.

(4) Do not hesitate to pay for a competent mechanical engineer and boilermaker to see your machine properly built, as otherwise you may possibly find later that there are other jerry things besides jerry-building possible in your new wine into old bottles.

Sewerage Schemes in South Africa. The Town Council of Port Elizabeth has been authorised to borrow £200,000 and the Town Council of East London £210,000 for sewerage and drainage works.

Preliminary Studies in Bridge Design.—This little book,* a reprint of articles which appeared in The Surveyor and Municipal and County Engineer, is intended as the first in a series of volumes which together will form a treatise on the design of ordinary highway bridges of moderate spans. This first volume goes further back than the selection of the site, and considers the most important and neglected factors in design, such as the necessity for considering a bridge as a part of a road system, and the relation of bridges to the water-ways. The bridge engineer is apt to forget this primary purpose of a bridge, and to treat it as a piece of work on a river or stream. Mr. Byrne, in a refreshingly original manner, has emphasised the necessity for taking natural and economic conditions into consideration, and has dealt with a very broad problem in a way which should be helpful to the best method of getting the river and the traffic across one another.

* Preliminary Studies in Bridge Design. By Austin T. Byrne, New York.

THE SURVEY OF INDIA.

SURVEYOR-GENERAL'S REPORT FOR YEAR 1910-11.

The general report on the operations of the Survey of India during the survey year 1910-11 has been issued. This report was prepared under the direction of Colonel S. G. Burrard, C.S.I., R.E., F.R.S., who, on October 24th, succeeded the Honourable Colonel F. B. Longe, C.B., R.E., as Surveyor-General of India. As stated in the preface, it is "intended to be general and concise. More detailed descriptions and discussions of results will be found in the volume 'Records of the Survey of India, 1910-11.'"

The report is in four parts. Part I., "Administration," records a few facts relating to the transference and amalgamation of offices, and includes a table headed "Disposition of Officers." From this table the *personnel* of each survey party or office staff can be found, and the locality in which the party worked or where the office was situated. The names of imperial and provincial officers and of upper subordinates are given, and the number in each party or office of lower subordinates.

Part IV. contains short references to work done for other Government departments, including, it may be noted, a survey on the 2-in. scale of the Periyar catchment for irrigation purposes, this area being in the State of Travancore; and the preparation of the maps of Dr. Stein's explorations in Chinese Turkestan and Western China (1906-8) on a scale of 4 miles to the inch.

The bulk of the report is contained in Parts II. and III. and the related index maps. Three of these show by different colours and hatchings the areas surveyed during the year and previously. In separate index maps, the areas for which maps were prepared before October, 1910, the areas for which sheets have been published in 1910-11; in some cases the areas triangulated in advance are shown, and, in the case of the 1,000,000th scale, the sheets published, under publication, and in hand.

Part II. relates to "Survey Work in the Field," including topographical, forest and trigonometrical surveys, tidal operations, levelling operations, and magnetic surveys.

The brief descriptions of the areas in which the different parties were working form a series of word sketches of considerable interest, not only for those engineers and surveyors who possess the topographical instinct, but also for the general reader whose knowledge of Indian topography is based on the one hand upon broad and general descriptions of large areas, and on the other hand upon detailed accounts of single spots or very small areas. The ground covered by a single survey party during the year amounted in many cases to an area of 5,000 or 6,000 square miles.

The forest surveys were in every case carried out by the topographical party working in the district in which the forest lies. These surveys were for the most part on the 2-in. scale, some on the 1-in., and forest boundaries on the 4-in. In the Eastern circle twelve forest reserves fell within the area under survey by No. 10 party.

The classes of maps published by the office are: The map of India on the scales of 1 in. to the mile and 1 in to the miles, geographical maps on the 1,000,000th scale (about 15 miles to 1 in.); small scale geographical maps and special maps. "The joint duty of the office is to reproduce and print the 1-in. and ½-in. maps of India, prepared by the field parties and circle offices from the topographical surveys now in progress." Of the 1-in. maps, 115 were reproduced and printed during the year, and 111 sheets were received from the circle offices. Next in importance ranks the preparation of the map of India on the 1,000,000th scale, and the general small-scale maps.

A new "Railway, Road and Canal Map of India," 32 miles to 1 in., has been prepared and published, and a general map on the same scale is being prepared but has been delayed by the necessity to include Tibet and other North-Eastern areas. A railway administration map has also been issued, and this will be revised and published annually. No fewer than 150,000 copies of a railway map for the Coronation Durbar were printed.

The cost of the department for the financial year ended March 31 1911 was about £223,000.

Artificial Stone.—A correspondent asks for the name of the makers of a stone composition called 'Flinite."

Correspondence.

"Be calm in arguing; for fierceness makes
Error a fault and truth discourtesie."
GEO. HERBERT, *"The Temple."*

INTERCEPTING TRAPS IN HOUSE DRAINS.

To the Editor of THE SURVEYOR.

SIR,—It has been said that the intercepting trap must go. In my humble judgment the intercepting trap must not go until an equally efficient means has been devised for preventing the free discharge of sewer air into the atmosphere within smelling distance of the habitations of human beings. So long as foul odours are known to have their origin in the common sewer, so long will not medical men or the public be persuaded that no risk to health is incurred by inhaling them, and if it were possible so to convince them, there would still exist the *nuisance* which would have to be abated. That the intercepting trap does possess the important advantage I have mentioned I suppose no one will question, and if that advantage were not attended with some disadvantage no objection to the intercepting trap would be raised. There can be no doubt that the intercepting trap adds something to the liability of drains to become blocked, and there can be as little doubt that drains also become blocked in innumerable instances from causes which are in no way connected with the trap, and it would therefore be as reasonable to argue that drains should therefore be abolished as that the intercepting trap should.

From all that has been said upon the subject, the entire objection to the intercepting trap may be summed up in the added liability to cause stoppage in the house drains, for I suppose it can hardly be treated as a serious objection that fæcal matter remains in the trap blissfully unobserved by anyone until the next flush or two come to displace it, or the suggestion that foul odours would not emanate from sewers if there were no intercepting traps. It follows then that, if the trap does possess some advantage, its abolition can only be justified by greater disadvantages incident to its use, and the impracticability of either removing those disadvantages, or of so reducing them that their advantages cannot outweigh them. Whether that *is* impracticable is a question which, I take it, has been amply answered by Mr. de Courcy Meade when he tells us that, from his observations in the city of Manchester, the stoppages in intercepting traps occur with an average frequency in each drain of about once in every 160 years. I do not suggest that that infrequency is the case in every town, but I do venture to affirm that it proves that frequent stoppages are not necessarily incident to the interceptor, and that if properly constructed and laid, similar results may be obtained anywhere. Would any sane person, assuming the intercepting trap has any permanent advantage, however small, which I suppose hardly any engineer would dispute, dream of sacrificing it to avoid having to clear a choked syphon or drain once in 160 years. Surely, then, if the interceptor is a useful appliance, the sensible course is to see that conditions are insisted upon that will give results such as Mr. Meade has shown are perfectly practicable.

But *cannot* the function of the intercepting trap be equally performed, and yet the trap abolished, at any rate in the form and situation usually adopted? If every waste discharge from the interior of a house were passed to a trapped gully or other opening outside the dwelling, the interceptor could be dispensed with without the risk of sewer air circulating about the house. As everyone knows, the common practice is to convey the waste liquids in the manner mentioned, with one exception, that of the soil pipe. It therefore only remains to provide a syphon trap at the bottom of the soil pipes and the problem is solved. Such a position for the interceptor would, owing to the velocity of the flow at that point, render the risk of blockage a perfectly negligible one, and if it were not, a cast-iron syphon, with side access plate in a small chamber, would make the cleansing of it quite easy. Such an arrangement would prevent the circulation of air in the drains, and have the advantage of giving the quietus to the superstition that the free circulation of air in sewers and drains is either necessary or desirable, a superstition that has been severely, if not mortally, wounded by the Departmental Committee's report. The arrangement suggested should satisfy those who object to the interceptor, unless, indeed, the agitation against it arises which I do not suppose—from a desire to relieve local authorities from the responsibility of ventilating the public sewers, and imposing that work upon private individuals, a shirking of responsibility which I think would be reprehensible.—Yours, &c.,

T. CAINE

Worcester.
November 26, 1912.

FIRE PROTECTION IN LONDON.

To the Editor of THE SURVEYOR.

SIR,—The coroner in summing-up at the Kensington fire inquest on Thursday, 21st inst., is reported to have spoken as follows: "The calamity made one wonder how many other buildings in London were in the same condition as they were told Messrs. Barker's premises were; how the many negotiations were going on, and how many buildings were waiting before the necessary alterations were to be made."

I wish to take the earliest opportunity of publicly replying to these questions. There are upwards of 50,000 buildings in the Metropolis at the present moment to which the London Building Act Amendment Act of 1905 has not yet been applied.

Although this Amendment Act has been in force now for upwards of seven years, the superintending architect of the London County Council, giving evidence before the House of Commons Committee on the London County Council General Powers Bill (1912) in June last, stated that only 2,330 buildings had been scheduled for action at that date, and that the Building Act Committee of the London County Council had only considered 1,203 of those cases. Of these 1,203 cases only 527 had at that date been satisfactorily equipped by the provision of suitable means of escape, and the balance were in what might be termed a state of negotiation.

That so few buildings (527) should have been put in order out of approximately 50,000 cases in the long period of seven years is a matter of gravest import, but the balance should not in any way be attributed to the superintending architect nor his officers, but specifically to the London County Council in its corporate capacity, which does not give its Building Act department either the necessary means, the necessary staff, or the necessary encouragement to carry out the requirements of the Building Act Amendment Act energetically and promptly.

It is not for me to go into the reason why the County Council should apparently have been so adverse to allowing its officers to carry out their obvious duties, but the fact remains that indirectly the responsibility for lives lost in such buildings as the Barker establishment must fall on the shoulders of the authorities rather than the building owners, who, owing to the council's known apathy, practically consider the Amendment Act of 1905 a dead letter. Thus the short reply to the coroner's question is that quite an enormous number of buildings in the Metropolis are in the same condition as the one which was under review at the inquest—that but very few negotiations are going on as to remedying this state of affairs, and that quite 50,000 buildings are waiting for the necessary alterations to be made.

It is to be hoped that the Barker fire will awaken the London County Council to its duties in this particular matter. With the necessary staff and facilities, and with the diligence which the county council occasionally applies to other departments of its work, the outstanding 50,000 buildings should be put in proper order within the next five years.—Yours, &c.,

EDWIN O. SACHS.

British Fire Prevention Committee's Offices,
8 Waterloo-place, Pall Mall, S.W.
November 25, 1912.

BITUMINOUS MATERIALS.

To the Editor of THE SURVEYOR.

SIR,—I venture heartily to endorse Mr. John Hutchinson's admirable suggestion that your journal should be the medium for defining once and for all time the exact meaning of such words as asphalt

and bitumen. I may say that my article, entitled "What is Asphalt," which appeared in your issue of March 9th last (pages 404-406) was written in an earnest endeavour to that end.

Upon one point, however, in Mr. Hutchinson's letter I would at once like to join issue with him, and that is that asphalt and asphaltum are not synonymous terms, the former being recognised throughout the world as the natural material, and the latter as the residuum obtained from distillation of asphaltic or semi-asphaltic base petroleums. I therefore, as my contribution, contend that it is absolutely necessary that all the materials to-day known under the generic name of asphalt should be divided into three separate classes, as follows:—

(1) Pure natural asphalts or solid bitumens.

(2) Natural rock asphaltes, or calcareous rock impregnated with bitumen.

(3) Asphaltums, or residuums obtained from the distillation of asphaltic or semi-asphaltic base petroleums.

In an article upon this subject, which I wrote at the request of Lord Montagu—who, by the way, has since become the president of our Association of Bituminous Paving Material Manufacturers—and which appeared in *The Car Illustrated* of January 4, 1911, I then quoted the definition of asphalt. This, under the heading of "Bitumen," appears in Ure's Dictionary, and, in view of this discussion, may now be of interest. It reads as follows:—

"It is a very remarkable fact in the history of the useful arts that asphalt, which was so generally employed as a solid and durable cement in the earliest constructions upon record, as in the walls of Babylon, should for so many thousand years have fallen wellnigh into disuse among civilised nations. For there is certainly no class of mineral substances so well fitted as the bituminous by their plasticity, fusibility, tenacity, adhesiveness to surfaces, unpenetrability by water, and unchangeableness in the atmosphere, to enter into the composition of terraces, pavements, roofs, and every kind of hydraulic work. Bitumen, combined with calcareous earth, forms a compact, semi-elastic solid, which is not liable to suffer injury by the greatest alternations of frost and thaw, which often disintegrate, in a few years, the hardest stone, nor can it be ground to dust and worn away by the attrition of the feet of men and animals, as sandstone flags and even blocks of granite are."—Yours, &c.,

CECIL NATHAN.

3 London Wall Buildings, E.C
November 25, 1912.

[Another letter on this subject—from Mr. A. E. H. Dussek—is unavoidably held over until next week.—ED. THE SURVEYOR.]

WHAT IS A GARDEN CITY?

To the Editor of THE SURVEYOR.

SIR,—Mr. Culpin has a weakness for startling fresh hares, but I fail to see why the fact that I confused him with Mr. Craske (for which I offer both gentlemen an apology) should enable him to dispose of my letter by saying that I "have not in any way dealt with the points in his last letter." Like the ladies, who, when asked for a reason, only reply, "because it isn't," he says, "without wasting a column I say it is not so." Contradiction is not argument, and I must respectfully decline to accept his statements in the absence of any support of them in the way of proof or argument.

Mr. Craske's letter only increases one's surprise that Mr. Culpin should have disputed my statement about the speculative character of most "garden city" schemes. Mr. Craske states that the "First Garden City, Limited, is a commercial company, whose sole object is the development of an estate of 4,000 acres at Letchworth as a garden city." There is no pretence of philanthropy or disinterestedness about this, though I am afraid Mr. Culpin will be shocked at such a statement, and will probably in your next issue tell Mr. Craske that he has misrepresented, or does not understand, the objects of the garden city company.

I think your readers may be left to choose between the preacher (Mr. Culpin) and the practician (Mr. Craske), for while the propagandist talks grandiloquently of philanthropy and sociology, the practical man is content to rely on the commonplace method of the development of the estate of town for which he is responsible.—Yours, &c.,

Lytham. V. J. PEET.
November 26, 1912.

THE MANCHESTER APPOINTMENT.

To the Editor of THE SURVEYOR.

SIR,—Your interesting comment in THE SURVEYOR of the 15th inst., congratulating the Manchester City Council on their action of limiting candidates for the post of deputy city surveyor to either associates or members of the Institution of Civil Engineers, has raised this question in my mind (and probably in others that, having passed the examination of the Institution of Municipal and County Engineers, what is the value attached to being an associate or member of that body? If such a qualification is not deemed sufficient for the post of deputy surveyor to any borough, I think that the sooner the junior members of the profession realise that fact the better, and I hope, Sir, that you will, with your usual fairness, give this matter due publicity.—Yours, &c.,

ASSOCIATE.

November 21, 1912.

[Our correspondent is not quite accurate in his reference to our comment on the Manchester appointment (p. 663). We congratulated the Manchester City Corporation on widening the appeal of their advertisement, not on limiting it—a distinction with a difference. We should still more warmly have welcomed an extension that would have provided, as a qualification for candidature, membership of the Institution of Municipal and County Engineers.—ED. THE SURVEYOR.]

TOWN PLANNING IN URUGUAY.

As an outcome of the urban planning competition held some months ago, the Government has given its approval to a very extensive and ambitious project for practically transforming the city of Montevideo says the *Times* in its *South American Supplement* of Tuesday. The main feature is the construction of a number of direct and diagonal wide avenues running between various parts of the city, the port, and the principal suburbs. Along these, sites are reserved for a new Government Palace, a Palace of Justice, a National Museum and Library, a Municipal Hall and Municipal Theatre, a new General Post Office, and various other edifices of a public character.

The Government does not propose to undertake these constructions all at once. Its intention is to commence with the new Government Palace, and with two broad avenues connecting that with the new Legislative Palace already partially built and with the port. The site selected for the Government Palace is completely on the outskirts of the city, and to provide it the Government has already decreed the expropriation of twenty "blocks" of land (each block consisting of about 11,000 sq. yds.). Only one-fourth or one-fifth of this space will be actually occupied, the plan being to resell the remainder (sites in which being allowed the preference) at an increased value, as a source of revenue, and, with the same object, to impose a "higher value" tax on all the adjacent properties. The same system will be followed in the expropriations necessary for building the avenues. This measure is causing some alarm among owners of land, and creating a feeling of complete instability of tenure from one day to another. If the entire plan is carried out on the same system, there is hardly a property in the whole city that will not fall under expropriation. This, however, is scarcely likely to happen, for the project is far too costly—the city does not yet boast 350,000 inhabitants, and its population does not increase rapidly—to be carried out in its entirety.

Sewage Disposal in the United Kingdom (By Henry Lemmoin-Cannon, P.A.S.I. Price 7s. 6d. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.) . . . gives a concise but comprehensive outline of the present position with regard to the question of sewage disposal. The main portions of the book are worthy of present-day interest, as it contains a great deal of information on practical work for students, engineers and surveyors.—*Glasgow Herald*.

Birmingham Sewerage.—The Birmingham Public Works Committee, who gave long consideration to the system of sewering best adapted to the extended city, reported on the way best open to the adoption of a combined system, and advise the retention of the existing separate systems in the outer districts. In regard to the former, they point out that the necessary widening of the River Rea would alone would cost £200,000. The matter is to be further considered by the committee.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

286. Hydraulics.—A hemispherical cistern is 20 ft. in diameter, and it is full of water. How long will it take to lower the depth of the water 5 ft. if the water escapes through a 3-in. diameter sharp-edged hole in the bottom of the cistern? The coefficient of discharge for the hole is 0·60. (H. V. O., *West Bromwich.*)

287. Street Gulley.—Will some reader kindly supply a sketch of some form of street gulley, the grid of which is in the face of the kerb and not in the channel of the roadway? ("Anxious.")

288. Mechanics.—Explain clearly the distinction between a vector, a scalar, and a rotor quantity. ("Beginner.")

289. Strength of Materials.—Compare the resistances to bending of a wrought-iron I beam, flanges 6 in. by 1 in., web 8 in. by ⅜ in., when upright, and when laid on its side, thus ⊢.

290. Design of Struts.—Explain why the resistance of a long strut depends largely on the stiffness of the material than on its strength. ("Designer.")

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

285. Building Construction.—Explain, with sketches where necessary, the meaning of the following terms: (*a*) Larrying, (*b*) pugging, (*c*) gib and cotter joint, (*d*) lead soakers. ("Pupil.")

(a) Larrying.—Larrying is the use of very soft semi-liquid mortar, laid on the work and rushed up in the vertical joints by sliding the bricks along. It is very often adopted in thick walls, after face

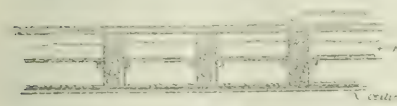


Fig. 1.

bricks have been laid, and then consists in spreading soft mortar in a thick layer over the bed, and putting each brick down some distance from its

Fig. 2.

ultimate position, and pushing it into that position thus filling up the joints between the bricks.

(*b*) *Pugging.*—The object of pugging is to reduce the transmission of sound. Fig. 1 shows part section through sound-proof floor with pugging.

(*c*) *Gib and Cotter Joint.*—See Figs. 2 and 3.

(*d*) *Lead Soakers.*—A lead soaker is a sheet of lead placed over any part which cannot easily be protected from the weather otherwise. Where ridges stop against the roof plane, as in the case of dormers, a soaker is provided, and in every instance where

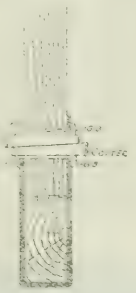


Fig. 3.

[illegible] slate about against brickwork, &c. (H. E. M., *Waltham-on-Thames.*)

L. B. (*Ware*) sends the following sketches (Figs. 4 and 5), showing the use of the gib and cotter in the

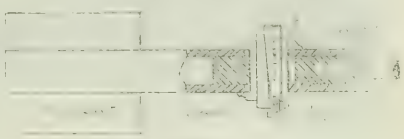


Fig. 4.

joint between the tie rod and shoe in an iron roof truss. The "clearance" allows the joint to be tightened up.

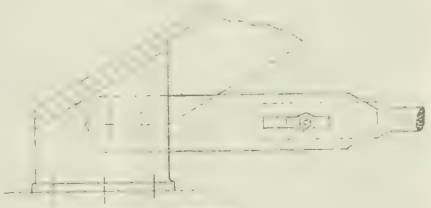


Fig. 5.

The gibs and cotters are of cast-iron, and the straps of wrought-iron.

Bridge Building.—Students, young engineers, and surveyors will find much useful information in "Preliminary Studies in Bridge Building," by Reginald Ryves, Assoc.M.Inst.C.E. (London: St. Bride's Press, Limited, 24 Bride-lane, E.C. Price 2s. nett.) The book is described as the "first of a series of small volumes, each complete in itself, dealing with the design of ordinary highway bridges of moderate span." Though highway bridges alone are referred to, the matter contained in this volume is largely applicable to railway bridges, aqueducts, and similar engineering undertakings. The five primary types of bridges are described, and the conditions determining the best site for each of the three types of streams are discussed in detail; while, in connection with wandering streams various modes of designing abutments or approach spans are dealt with. Improvements of fords and the effect of eccentric loading of vehicles on the girder loads are among the numerous other items touched on. *Scotsman.*

THE UPKEEP OF ROADS AND HEAVY MOTOR TRAFFIC.

DARWEN CORPORATION'S WEIGHBRIDGE.

Although the Heavy Motor Act has now been in force about seven years, it has not been generally taken full advantage of the enactments. The Act distinctly places the limit which shall be carried on each axle as 8 tons, and to provide a machine specially for such a test has been left to the Darwen Town Council, who placed with Messrs. W. and T. Avery, Limited, Birmingham, an order for the design and manufacture of a machine which has been fixed in the Market-square at Darwen. The illustration and description should be of interest to surveyors and contractors, as well as to the heavy motor user.

The weighbridge shown is so constructed and arranged that when a car is upon it the load can be immediately ascertained upon either of the axles, or upon the two axles combined. The apparatus can be used with equal facility for ordinary wagons or carts, as, although the two platforms are quite distinct when weighing the separate axles, when combined for weighing ordinary traffic the two platforms are practically one, as there is no dead plate intervening. The combination of three separate pillars and steelyards is somewhat special, and in this case most useful, as the readings can be taken on either platform separately and simultaneously upon two separate steelyards, or a combined load upon the two platforms can be ascertained upon a third steelyard.

It is well to point out that with this arrangement the weighman has no hand lever to manipulate, the steelyards always being in gear, and no loose weights form any part, as the steelyards are graduated to their full capacity by 7-lb. divisions. Avery's patent steel-notched protection bar is fitted to each steelyard to prevent [illegible] poising nib of the sliding poise coming to grief on notches when dropped in.

Each separate weighing platform is made entirely of iron and steel of improved design, which entirely prevents all torsional stress, and allows the platform to swing in the direction of the traffic, preventing undue shock and wear to the knife-edges and bearings, and prolonging the life and accuracy of the weighbridge. The underwork of each platform is carried in a strong cast-iron framing, with joggle joints, machined and bolted together, which prevents any shifting under stress, with consequent variation in weighing. The girders, verges and levers are the result of many years' experience and [illegible] the best material, [illegible] necessary to avoid any variations in the weighings. The verges are interchangeable, as are also the knife-edges, the latter being of special high grade steel, [illegible] recesses in the levers, and secured by means of wrought-iron shanks and nuts. This interchangeability is a matter of great importance in machines of this character, as it enables the weighbridges to be kept in perfect weighing condition at a minimum cost, and saves delay when replacement is necessary, at the same time ensuring a continuance of accuracy.

The Darwen Corporation are to be congratulated in the possession of such a machine, the work of which in restraining overweighted motor lorries increasing the cost of the country roads will no doubt be watched with great interest by local authorities throughout the country.

MOTOR WAGON BEING DRIVEN ON TO AVERY WEIGHING MACHINE.

TOWN PLANNING IN THE SOUTH YORKSHIRE COALFIELD.

SUGGESTED APPEAL TO THE LOCAL GOVERNMENT BOARD.

Town Planning in its relation to the new coalfield around Doncaster was the subject of discussion at a meeting of the Royal Sanitary Institute held at Doncaster on Saturday last, and presided over by Mr. H. Percy Boulnois, M.INST.C.E., chairman of the council of that body.

Dr. ARTHUR B. DUNNE, medical officer of health of the Doncaster rural and Bentley urban districts, presented a paper, in which he pointed out that in the district around Doncaster thirteen new collieries were in process of being, or were about to be, sunk. Of these, ten are within the area covered by the Rural District Council of Doncaster and the urban district of Bentley. It was estimated that each pit would form the centre of a district of from 10,000 to 12,000 persons, and that in the districts surrounding Doncaster there would [illegible] 120,000

in the near future directly dependent upon mining. As the collieries were situated in sparsely populated rural parishes, and were sometimes quite a distance from any existing village, it would be realised what were the problems involved in housing the people. The Woodlands model village at Brodsworth had not escaped criticism for various reasons, but against this must be set the fact that it had attracted attention, and had stimulated public opinion. Messrs. Barber & Walker had a colliery village, covering an area of 75 acres at Bentley, where 802 houses would eventually be erected. At Edlington, in connection with the Yorkshire Main Colliery Company, a large [illegible] Askern the colliery company had bought an estate, [illegible] Rossington, [illegible] engaged in sinking a new colliery, there was to be [illegible] on the same principle as in their well-known village at Maltby, while at Owston the Bulcroft Colliery Company were erecting a small village. All these villages, though differing one from another in design, yet had this in common—that they were laid out on a definite plan from the beginning, the houses being erected as they were wanted. They would not, however, be capable of housing the new population altogether, and the speculative builder was already in the field providing [illegible] and it was in connection with the activities of the private builder that the necessity of a town plan for a colliery village arose.

Dr. J. R. KAYE, medical officer of health to the West Riding of Yorkshire, said it must be admitted that the proper housing of the very poor seemed practically impossible unless some public burden

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
A Donegal Appointment	734
Appointments Vacant	763
Assistants' and Students' Section	749
Association of Managers of Sewage Disposal Works: Notices	762
Bituminous Materials	747
Cornish Roads: Important Proposals	734
Correspondence	747
Fair Play	735
Fire Protection in London	747
Highway Administration in Saskatchewan	760
Institution of Municipal and County Engineers	751, 761
Institution of Municipal Engineers: Notices	762
Institution of Water Engineers: Notices	762
Intercepting Traps in House Drains	736, 747
Law Notes	753
Lithofalt Block Paving	758
Local Government Board Inquiries	754
Manchester Appointment	748
Manchester Sewerage	759
Mechanical Haulage	735, 745
Meetings	766
Municipal Competitions Open	763
Municipal Contracts Open	763
Municipal Work in Progress and Projected	755
Personal	757
Recent Publications	760
Resistance to Rolling	752
Road Menders' Work in Great Britain	758
Royal Commission on Sewage Disposal: Eighth Report	733
Society of Engineers: Notices	762
Standards of Purity for Rivers and Waterways	734, 744
Survey of India	735, 746
Tenders for Municipal Works or Supplies	765
Town Planning in the South Yorkshire Coalfield	735, 750
Town Planning Schemes	761
Up-keep of Roads and Heavy Motor Traffic	750
What is a Garden City?	748

were borne. They ought to bear in mind that good housing meant diminishing public expenditure in other directions. In Ireland within recent years something like £559,000 had been advanced by the State. Why could not something be done in England on the same principles?

Mr. F. KIRKBY, chairman of the Bentley Urban District Council, expressed the opinion that in the districts affected the parish councils ought to have power to engage surveyors and nuisance inspectors. They might have a Town Planning Act, and yet have bad and undesirable houses erected unless the buildings were supervised as they were built.

Mr. R. G. WHITLEY, surveyor to the Bentley Urban District Council, said he considered that if the authorities took the subject to heart they would have a town plan during the next twelve months. Twenty thousand more houses would be wanted in the vicinity of Doncaster. But the procedure under the Town Planning Act was too long. It would be two years before they could get a scheme finally approved if they started to-day. He thought the case was one for the intervention of the Government.

Mr. GEORGE PROBERT (Bolton-on-Dearne) declared that the local authorities had not done their duty, and that some of them did not intend to do. The members wanted rousing up when their time of office expired.

The CHAIRMAN (Mr. H. Percy Boulnois) agreed with the last speaker, adding that with one exception there was not a representative of the rural district council present. If there was a will there was a way to get a scheme through. It was evident that the time was more than ripe for dealing with this area. Miners lived gray lives, and it was the duty of the local authority to help them.

The meeting subsequently approved a resolution calling the attention of the council of the Royal Sanitary Institute to the urgent necessity of applying to the President of the Local Government Board in favour of such measures as might facilitate the putting into operation immediately of the Town Planning Act in the Doncaster rural district.

"The Civic Engineer's Who's Who."—The first issue of "The Civic Engineer's Who's Who" (London: St. Bride's Press, Limited, 24 Bride-lane, E.C., 2s. 6d. nett) gives wonderfully complete lists of the engineering officials of England and Wales. For a first issue it is very creditable.—*Glasgow Herald.*

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

METROPOLITAN DISTRICT MEETING.

A Metropolitan District meeting, held at the offices of the Institution of Municipal and County Engineers, on Wednesday, the 20th inst., at 7.30 p.m., those present being Messrs. J. Patten Barber (district chairman, Islington), O. E. Winter (district representative, Hampstead), H. Percy Boulnois (past-president, Westminster), J. Rush Dixon (Woolwich), W. F. Loveday (Stoke Newington), C. Chambers-Smith (Westminster), P. G. Killick (Finsbury), J. Sutcliffe (Deptford), J. E. Cooke (Islington), J. Gair (Marylebone), F. J. Slater (Camberwell), A. E. Darby (Bethnal Green), G. Sturgess (Chelsea), and Norman Scorgie (district representative and hon. district secretary, Hackney). Mr. Patten Barber occupied the chair.

The minutes of the Metropolitan District meetings held at Caxton Hall, Westminster, on February 9th and March 18th last were read, confirmed and signed.

EXECUTIVE COMMITTEE.

In accordance with the resolution passed on March 18th, the meeting proceeded to the election of an executive committee, consisting of the chairman, secretary and two district representatives as *ex-officio* members, four other members, and two associate members. For the four members the following were nominated—viz.:—Messrs. J. Sutcliffe (Deptford), E. B. B. Newton (Paddington), W. F. Loveday (Stoke Newington), P. Dodd (Wandsworth), H. Heckford (Poplar), J. Rush Dixon (Woolwich), E. J. van Putten (Lewisham), R. J. Angel (Bermondsey), and A. R. Finch (Kensington). It was resolved that the election be by ballot, and Messrs. Killick & Cooke were appointed scrutineers. The scrutineers having presented their report, the chairman declared Messrs. P. Dodd (Wandsworth), E. B. B. Newton (Paddington), J. Rush Dixon (Woolwich), and J. Sutcliffe (Deptford) elected.

Messrs. G. Sturgess (Chelsea) and W. P. Wrack (Poplar), having been nominated as associate members of the committee, and there being no further nominations, the chairman declared them elected.

DRAFT BY-LAWS—OVERHANGING LAMPS, SIGNS, ETC.

The hon. district secretary having read a short report on the draft by-laws forwarded by the London County Council to the several metropolitan borough councils, a general discussion ensued, after which it was resolved to deal with each by-law separately.

During the discussion the feeling was generally expressed that regulations to deal with overhanging lamps, signs, &c., in the Metropolis as a whole were necessary, and that, as the proposed by-laws were based on the conclusions arrived at at the conference held on November 5, 1908, they should, with slight modifications, as hereafter mentioned, be recommended to the borough councils for acceptance as an earnest attempt to deal with a difficult problem.

By-law No. 1.—Approved as drafted.

By-law No. 2.—In the fifth line omit "so" after "any such lamps," and, in the same line, after "fixed or fitted," insert "after such date," the object of these alterations being to bring No. 2 into conformity with By-law No. 1, and make it clear that it is not to operate retrospectively.

By-law No. 3.—Approved as drafted.

By-law No. 4.—Alter as in By-law No. 2 for similar reasons.

By-law No. 5.—Approved as drafted.

By-law No. 6.—Delete; it being considered inexpedient that the county council should have power to dispense with the observance of by-laws which they framed for the better government of the Metropolis.

By-law No. 7.—Approved as drafted.

By-law No. 8.—Approved as drafted.

ADDITIONAL.—It was resolved—"That some limitation should be placed as to the number of signs and structures, and that the following proviso, approved at the conference previously referred to, should be inserted:

"Notwithstanding anything contained in the preceding by-laws, not more than two signs or structures carrying the same shall hereafter be erected on or attached to any one building having a frontage of not more than 20 ft. on any street for the purposes of any one person, firm or company, in actual occupation."

It was resolved that a copy of the above recommendation should be forwarded by the secretary of

the institution to the town clerks of the several metropolitan borough councils, with a request that they should be submitted for the consideration of the council or proper committee, and that a copy be also sent to the borough engineers and surveyors within the metropolitan area.

THE NEXT MEETING.

The hon. district secretary having read communications from several members expressing inability to attend, and pointing out the inconvenience of Wednesday as the day of meeting owing to council and committee work, it was resolved—"That the next district meeting be held on Friday, December 13th, instead of Wednesday, December 18th, as provisionally arranged; that it be of a social as well as business character, and that friends of the members be cordially invited to attend and take part in the proceedings.

The meeting terminated with a vote of thanks to the chairman, who congratulated the members on the complete success of the gathering, and expressed the hope that many more of a similar character would be held in the metropolitan district.

RESISTANCE TO ROLLING.

PROF. CHATLEY'S STUDIES AND EXPERIMENTS.

No reference has so far been made in these pages to an interesting paper on "Resistance to Rolling," which appeared in the June number of the "Journal and Transactions" of the Society of Engineers. This paper was contributed by Mr. Herbert Chatley, B.Sc., Assoc.M.Inst.C.E.I., Professor of Civil Engineering at the Government College of Engineering, Tangshan, China.

The first part of the paper is a mathematical study of the conditions of static balance of a rolling pair, and of the changes which occur in this equilibrium when a torque is applied to the movable body. The author obtains an equation of the fourth degree for the length of surface in contact, and shows that more convenient expressions can be found if we assume that the ordinate to the curve of contact is a cosine or parabolic function of the abscissa. If the cosine form is used, the maximum stress is $\frac{\pi}{2} \times$ mean stress. If the parabolic form is used, the maximum stress is $\frac{3}{2} \times$ mean stress $\left(\frac{W}{bl}\right)$. The formulæ can be simplified by accepting the approximation:—

$$l = 2\sqrt{2VR}$$

where l is the length of the curve of contact, V its camber, and R the radius of the roller.

Though the assumption that the coefficient of depression is constant is probably to some extent incorrect, the author cannot see any practical way of avoiding the resulting error, which does not seem to be serious within the limits usually considered.

When a roller rests upon a plane a small force applied parallel to the plane, or a small tilt of the plane, is usually sufficient to overcome the resistance to rolling. When the plane is tilted, but not enough to cause rolling, there must be a tendency to slide in the direction of the applied force, and this will call out a shear stress due to friction between the two pieces and a slight compressive stress in front of the roller. As the force is increased the resultant of it and the weight becomes more inclined until it passes a point within the surface of contact beyond which the resultant of the stresses in the plane cannot pass. There must be such a point, for an infinitely great stress would be needed at the front edge of the surface of contact if the resultant of the stresses is also to act at this point. The energy required to produce rolling includes the following items:—

(*a*) The continual maintenance of a slight compression in front of the roller.

(*b*) The continual rupture of the cohesive bond developed by the close contact of the two pieces.

(*c*) The difference between the strain energy stored by the vertical compression and that recovered by the resilient return of the material. This difference depends on the time needed for the recovery of the material and the degree of imperfection in its elasticity.

(*d*) A similar difference due to the imperfect or late recovery from the shear strain.

The author concludes that the usual statement that there can be no rolling resistance with mathematically geometrical and elastic materials is incorrect. The resistance is largely due to the continuous maintenance of a lateral compression and shear.

EXPERIMENTAL EVIDENCE.

Prof. Chatley notes that the published experimental work on this subject is surprisingly meagre. He has carried out several series of experiments with a view to the determination of constants and to find the effects produced by changes in the conditions.

The apparatus used included steel fly-wheels provided with axles of various sizes, rolling upon pairs of brass rails. These rails were provided with levelling screws, by means of which varying tilts could be given and measured. The rolling angles were determined, and the mean rolling resistances were also found. With fly-wheels between 16 lb. and 18 lb. in weight, and with weights per unit breadth of contact varying from 39½ lb. to 44 lb., the following were found to be the rolling angles in radians: With a ½-in. axle, 0·0043; with a ¾-in. axle, 0·0038; 1-in. axle, 0·0037; 1¼-in., 0·0035; and 1½-in., 0·0032.

Further experiments were made with simple rollers on inclined planes. On an oak plane, steel rollers of 0·372 in. diameter, weighing 0·07 lb. to 0·11 lb., and 0·035 lb. per unit breadth of contact, gave a rolling angle of 0·0093 radian. On an oak plane, a hard-wood roller, 0·761 in. diameter, weighing 0·04 lb., and 0·013 lb. per unit breadth of contact, had a rolling angle of 0·0070 radian. Other experiments, on a cast-iron plane, with weights of 9 lb. to 12 lb. per unit breadth of contact, gave rolling angles varying from 0·0012 to 0·0024 radian. Greasiness of the surface increased the rolling angle. On pine wood similar experiments gave rolling angles of 0·0061 to 0·0069 radian. It was found that a small flaw in the roller or a particle of grit on the plane increased the rolling angle by 100 per cent, or more. The starting value of the rolling angle is appreciably more than the kinetic, but by an uncertain amount.

This paper forms a useful contribution to the study of the subject, and several of the points raised in it will, no doubt, be discussed by mathematicians and engineers.

CORRESPONDENTS PLEASE NOTE!

There is a man the printer loves, and he is wondrous wise,
When e'er he writes the printer-man he dotteth all his "i's";
And when he's dotted all of them with carefulness and ease,
He punctuates each paragraph and crosses all his "t's."
Upon one side alone he writes, and never rolls his leaves,
And from the man of ink a smile the mark "insert" receives;
And when a proof in duplicate he doth ask—taught wisely he has been—
He doth the second proof stamp for postage have put in;
And thus by taking little pains, at trifling care and cost,
Assures himself his manuscript will not be buried or lost.
So let all those who long to write take pattern by this man;
With jet black ink and paper white, do just the best they can:
And then the printer-man shall know and bless them as his friends,
All through life's journey as they go, until that journey ends.

By The Editor of the *Meriden Express*.

Manhole Covers.—"Inquirer" writes: "Might I ask any of your readers to be good enough to inform me how they deal with the question of 'rocking' manhole covers? Hinged covers have not proved satisfactory, as the hinge usually gives way first, and when placed in certain situations (the centre of the tramway track, for instance), it is imperative that covers without hinges should be used. My experience is that manhole covers, whether round or square, and however well fitted when new, soon begin to 'rock' when subjected to heavy traffic, with the result that the covers have to be renewed while the frame remains good. I shall be greatly indebted to any reader who can inform me of the best means of overcoming this difficulty."

Permanent Building with 2-in. Walls.—Messrs. F. H. Heath, Limited, building specialists, 22 Bridge-street, Manchester, write: "It may be of interest to your readers to know that we have recently had accepted by the Birmingham Corporation plans for the erection of a cinematograph hall in High-street, Erdington, the outside walls of which are to be constructed of reinforced cement slabs 2 in. thick, secured to steel framing. The building is to be about 80 ft. long by 45 ft. wide, and about 18 ft. to eaves. The whole of the steel work will be encased with "Gypo." The building will seat about 800 people. We believe this is the first building with walls 2 in. thick to be accepted as a permanent building under the corporation by-laws. The construction has met with the approval of a number of authorities as being of a permanent and sanitary nature."

Law Notes.

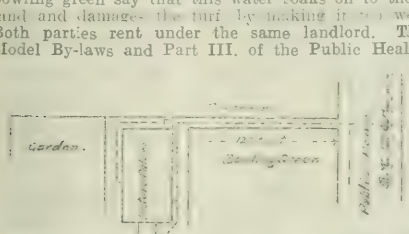
EDITED BY J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries which should be written legibly on foolscap paper, one side only, should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed. **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

In order to avoid confusion, correspondents are requested to write initials instead of words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

RAIN WATER FROM ROOF.—"S.A.M." writes: A builds a picture palace according to approved plans, but neglects to lay the drain as shown to carry off the water from the roof to the surface-water drain in the public road. The tenants of the adjoining bowling green say that this water soaks on to their land and damages the turf by making it too wet. Both parties rent under the same landlord. The Model By-laws and Part III. of the Public Health



Acts Amendment Act are in force. There are no foul-water drains, not even a lavatory basin. (1) Have the council power to compel A to lay the drain, seeing that the building is over 100 ft. from the sewer? (2) Upon whom should a notice (if any) be served? and (3) Under what section? I consider it is a matter for private action only. I may add that the subsoil is sand and gravel, and I did not think it necessary to drain the site so as to prevent dampness in the building.

In my opinion the council have not power to compel A to lay the drain.

SEWAGE DISPOSAL WORKS: FLOODING OF SLUDGE-PITS.—"Ultra" writes: About fifteen years ago this council bought a piece of land on which sewage disposal works were constructed, and for a long time now we have had considerable difficulty with regard to the sludge owing to the surface water from the adjoining field flowing on to the sludge-pits, causing the sludge to be always soft and unfit to be lifted with shovel and carted away. The sludge-pits are made up of ballast, about 2 ft. 6 in. in depth, on to which the sludge is discharged and allowed to dry off, but, owing to the conditions stated above, it is only in dry weather that it will stiffen. The land on which the sewage works are constructed was bought from the owner of the field referred to. Can the district council compel him to drain off this surface water so as to prevent it from flowing on to the sludge-pits?

In the absence of any special provision in the conveyance of the site of the sewage works to the council, unless the adjoining owner has done anything on his own land whereby the flow of surface water on to the sludge-pits is greater than would ensue from the operation of natural laws, he is not liable. If he has done anything of the kind he would be liable to the extent to which the drainage is increased by such acts of his beyond what it would have been had the water been allowed to flow as it would have done [illegible]. *Rawlins v. Ingram* [1901] 1 Q.B. [illegible].

WATER SUPPLY.—"G.N." writes: I have been instructed by my council to advise on the water supply of forty-five colliery houses in this (an urban) district, for which there are at present three common taps in the streets abutting, fed by the local water company's mains. As these mains are laid in the streets and within a few feet of the houses, I have reported to the effect that, in my opinion it is not a case in which it could be held that there is not an adequate water supply, as the tenants can, by means of the taps, have as much water from the company's mains as they want by fetching it; but as all the tenants have to come out of their houses, and some have to travel about 30 yds. in order to get to the nearest tap, it seems to be more a matter of inconvenience than of inadequate water supply. The above conditions have obtained probably since the erection of the houses, which are of a good age; but there is a diversity of opinion as to the correctness of my view as expressed in the report, and I will be obliged for your valuable opinion thereon, in view of sec. 62 of the Public Health Act of 1875.

The question when a house is "without a proper supply of water" within the meaning of the section is one which does not appear to have been judicially decided. Presumably it would be a question of fact in each individual case. This section does not (as does sec. 3 of the Public Health [Water] Act, 1878) in terms require the supply to be "within a reasonable distance," but probably a supply not within a reasonable distance would not be a "proper supply" within sec. 62. The Local Government Board have expressed the opinion that in determining what is a reasonable distance regard must be had to the labour involved in carrying the water, and to the injurious results likely to arise if, in order to avoid this labour, the water is stinted. Similar principles would appear to apply to the present case.

WATER SUPPLY: SERVICE PIPES.—"Monte" writes: In the area of a company which has incorporated in its local Acts Waterworks Clauses Acts, 1847 and 1863, alterations and extensions are being made in existing water-service pipes—*i.e.*, the company's water supply is being laid on to additional water-closet cisterns or baths. Can the company—under sec. 19, Waterworks Clauses Act, 1863—compel the owner, where the service pipe has previously been brought in from the next property, to lay in a new and separate service direct from the company's main, the premises in many cases having different owners and separate assessments; or can the owner, where the existing stop tap is an obsolete diaphragm pattern, and in such a position that it controls only a small portion of the service pipe, be compelled, because he is making alterations or extensions, to fix a new stop tap in an approved position? In this area all service pipes and fittings belong to and are laid by the owner.

Under the section referred to a consumer cannot, without the consent of the company, (1) fix a pipe or apparatus to (*a*) a pipe belonging to the company or (*b*) a communication pipe or service pipe belonging to or used by the consumer, or (2) make any alteration in any such communication or service pipe or in any apparatus connected therewith. It is open to the company under this section to refuse their consent to the fixing of new pipes or apparatus to the existing service pipe, so that if the consumer wishes, *e.g.*, to lay on a supply to a water-closet cistern or bath, he would have to lay a new service pipe to the company's main, but he could not connect to the main without their consent, and they might make their consent conditional on his discontinuing the use of the existing service pipe. If, however, the company were to consent to the fixing of new pipes or apparatus to the existing service pipe, they might make such consent conditional upon a new stop-tap being fixed in an approved position.

SURFACE-WATER DRAINS.—"C. D." writes: I forward sketch plan [not reproduced] of surface road water, cellar, and land drains and wells, which are drained through a field. This field is water-logged at bottom, and the owner has asked the urban district council to allow him to connect to that in the main road, as he cannot get fall to connect in his field. The council refuse permission. (1) Can the owner of the field connect in the main road, seeing that their surface road water drains go through his field? (2) Can the owner of the field compel the urban district council to make a new drain in the road? (3) If not, are the urban district council responsible for the drain being kept in proper repair through the field? (4) If the council go into the field to repair the drain are they responsible for surface damage?

(1) Assuming that this is an urban district, the surface-water drain is a "sewer" vested in the urban district council, subject to the county council's right of user. This being so, it would appear that the owner of the field has a right, under sec. 21 of the Public Health Act, 1875, to cause his drains to empty therein on giving notice to the council and complying with their regulations. (2) In my opinion he cannot. (3) Yes. The council are bound, under sec. 15 of the Act of 1875, to keep all sewers vested in them in repair. (4) The council have an implied right of access to repair their sewer. If they do any damage to the land the owner would probably be able to claim compensation under sec. 308 of the above Act.

We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Cleckheaton U.D.C. (November 21st. Mr. P. M. Crosthwaite).—This was an application for a Provisional Order authorising the construction of new gasworks on a site acquired many years ago at Moorend, and the raising of new capital for that purpose to the extent of £50,000, and also upon an application for sanction to borrow £21,400, the residue of capital expenditure authorised by a Provisional Order of 1888. Already a gasholder is upon the site with a capacity of 500,000 cub. ft., and beyond this the estimated expenditure on the new scheme is £57,150, but during the next few years it is calculated that not more than £40,000 will be called for.—It was stated that the capacity of the present works is 550 000 cub. ft. per day, and it is proposed to put down a new plant—to produce 750,000 cub. ft.—in a form easily and economically capable of extension when required.

Dublin T.C. (November 19th. Mr. P. C. Cowan).—£28,100 for the purpose of extending the electrical cables of the electricity generating station buildings; £2,000 for extending the underground public convenience at Nelson's Pillar; £4,000 for acquiring property in Castle-street for municipal offices; and £2,200 for the extension of the Pig Market.—With respect to the proposed loan for electrical cables, it was explained that the receipts from the department for the year 1911 were sufficient to not only pay all the working expenses of the undertaking, and all the interest upon all moneys borrowed up to this, and the part repayments of the borrowed money, but left an absolute available cash surplus amounting to £11,670. The surplus of the preceding year was £6,458. These two sums have wiped out the debit balance carried over from preceding years, and have left the undertaking with a surplus this financial year of over £4,000. With reference to the loan for municipal offices, it was stated that the present condition of things caused congestion of the official staff and exasperation to the public. It was also stated that, if the condition of the Pig Market was not improved, a threat had been held out that the corporation's licence would be withdrawn.

Youghal U.D.C. (November 19th. Mr. J. F. McCabe).—£2,000 for the erection of workmen's dwellings.—Mr. D. A. Levie, of the firm of Chillingworth & Levie, Cork, engineers of the scheme, said the total cost would be £1,483, including nine houses at £135 each. The dwellings would have a living room and scullery and bedroom on the ground floor, and two bedrooms upstairs.

St. Annes-on-the-Sea U.D.C. (November 20th. Mr. P. M. Crosthwaite and Dr. A. H. MacEwen).—£38,000 for works of sewage disposal.—Some time ago a sewerage scheme was submitted to the Local Government Board, but it was not sanctioned. The engineer, Mr. C. J. Lomax, prepared another scheme, which the council adopted. It was into this scheme that the inquiry was held. Mr. Lomax explained that the scheme, which provided for a resident and visiting population of 98,500, was similar to the one previously submitted, except that the outfall was much further out to sea. Dr. Sargent, the county medical officer of health, attended the inquiry, and although he did not oppose the scheme, he said that the tendency of the times was to prevent crude sewage being turned into the sea, and conditions allowed by the Local Government Board twenty years ago were not now advocated. Mr. T. Loftos, town clerk of Blackpool, opposed the application. He said that the screening system should be adopted. Evidence in support of this view was given by Mr. J. S. Brodie, the borough surveyor of Blackpool, and Dr. Rees Jones, the Blackpool medical officer of health.

Uckfield U.D.C. (November 20th. Mr. A. G. Drury).—£12,200 for the purposes of sewerage and sewage disposal, including the execution of works in the parish of Isfield (which is within the Uckfield rural district).—Mr. W. H. Overton, of the firm of Messrs. Overton & Scott, the engineers for the scheme, gave details of the proposed new works. Mr. Hugh Stott, medical officer of health, said he thought it an excellent scheme under the circumstances. It was absolutely necessary for the Uckfield Urban Council to do something, because of the effluent from the old sewage works.

APPLICATIONS FOR LOANS.

Birmingham T.C.—£40,800 for the widening of Broad-street.

Droitwich T.C.—£1,700 for the provision of working-class dwellings.

Fleetwood U.D.C.—£2,770 for street works.

Greenock T.C.—£60,000 for the Greenock and Port Glasgow electricity scheme.

Hoylake U.D.C.—£1,325 for works of street improvement.

Northampton T.C.—£1,500 for the provision of conveniences and other works at Far Cotton recreation ground.

Oswaldtwistle U.D.C.—£1,040 for a drainage scheme.

Selby U.D.C.—£960 for the purchase of land for workmen's dwellings.

Wakefield T.C.—£20,000 for water mains extensions.

Worcester T.C.—£7,400 in connection with the electricity undertaking.

LOANS SANCTIONED.

Battle U.D.C.—£1,174 for the provision of cottages.

Bray U.D.C.—£10,000 for housing purposes and £1,000 for water mains.

Cambridge T.C.—£8,495 for a duplicate rising main.

Carrickmacross U.D.C.—£4,200 for working-class dwellings.

Finchley U.D.C.—£3,200 for the provision of an open space.

Lees U.D.C.—£480 for street widening.

Maldens and Coombe U.D.C.—£3,000 for Wimbledon and Putney Common extension scheme. The period of repayment is sixty years.

Mansfield T.C.—£300 for the purchase of property for street improvement.

Norwich T.C.—£4,811 for works of sewerage.

Rushden U.D.C.—£12,300 for sewage disposal extension.

Saltburn U.D.C.—£3,290 for the purchase of the brine baths.

Shifnal R.D.C.—£4,350 for the Albrighton sewerage works.

Swansea T.C.—£6,550 for a housing scheme at Cwm and £10,167 for houses at Trewddfya Common.

FORTHCOMING INQUIRIES.

DECEMBER.

		£
2.—	**Harrow-on-the-Hill.** For the erection of cottages and stables, and the provision of an open space (Mr. W. H. Collin) ...	700
2.—	**Wood Green.** For the provision of a fire station (Mr. Edgar Dudley)	800
3.—	**Halifax.** For works of sewage disposal (Mr. F. O. Stanford)	1,823
3.—	**Margate.** For the provision of a pavilion (Mr. W. O. E. Meade-King)	4,500
3.—	**Penarth.** For private street works (Mr. F. H. Tulloch)	800
3.—	**Walton-le-Dale.** For works of water supply (Mr. M. K. North)	4,500
4.—	**Ashton-upon-Mersey.** For privy conversion purposes (Mr. E. Leonard)	1,200
4.—	**Barnoldswick.** For the purposes of the gas undertaking (Mr. M. K. North) ...	10,063
4.—	**Croydon.** For private street works (Major J. Stewart)	4,197
4.—	**Ramsgate.** For the provision of public conveniences (Mr. W. O. E. Meade-King)	1,680
4.—	**Runcorn.** For sewage disposal purposes (Mr. F. O. Stanford)	18,500
5.—	**Accrington.** For the purposes of the gas undertaking (Mr. M. K. North)	16,000
5.—	**Desborough.** For the provision of recreation grounds and works of sewage disposal (Mr. F. O. Stanford)	3,457
5.—	**Poole.** For the purpose of public pleasure grounds (Mr. F. H. Tulloch) ...	188
5.—	**Wimbledon.** For the provision of a burial ground (Mr. W. O. E. Meade-King) ...	3,180
9.—	**Birkenhead.** For the provision of a tuberculosis dispensary (Mr. J. R. Hutchinson)	620
10	**Bootle.** For the provision of hospitals (Mr. J. R. Hutchinson)	3,753

Municipal Work In Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Birmingham £4,500, Cardiff, Johnstone £2,500, Shrewsbury (Staffs) £7,191; housing and town planning—Carnarvon £20,000, Coventry £10,500; roads and materials—Bingley £5,000, Cheshire £1,200, Ramsgate, Southampton £2,500; sewerage and sewage disposal—Clones £2,600; Wirksworth £9,300; water, gas and electricity—Grimsby £8,000, Norwich.—Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Birmingham T.C.—The Public Works Committee have had under consideration the reconstruction of the bridge carrying the London and North-Western Railway line over Witton-road in the vicinity of Witton Railway Station. The estimated cost of constructing a girder bridge to a span of 50 ft. is, together with the necessary street works, £4,500, and the committee recommend that they be authorised to have the work carried out.

Bromley T.C.—A public convenience is to be provided in King's Meadow at a cost of £351.

Cardiff T.C.—The city engineer, Mr. W. Harpur, has received instructions to obtain tenders for the new fire station.

Cheshire C.C.—A new school is to be built at Ashton-on-Mersey, at an estimated cost of £5,000.

Johnstone T.C.—A new public abattoir has been completed at a cost of £2,500.

Llandudno U.D.C.—Improvements are to be carried out at the isolation hospital next year at an estimated cost of £100.

Newcastle-on-Tyne T.C.—A sub-committee has been appointed for the purpose of pushing forward immediately the schemes for the building of new baths at Walker, Benwell, and Heaton; and also for the provision of cottage baths in the poorer parts of the city. The proposal is to take a number of private houses and instal baths therein, the use of which can be had at a cheap rate.

Rhyl U.D.C.—The Local Government Board having refused to grant a proposed loan of £10,000 for the renovation of the Rhyl Pier, the council have decided to abandon the scheme for acquiring the structure.

Shrewsbury T.C.—The scheme for widening English Bridge is to be undertaken, provided one-third of the estimated cost—£12,525—is met from an outside source.

Staffs C.C.—A nurses' home is to be erected at Cheddleton Asylum, at an estimated cost of £7,191.

Swansea T.C.—The Parks Committee have decided to spend £64 at Morfa-stan Park in excavating for a proposed open-air swimming bath.

HOUSING AND TOWN PLANNING.

Carnarvon T.C.—An extensive housing scheme, estimated to involve an outlay of £20,000, is under the consideration of the council.

Coventry T.C.—A proposal is being considered for the erection of fifty industrial dwellings, at an approximate cost of £10,500.

Dundee T.C.—Approval has been given to the carrying out of a scheme of housing which will mean the clearing away of a large amount of slum property along King-street between Queensberry-square and Loreburn-street. The cost of the scheme is estimated at £5,000.

Glasgow T.C.—The city engineer, Mr. A. B. McDonald, has received instructions to prepare a building plan for an area of 20 acres of the ground at Riddrie belonging to the corporation, showing twelve houses to the acre, in terraces of eight on each side, being 240 in all. The houses are to be of the cottage type, and the rents are not to exceed £18 each.

Hailsham R.D.C.—The council have adopted a report from the Housing and Town Planning Special Committee stating that at their meeting with representatives of the Uckfield Rural District Council, it was agreed that application should be made to the Local Government Board for the assistance of one of their expert officers upon the question of a town planning scheme for the parishes of Waldron and Heathfield.

Hemel Hempstead T.C.—It has been decided to purchase for £700 a site for the purpose of a housing scheme.

Honiton T.C.—Inquiries are being made with respect to the availability of a site in Cowley-lane for a housing scheme.

Merthyr Tydfil T.C.—The five houses of concrete that are being erected at Merthyr are expected to be completed next month, the *South Wales Daily News* states. The cost is borne by Mr. Gilbert Harrap, of Farnham, Kent, who has presented the corporation with a cheque for £500. Mr. Harrap is well known in the town by reason of his business connections. Some months ago the corporation discussed the question of building concrete houses, as a further step towards solving the housing problem, but there were divergent opinions among the members as to the utility of concrete for building purposes. Mr. Harrap was favourably impressed with the idea, and in order that the ratepayers should not be burdened with the expense of experimenting with the material, he offered to defray the cost of building the five houses that are now in course of erection. The cottages are expected to cost about £100 each. Nearly 300 houses are owned by the municipality, and the erection of many more is contemplated, but the urgent need is for a small house, to be let at a rental of, say, 10s. a month.

Midhurst R.D.C.—The question of the provision of cottages has been referred to the consideration of the Public Health Committee.

Pebworth R.D.C.—It has been decided to make an offer of £60 for 1½ acres of meadowland for the purpose of a housing scheme.

PARKS AND OPEN SPACES.

Hove T.C.—The borough surveyor, Mr. H. H. Scott, has been instructed to bring up suggestions for providing dressing-room accommodation for footballers in Hove Park.

Liverpool T.C.—Subject to the necessary sanction being obtained, the Parks and Gardens Committee have adopted a scheme prepared by the city surveyor, Mr. T. Shelmerdine, for the conversion, at an estimated cost of £7,000, of land at Rupert-lane Barracks into a public recreation ground

REFUSE COLLECTION AND DISPOSAL.

Middlesbrough T.C.—The borough engineer, Mr. S. E. Burgess, has submitted to the Sanitary Committee a scheme for the provision of a dock for loading refuse in the barge. This provides for the construction of a dock on the western portion of the ferry land, at an estimated cost of £3,500, or, including the cost of the land, £5,500. The loading of the barge will not, he said, be seen from the transporter or from Ferry-road, and the only annoyance, if any, would be in the leading of the refuse from the depot, which would apply to any site. The committee have decided to await the report of the sub-committee appointed to inquire as to sites.

ROADS AND MATERIALS.

Belfast T.C.—It has been decided in constructing the tramway in University-avenue to increase the width of the carriageway by reducing the footpath, so as to leave room for vehicles between the tramway track and the footpath; also to pave the portion between the tramway rails with wood, and complete the portion outside the tramway track with tarmacadam.

Bingley U.D.C.—A number of properties are to be purchased for the widening of Main-street, the nett cost of improving which is estimated to be £12,000. It is also proposed to widen Cottingley Bridge, at an estimated cost of £5,000, half of which would be borne by the county council. These improvements are being carried out with a view to the promotion of a tramways scheme.

Birmingham T.C.—The council on Tuesday last agreed to purchase a strip of land, containing about 1,140 sq. yds., in Broad-street, between Baskerville-place and Easy-row, for the widening of that thorough-

tate, for a sum of £40,000, the purchase to be completed and the money paid in 1920.—The Public Works Committee have been authorised to reconstruct the railway bridge in Witton-road to a width of 50 ft., at an estimated cost of £4,500.

Bodmin R.D.C.—The council on Saturday last received a letter from the county surveyor, Mr. E. A. Brookes, containing details of the expenditure on the main roads in the district, and stating that a cheque for £198 would be sent in final settlement of the contract to March last. Replying to Mr. J. Bate, the clerk, Mr. J. Pethybridge, said the county council had expressed their intention not to pay the insurance contribution of the men employed on the main roads. Mr. Dyer asked why the county council were taking that course, and Mr. J. Knight, surveyor, replied that he understood it was because it was not in the contract. Mr. Dyer: Neither is it in our contract either. Supposing the district councils did not pay the contributions for the men employed on the main roads, what would happen? The clerk said the county council expected the district councils to do their work for them, and they were cutting down the expenditure to the lowest possible point. The surveyor said it was very difficult to carry on the work on the main roads under present conditions. The council decided to accept the cheque sent on account, and asked for a further sum which they considered due to them.

Cheshire C.C.—It has been decided to purchase four tar-spraying machines, at an estimated cost of £300 each.

Dorset C.C.—The Poole Corporation have forwarded plans and estimates for improving High-street and Towngate-street, at an expenditure of £11,834, with a request for a contribution, and the council have referred the matter to a sub-committee.

Edmonton U.D.C.—Private street improvement works are to be carried out, at a cost of £2,224.

Hampshire C.C.—A resolution was carried at the recent meeting requesting the Main Roads and Bridges Committee to consider the question of the housing of the road men employed by them in the rural districts.

Hastings T.C.—Bexhill-road is to be improved, at a cost of £2,764, and £545 is to be spent on tar treating certain roads.

Newhaven R.D.C.—The council are giving consideration to a proposal by the Rottingdean Parish Council requesting the rural council to apply to the Local Government Board for power to raise a loan not exceeding £700 to carry out the scheme recommended by the Rottingdean Sea Defence Committee for the repair and protection of the Rottingdean Gap, such loan to be a special expense on the parish of Rottingdean. If the suggested scheme were carried out it would prove a permanent solution of the difficulty arising in connection with sea erosion at the Gap.

Ramsgate T.C.—Tenders are to be obtained for work in connection with the East Cliff extension, the construction of a sewer, and the provision of a shelter.

Richmond (Surrey) T.C.—The tender of the [illegible] Wood Company, at £286, has been accepted for wood paving works in Kew-road. The same company have just completed other important wood paving contracts in the borough.

Southampton T.C.—The borough engineer, Mr. J. A. Crowther, has received instructions to carry out channelling and kerbing works up to an estimated expenditure of £2,500.

Thames Ditton U.D.C.—The council have received a letter from the Surbiton Council urging that "as the position of the new arterial road is practically settled, it appears that the time has arrived when the three authorities concerned, Surbiton, Esher and the Dittons, and Malden and Coombe should now [illegible] efforts to urge the Road Board to allocate [illegible] special sum for the cost of constructing the new road." They also suggested the holding of a conference of the three authorities and with this the council concurred and appointed representatives.

West Sussex C.C.—Upon the presentation of the report of the Roads and Bridges Committee at the meeting of the council last week a question was asked by Mr. Boxall with reference to the roads. A great many complaints, he said, had been received about the great danger of the loose stone of the roads. It had really become a very serious matter. Alderman Wilberforce replied that he was perfectly aware of these complaints and they were well founded. The explanation was this. Last year, when they tarred the roads they had great difficulty in getting granite chippings which had been used previously with the tar and which had given a sufficient foothold for the horses. They therefore had to substitute pea beach—small round stones—which went very well with the tar and looked very nice; but the round stones were slippery. The county surveyor, Mr. H. W. Bowen, had been approached on the matter, and he hoped next year they would have ample granite chippings. The chairman added that they were taking immediate steps to put down sand and granite chippings.

SEWERAGE AND SEWAGE DISPOSAL.

Clones U.D.C.—Mr. H. J. Weaver, of Gloucester, has prepared a sewerage scheme, estimated to cost £2,600, which is now under the consideration of the council.

Devonport T.C.—The construction of the filter-bed and new reservoir at Crownhill, and the Dousland reservoir, has been completed, at a cost of £39,107—£107 in excess of the estimated price.

Hemel Hempstead R.D.C.—A sewerage scheme for King's Langley has been prepared by Mr. W. H. Radford, the estimated cost being £686.

Llandilo Fawr R.D.C.—The sanitary surveyor, Mr. J. Griffiths, has prepared a sewerage scheme for Brynamman, and an expert is to be asked to draw up a report upon it.

Rothesay T.C.—Mr. J. B. Brodie, of Glasgow, engineer for the proposed sewage scheme, has explained to the council his proposals in detail. He made special reference to the screening chamber which it was proposed to place on the shore at Bogany, and assured the council that from the position of the outfall there would be no possibility of any nuisance that would affect the Craigmore district. At the proposed outlet there was a depth of 35 ft. at high water and 25 ft. at low water. Some questions were put as to an alternative scheme to deal with the sewage by way of purification, but Mr. Brodie stated that there would be no necessity for a process of that kind, and it would only entail an additional burden on the ratepayers.

Rushden U.D.C.—It was stated by the chairman at a meeting held recently that the scheme of the surveyor, Mr. W. B. Madin, for the extension of sewage disposal works had gone through, practically without the alteration of a comma, and he thought that this reflected great credit on the surveyor. The scheme had satisfied the Local Government Board with only the very slightest alterations. It was due to the surveyor that this should be mentioned.

Street U.D.C.—A tender of £66 has been accepted for the purchase of the osiers at the sewage farm.

Wirksworth U.D.C.—A sewerage scheme prepared by Mr. H. A. Johnson, of Bradford, is to be carried out, at an estimated cost of £9,300.

WATER, GAS, AND ELECTRICITY.

Birmingham T.C.—The installation of the new vertical retorts at the Windsor-street gasworks is rapidly approaching completion. There are twenty-two beds of retorts, each bed containing four retorts, and the work is being carried out by the Woodall-Duckham Syndicate Company, Westminster, S.W., at a cost of £60,000.

Goole R.D.C.—A letter of inquiry with respect to the matter having been received from the Local Government Board, the council have appointed a committee to consider the question of a water supply for Swinefleet.

Grimsby T.C.—The Lighting Committee have advised the council to provide new plant at the electricity station, at an estimated cost of £8,000.

Llandudno U.D.C.—The assistant engineer, Mr. W. T. Ward, reports the completion of the works at Dulyn and Melynllyn, the two lakes west of the Conway from which the town gets its water supply. One of the works was the connection of the 12-in. outlet from Dulyn to the town conduit pipes, making available (in addition to the present 9-in. outlet) an additional outlet for water supply purposes. The second section of the works consisted of a new 9-in. connection to Melynllyn, giving an extra foot of depth of water in the lake to draw from. The quantity of water now, therefore, available for water supply purposes from the lakes is double what it was two years ago.

Maryport U.D.C.—A scheme has been approved for the provision of a new retort stack with regenerative furnaces at the gasworks, at an estimated cost of £1,500.

Norwich T.C.—The electric light is to be substituted for gas light for public street lighting in the remainder of the city not at present lighted by electricity, the substitution to be completed by October 1, 1913.

Oystermouth U.D.C.—A conference is to take place with the Swansea Waterworks Committee with reference to a proposed new water supply for Mumbles.

Warrenpoint U.D.C.—A new water supply was inaugurated last week. The water is derived from the Mourne range of mountains, whence it passes into a large reservoir with connecting pipes. The supply is abundant and excellent in quality.

MISCELLANEOUS.

Chester-le-Street R.D.C.—Having regard to the increased cost of living, the council have decided that the wages of the workmen who at present received 24s. a week and under be increased by 1s. 6d. a week, and that men receiving over 24s. have their wages increased by 1s. a week.

West Sussex C.C.—It has been agreed to contribute £1,000 to the proposed scheme for dealing with coast erosion at Lancing.

PERSONAL.

Mr. H. Beeney, surveyor to the Chertsey Rural District Council, has had his salary increased by £50 per annum.

Mr. H. Endsor Inglis, surveyor to the Keynsham Rural District Council, who has resigned, has accepted a position abroad.

Mr. J. E. Hamblin, late of Feltham and Wood Green District Councils, has been appointed surveyor and inspector of nuisances to the Urban District Council of Sexmundham.

Mr. J. H. Bridges, borough engineer of Reading, and Superintendent of the Reading Corporation Tramways, has been appointed a delegate from this association at the International Road Congress to be held in June next.

Mr. James W. Stephens, assistant surveyor to the Feltham Urban District Council, has been appointed surveyor and inspector of nuisances to the North Walsham Urban District Council.

Mr. R. S. Murt, chief engineering assistant in the office of the Cornwall county surveyor, was on Wednesday the 20th inst. presented with a purse of money by the office staff on the occasion of his marriage.

Earl Fortescue, Lord Lieutenant of the County of Devonshire, has consented to accept the office of president of the twenty-fifth congress of the Royal Sanitary Institute to be held at Exeter from July 7 to 12, 1913.

Mr. E. George Mawbey, M.INST.C.E., borough surveyor of Leicester, recently received a gold medal and plaque from the Dutch Government who visited Leicester to inspect the sewerage and land treatment works at Beaumont Leys and the Abbey pumping station.

FOR OTHER ADVERTISEMENTS
See End of Paper.

BRIDGWATER RURAL DISTRICT COUNCIL.
SURVEYOR'S ASSISTANT.

Applications are invited for the post of Junior Assistant in the Engineer and Surveyor's Office. Salary £50 per annum, rising by annual increments of £5 to £60 per annum.

Applications in candidate's own handwriting, stating age and experience, together with copies of three testimonials, to be delivered to the undersigned by December 17th, endorsed "Assistant."

No application will be considered unless candidate has had practical experience, and preference will be given to a Student of the Institution of Municipal and County Engineers.

W. ALFRED COLLINS,
Engineer and Surveyor.

56A, Eastover,
Bridgwater.
November 27, 1912.

SECOND ARCHITECTURAL ASSISTANT required by the Government of Ceylon for the Public Works Department for three years' residential service, in the first instance, with possible extension. Age between 25 and 30 and unmarried. Strict medical examination, and vaccination if necessary.

Salary £300 a year, rising to £350 by annual increments of £25. Free first-class passage out and home again on satisfactory termination of engagement. Half salary on voyage out, full salary from date of arrival in the Colony.

The selected candidate should have had a good sound general and practical knowledge of the work of a Provincial Architect and Quantity Surveyor. He should be neat and accurate in draughtsmanship, taking out of quantities, and in the preparation of estimates.

Application, by letter (no special form required), stating age, giving full particulars of experience, accompanied by copies of testimonials (not originals), with names and addresses of referees of whom inquiries can be made as to capabilities and character, should be sent at once to the Crown Agents for the Colonies, Whitehall Gardens, London, S.W.

Quote M 5711 on left-hand top corner of application.

URBAN DISTRICT COUNCIL OF DENTON.
EXTENSIONS OF SEWAGE DISPOSAL WORKS.

The above Council are prepared to receive Tenders for Alterations to existing Tanks, Construction of New Sludge Tanks, and Erection of Engine and Sludge Pressing House, and other Works in connection therewith.

Plans may be seen, and General Conditions, Specifications, and Forms of Tender may be obtained, on or after the 6th December 1912 at the Office of Mr. John B. Cooke, Engineer of the Council, Town Hall, Denton, near Manchester, upon payment of Three Guineas, which sum will be returned on receipt of a *bonâ-fide* Tender.

Tenders, sealed and endorsed "Sewage Works Extensions, Contract No. 1," or "Sewage Works Extensions, Contract No. 2," as the case may be, must be sent in to me so as to be received by me not later than the 17th December, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

WM. RICHARDS,
Clerk to the Council.

Town Hall,
Denton,
Near Manchester.
November 27, 1912.

URBAN DISTRICT OF FINCHLEY.
FORTIS GREEN-ROAD IMPROVEMENT.

The Council of the above-named District invites applications for the Coating of about 2,000 super. yds. of Carriageway with the undermentioned Materials:—

(A) Bitumen-treated Macadam.
(B) Asphalt on Concrete.
(C) Creosoted Deal Blocks on Concrete.

A minimum guarantee of five years will be required with all Material.

Specifications and Forms of Tender may be obtained from Mr. C. J. Jenkin, M.I.C.E., at the undermentioned address. A deposit of £2 will be required, and will be returned on receipt of a *bonâ-fide* Tender for the whole of the work.

Sealed Tenders, endorsed "Fortis Green-road," to be addressed to the undersigned and delivered not later than the 14th of December, 1912.

The Council does not bind itself to accept the lowest or any Tender.

E. H. LISTER,
Clerk of the Council.

Council Offices,
Church End, Finchley, N.
November 28, 1912.

PUPIL.—The Borough and Waterworks Engineer of Leamington (A.M.I.C.E.) has a vacancy in his office for a Pupil.—Address, Town Hall.

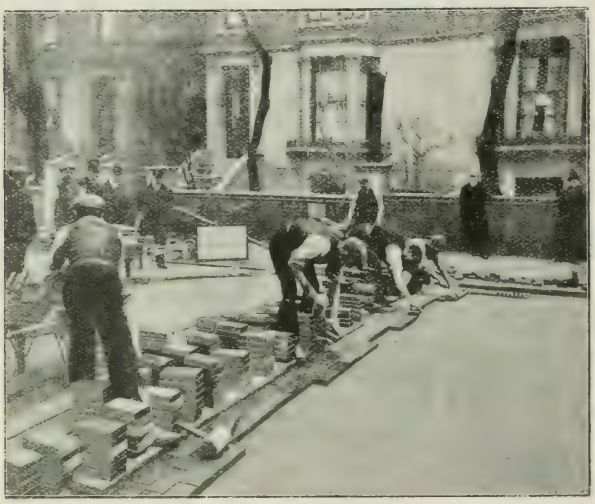
YOUNG ENGINEER wishes lessons in surveying from Practical Surveyor; no coaches.—Apply J. N., 41 Palace-court, W.

THE ROAD MENDER'S WORK IN GREAT BRITAIN.

AN AMERICAN IMPRESSION.

A writer whose skill in literary composition is of no mean order, and whose style distinctly "gets home," has contributed to *Engineering and Contracting* a description of a method of road maintenance the importance of which we have frequently been concerned to urge. While, however, the system is in operation in many parts of the country, the article referred to, the full text of which appears below, has filled us with the desire to see it carried out precisely in the way so vividly described and with exactly the same plant as that referred to. The article runs as follows:—

"The old man-jug or water patrol method of road maintenance is still in use in certain rural parts of England and Scotland. By this plan it was customary to subdivide the highways into sections of about 4 miles each, and place these under the charge of one man (generally an elderly man), whose duty it was to patrol the road, remove all foreign or organic matter, and wherever and whenever necessary make repairs at the very inception of demand for them, the theory being the old-fashioned one of a "stitch in time saves nine." The equipment used by this man has always been a small cart drawn usually by a donkey, the cart containing the usual tools for road repairs, and, in addition, two large jugs of water and a pail. The base of operations for the caretaker is invariably a small and attractive-looking, vine-covered shed, built well on one side of the highway. Under this shed is kept, in a locked portion, the cart and tools, and under an open section is usually a pile of large stone. In dry weather, when nothing else of importance occurs to be done, the caretaker accumulates a supply of ordinary field stone of sufficient toughness to use for surfacing or building roadways. This is usually in England a flint rock, tougher, if anything, than our trap rock. In wet weather the caretaker breaks up the large stone to sizes which will pass as a minimum through a 1½-in. ring. With a supply of this cracked material on hand he is in shape to take to the road and make such repairs as may be necessary at different points. His usual method is to drive down the road with his little cart filled with a certain amount of stone and the tools above mentioned. When he gets to a point which to the eye looks low, he puts some water from one of the jugs in his pail, dashes it on the road at the apparent low spot, and if the water holds and does not run off then he knows that a repair must be made. He then starts in and ravels up the road sufficiently to incorporate the low point and loosen and revamps by hand the macadam, adding a sufficient amount of new material to bring the roadway up to a perfect surface. This is all done by hand, including the hammering, which takes the place of a roller. When he gets entirely through he again tries it out with water, and if the water runs off his job is complete, and he goes on to the next place."



Method of Laying Lithofalt Block Paving

LITHOFALT BLOCK PAVING.

BUCKINGHAM PALACE QUADRANGLE CONTRACT.

We have from time to time had occasion to call attention to the enterprise of the Limmer Asphalte Paving Company, Limited, in connection with various products which they have placed upon the market during the past few years. Among other things, we have to call special attention to the increased use both at home and abroad of this company's well-known Lithofalt paving blocks for carriageways, footways, courtyards, and so forth. The use of these blocks is being increasingly appreciated by engineers and architects who desire a dustless, noiseless, sanitary and antiseptic paving for confined areas, courtyards, carriageway drives, and similar situations, and among the numerous other places in which the blocks have been laid within the last two or three years may be mentioned the approaches to the British Museum, the courtyards to Fleetway House (the new offices of the Amalgamated Press, Limited), Messrs. Maples' extensive premises in Tottenham-court-road, Messrs. Huntley & Palmer's works at Reading, Messrs. J. Lyons & Co.'s up-to-date depot and bakeries at Cadby Hall (Kensington), and the Pure Ice Company's depot (All Hallows-lane, E.C.); another important contract being in connection with the reconstruction of the Great Western Railway Station at Snow-hill, Birmingham. Lithofalt blocks are also specified to be laid in large areas in the courtyards and approaches to the New King's College Hospital at Denmark-hill in South London, an institution which, when completed, is expected to be one of the most up-to-date and finely equipped of its kind in the world.

Without doubt, however, the most striking testimony to the all-round excellence of the system is the statement to hand this week that the Limmer Company have received an order from H.M. Office of Works to pave a portion of the quadrangle at Buckingham Palace with these blocks. Needless to say, it is of the utmost importance that the paving laid in a position of such prominence should be one of the highest possible standard, and it may be safely assumed that the use of Lithofalt blocks was not decided upon by the Government department responsible until their merits and general suitability had been very carefully investigated.

During the past few years the blocks have been supplied and laid to the amount of many thousands of yards in some of the principal metropolitan boroughs and suburban districts, as well as the chief watering places, including Brighton and Folkestone. We also understand that very large quantities have been exported to such distant Colonies as New Zealand, and that the Municipality of Shanghai have for some time past had the blocks under the most rigorous tests, and subjected to wide variations in climatic conditions, and have now specified them for use in the streets of the town.

Town Planning at Finchley.—Mr. Thos. Adams, on behalf of the Local Government Board, recently conducted an inquiry into the application of the Finchley Urban District Council for permission to prepare a town-planning scheme. Mr. C. J. Jenkin, the council's surveyor, in the course of his evidence, stated that the council never knew from day to day what large residences would be marked for demolition by builders who proposed to construct ordinary "gridiron" streets. It was not the intention of the council to oppose the inclusion of working-class dwellings in the development scheme. All classes would be catered for.

Manchester Sewerage.

LOOKING FIFTY YEARS AHEAD.

[The following interesting description we quote from the *Manchester Evening News*. The initial which cloaks the identity of the author suggests that he is the son of a well-known municipal surveyor, and is himself an engineer of wide experience.]

A few days ago I was walking along a completed portion of the new main sewer which the Manchester Corporation are engaged in making—an enterprise on which the health of the population almost absolutely depends, and which is going to cost the ratepayers something like £1,000,000. It was in the neighbourhood of the Irwell at Hulme that I entered the sewer, and I had strolled several hundred yards along the broad, clean, subterranean highway when a rumbling noise overhead compelled an instinctive halt. . . . And then I learnt that we were exactly beneath Chester-road, and that just about 30 ft. above our heads the tramcars were passing along the thoroughfare.

TO PROVIDE FOR 1,400,000 PEOPLE.

This bright brick "tube," which is to carry so much of Manchester's sewage to Davyhulme, is, roughly, 13½ ft. wide and about 8 ft. high—wide enough for a carriage and pair to be driven through it. This is the maximum—in parts it is narrower and lower; but the scheme has been designed by the city surveyor, Mr. de Courcy Meade, on a scale big enough to settle the Manchester sewerage problem for something like the next half century. It is expected to provide for the day when Manchester's population, now about 700,000, has almost doubled itself.

In this matter of sewerage provision, however, so much depends on rainfall, and other such doubtful conditions as the distribution of population, that absolute accuracy cannot be assumed. The existing sewers of Manchester were supposed to be sufficient to take the drainage of a population of 868,000. The population actually contributing to the sewage is only 615,000, but already the sewers are flooded during each heavy rainfall. They were even so flooded before the sewage of a population of only 500,000 was coupled up to them. In times of storm the water rises in the manholes to heights varying from 6 in. to 26 ft. above the tops of the sewers, the sewage backs up into the house drains, and the foundations become saturated with filth.

It is satisfactory, therefore, to have the assurance that the new main drainage system which is now being inaugurated will put an end to all this, and that the complaints which have been received from the Royal Infirmary, the University and other places will be heard no more. Next to the provision of a plentiful and pure water supply, nothing is more essential to the health of a large and congested population than a perfect drainage system, and as this large expenditure—which, by the way, is repayable over a period of only fifty years—will make Manchester one of the best drained cities in the kingdom, it is an expenditure which no one need grudge. It is a fortunate coincidence that the city council should have entrusted the carrying out of this work to the Rivers Committee, whose chairman (Alderman Frowde) and deputy-chairman (Councillor West) happen to be engineers.

THE AMATEUR BRICKLAYER.

The all-important point in hidden structures like sewers is that the material and workmanship should be of the soundest, and so far as a layman can judge from close inspection on the spot this condition is fulfilled to the letter. I saw more than one section of the work, and even participated to the extent of laying—"well and truly," let us hope—one brick of this great structure which is to give Manchester eventually a total length of over 100 miles of main and intercepting sewers.

At various points the miners were at work, here cutting through the firm clay and there carving a way through the red sandstone which is met with at intervals. As they bored and delved their way through the cutting they were followed up, only a few yards behind, by the builders, who, working by candlelight, laid brick on brick four deep, with Portland cement and proper filling to make a perfect job.

Hour after hour, by day and night, the work goes on under the strictest supervision of the workmanship. Then, even when the tunnel is to all appearances finished, along come the officials of the corporation, under a special clause of the contract, to undo here and there a piece of work, merely to make assurance doubly sure. This is done under an agreement which provides that the corporation shall replace everything at their own cost when the work is shown to be satisfactory, while the contractors must make the work good where anything not perfectly sound is disclosed.

It had been my intention to see something of the old sewers as well as of the new, and to this end I had been provided with the necessary rig, but of the five manholes which were opened for investigation near Chorlton-road none proved sweet enough to invite a descent. I saw the narrow and shallow little sewer which was considered good enough for our needs prior to 1885, and also some of the sewers which form part of the existing main drainage system, but as my guide, having explored the best of them, declared it "pretty bad," I considered discretion the better part of valour, and, with a profound admiration of the men who regularly inspect these subterranean passages, gave up the task.

It is a wonderfully interesting scheme this underground network of intercepting sewers and storm overflows, not easy to understand, and still less easy to explain. Briefly, the scheme is arranged so that, while the sewage proper is carried to Davyhulme, the storm waters are carried through more than 200 overflows into the rivers Irwell, Medlock and Irk (or their tributaries), and the Ship Canal. The arrangement of the intercepting passages is such that only the higher flow from the sewers can be carried into the rivers, and it is so exact that the percentage of dilution which is secured can be measured to a nicety. Down at Hulme, where a large new overflow will empty itself into the Irwell just below the normal level of the river, a penstock arrangement—a huge stop valve it might be called—is provided so that the flow can be stopped and the section pumped empty for the purpose of inspection.

A PURER WATERWAY.

When this new scheme of drainage is completed the Ship Canal will be purer than it has ever been. In dry weather over 17,000,000 gallons of water pass through the docks every twenty-four hours, as compared with an average daily flow into Davyhulme of over 36,000,000 gallons. But for the facilities which exist for discharging the storm water into rivers or streams Davyhulme would be literally swept away.

The average amount of mineral matter in the storm water now discharged from six overflows into the Ship Canal is 3,169 grains per gallon, whereas the estimated amount of mineral matter in the storm water to be discharged from the Woden-street overflow is only 18·5 grains per gallon, or little more than already exists in the Irwell itself with no flood at all. Three of the existing storm overflows will be dispensed with, and no sewage is to be admitted into the canal until it has been so diluted with storm water that the combined volume is seven times that of the sewage only.

If all this benefit can be obtained for £1,000,000 spread over fifty years the money will not have been ill-spent. Other towns in the area of the Joint Committee have had to spend proportionately more, the total being over £6,000,000 for a population of 2,782,215, and in many respects Manchester's expenditure in comparison with results is moderate. Even in the disposal of its sewage sludge, by conveyance to sea in its own steamer, Manchester's cost is comparatively low. The site for depositing Manchester's sludge is beyond the North-West Lightship, 7 miles off the Welsh coast—a round trip of 120 miles, which is made about 210 times every year. London sends her sludge vessel on a round trip of 116 miles, and Glasgow's vessel makes a trip of 90 miles, and the respective cost is: Manchester 4·3d., London 6·5d., and Glasgow 2·75d. Apart altogether, however, from the question of expense, it would seem perfectly clear that with its new drainage scheme Manchester will have efficiency, which is everything. Infinite pains have been taken in securing the necessary data and in

regulating the force of the flow all over the city. Many years ago the sudden oncoming of rain so surprised a party of officials in one of the Manchester overflow sewers that every man of them had to run for their lives to the river, and were only rescued with difficulty from the Irwell. There should be no such unexpected incidents for the next half century at any rate. C.

HIGHWAY ADMINISTRATION IN SASKATCHEWAN.

An interesting bulletin has been issued by Mr. A. J. McPherson, chairman of the Board of Highway Commissioners of Saskatchewan.

During the period from 1905 to the present day the Department of Public Works has spent annually on the improvement and maintenance of roads and on the construction of bridges amounts varying from £40,000 to £140,000, and much work has been done in opening up the country and giving settlers ready access to their markets.

When it was decided in 1906 to carry out improvements in definite localities, the plan adopted was to select one of the local residents of known ability to organise the labour and do the work. The results so obtained were naturally unsatisfactory, and in 1907, instead of local men being appointed, the best of the foremen previously employed were appointed as road foremen, to act during the whole season, to go from place to place where improvements were required, to organise the local labour, and see that the work was properly done. The same policy, with slight modifications, was pursued in 1908 and 1909, and, in addition, various publications had been distributed to the foremen and to the local authorities, and a force of skilled inspectors had been kept constantly at work supervising road building and improvement.

In 1910 the local authorities were asked to work out their problems and to apply for what assistance they required in order to do so. The arrangement was to make grants under regulations approved by the Lieutenant-Governor in Council to all municipalities which had completed their organisation under the Rural Municipality Act. The work had to conform to a certain standard, and certain information had to be placed before the Public Works Department. This system has produced good effects, and has given satisfaction where properly worked out.

In a new country such as Saskatchewan many improvements are urgently required which are so large as to be beyond the means of the local authorities. For instance, practically all bridges of 20 ft. span and over, and many small bridges and culverts, have been constructed by the provincial government, and in most cases their maintenance has also devolved on the provincial authorities.

Provision has recently been made for meeting the cost of important improvements of permanent value by spending a sum of £1,000,000 from the provincial treasury, and it is intended to proceed as fast as is consistent with economy and efficiency.

Provision has been made in a Highway Improvement Act for the appointment of a Board of Highway Commissioners, and municipalities will be asked to give further consideration to the classification of roads in order that a complete system of main roads may be built up, constructed with provincial funds, and, in addition, connected roads from one municipality to another. The Highway Commission will investigate methods of improvement that may seem to offer solutions of special difficulties, will distribute information to those interested, will give advice wherever needed, and will send experts if necessary to any place in the province to help in solving the problems of the local authorities.

Titanium Steel Tramrails.—Mr. T. Rowlands, director of Messrs. T. Rowlands & Co., Limited, Sheffield, British agents for the Titanium Alloy Manufacturing Company, writes: "In your issue of 15th inst. you have announced that the Liverpool Corporation are about to place in service 100 tons of the above. An error has been made in stating that these will be the first to be used in this country, as the writer has personally supervised the treatment of steel with titanium alloy and the rails made have now been in service for several months. Besides tramrails, several miles of permanent way rails have been made, and we hope to be in a position to give particulars as to their wearing qualities at an early date."

SOME RECENT PUBLICATIONS.*

Building Construction (Advanced and Honours Courses). By Charles F. Mitchell, M.S.A., &c., assisted by George A. Mitchell, A.R.I.B.A. Price 6s. London: B. T. Batsford.

We presume that it is hardly necessary to introduce our readers to "Mitchell's Building Construction," which is almost, if not quite, the most popular book on the subject. The volume now before us is the seventh edition of the "Advanced and Honours Courses," and is truly a wonderful production at the price. It has again been revised and enlarged, and the chapters on Skeleton-framed Buildings and Reinforced Concrete have been completely rewritten in view of the new London County Council regulations in regard to these classes of work. The book now contains over 900 pages, and innumerable illustrations, and the reader is led step by step through every phase of the science and art of building. Mr. Mitchell is an ideal guide, inasmuch as he not only possesses a great deal more than the necessary knowledge of the subjects with which he deals, but his experience as a teacher enables him to appreciate the student's point of view and to write in an easy and lucid manner, which makes it a pleasure to consult his book. There can be no doubt that, both as regards price and quantity and quality of matter, this is *the* book for the student of building construction.

Reinforced Concrete Construction (Advanced Course). By M. T. Cantell. Price 12s. 6d. nett. London: E. & F. N. Spon.

This treatise forms a continuation of the elementary course by the same author, and, in addition to the text and numerous illustrations, there are thirty-one fully worked examples covering the whole range of reinforced concrete construction. In most cases the examples are accompanied by explanatory diagrams, working drawings, and illustrations of recently constructed works. The reader is thus not only enabled to study the mathematical principles of design, but also to compare the results obtained by calculation with structures which have been recently erected. The subjects dealt with include (among others) Piles, Retaining Walls, Roofs, Water Tanks, Water Towers, Reservoirs, Swimming Baths, and Arches. A list of the symbols used appears at the beginning of the book, thus rendering it an easy matter to follow the mathematical parts of the book. Reinforced concrete construction has now a considerable literature, but there is plenty of room for such a complete and carefully prepared work as that under notice.

Practical Geometry and Graphics for Technical Students. By E. L. Bates and F. Charlesworth. Price 4s. nett. London: B. T. Batsford.

The authors of this book are both experienced teachers, and this fact is reflected in the style and arrangement of the work. They have kept in view the requirements of the practitioner as well as those of the student, and the book will be found to contain not only sufficient to cover the syllabus of the Board of Education "lower stage" examination in the subject, but also a great deal of practical information of value to engineers, architects, surveyors, and craftsmen in following their daily employment. The book is divided into three parts, dealing respectively with Plane Geometry, Graphics, and Descriptive Geometry. These are all subjects which are necessary for the professional equipment of architects, engineers and surveyors. The merit of the present volume is that it treats them definitely from this point of view, and thus it is specially suited to the needs of the technical student or practitioner. Information in regard to examinations is contained in appendices, and the text is elucidated by many clearly drawn diagrams.

Practical Mathematics for Technical Students. By E. L. Bates and F. Charlesworth. Price 3s. nett. London: B. T. Batsford.

This is an elementary text-book designed primarily to meet the requirements of technical students and artisans. The subjects included comprise Arithmetic, Algebra, Geometry, Logarithms, Mensuration, Trigonometry, and an elementary account of the processes of differentiation and integration. It will thus be seen that within the scope of its 500 pages the book contains all the mathematics that the average technical student or practical man requires. The

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

authors have acquired a reputation for lucidity of expression which is fully maintained in this work. Numerous worked examples, exercises and diagrams increase the value of the book, a prominent feature of which is the practical application of the principles discussed to the problems met with daily by engineers, architects, surveyors and draughtsmen. The book is one which will be appreciated by a large number of students for whom the standard works on mathematical subjects are unsuitable.

Early Christian and Byzantine Architecture. By Edith A. Browne. Price 3s. 6d. nett. London: A. & C. Black.

This is the fifth volume of an excellent series of books dealing with the various periods of architecture. The series is intended to constitute a popular history of architecture, and the method pursued in each volume is first to link up the style indicated with the past, then to treat it as a distinct entity, and finally to consider its influence on contemporary and future styles of building. The illustrations in the present volume, which range from the Church of Santa Sophia at Constantinople to the Roman Catholic Cathedral at Westminster, are very well reproduced, while Miss Browne's letterpress affords a delightful introduction of the architecture with which she deals. This volume and the others of the series will prove very helpful to the amateur who seeks to base his appreciation of great buildings upon a knowledge of the principles which go to make up their characteristic style.

Gasworks Directory and Statistics, 1912-13. Price 10s. 6d. nett. London: Hazell, Watson & Viney, Limited.

This is the thirty-fifth annual issue of this useful book. Its contents are divided into four sections, dealing with England and Wales, Scotland, Ireland, and Foreign and Colonial Gasworks respectively. In the case of each gasworks particulars are given as to population served, annual output, price, share capital, offices and officers, and many other matters of interest. As a book of reference for all engaged in the gas industry, it is difficult to imagine how this work could be improved upon.

A reprint from *Applied Science* of an article on "The Evolution of Vertical Lift Bridges," by Mr. Henry Gratton Tyrrell has been issued by the University of Toronto Engineering Society. Mr. Tyrrell, who is a bridge and structural engineer practising at Elvaston, Illinois, is the author of numerous writings on bridge engineering, his work experience in connection with which is at once apparent from a perusal of his latest contribution on the subject.

Specification and agreement writing is essentially a work in which clearness, definiteness and strictest accuracy in all particulars are of the utmost importance, and the reprint which the *Canadian Engineer* (Toronto) has published of a number of articles dealing with the subject will therefore be welcomed by engineers in general. What the lack of attention to details may result in is shown by the articles, and the procedure to be adopted is very clearly set out. The price of the pamphlet is 1s.

Illuminating Engineering Society. A paper, entitled "Modern Methods of Indirect Lighting: Their Advantages and Merits," will be read by Messrs. F. W. Willcox and H. C. Wheat at a meeting of this body to be held on Tuesday, the 3rd prox., at 8 p.m.

Roads Improvement Association.—Mr. Robert Todd occupied the chair at the November meeting of the council of the Roads Improvement Association. A resolution strongly urging the Local Government Board to support the application of the Croydon Corporation for a loan of approximately £20,000 to carry out the relief road scheme was unanimously passed. A small sub-committee was appointed to confer with leading horse owners upon the question of evolving a more up-to-date type of horse-shoe, which, while giving the horse a firm foothold upon the modern hard waterproof road surface, would also minimise the pitching action of the calkin. The lease was signed and various other arrangements settled concerning the association's new premises at 15 Dartmouth-street, Westminster, London, S.W. The association will take possession at Christmas. The Highways Bill of the association is to be brought up to date, and when completed arrangements are to be made to establish Parliamentary Committees in both Houses.

TOWN PLANNING SCHEMES.

QUESTIONS IN PARLIAMENT.

The President of the Local Government Board was asked in the House of Commons on Monday to state the number of local authorities who had applied to the Local Government Board for permission to prepare town-planning schemes, the number of authorities to whom such permission had been granted, and the number of town-planning schemes prepared or adopted by local authorities which had been approved by the Local Government Board; and whether the Local Government Board had issued any sets of general provisions under Clause 55 (1) of the Act of 1909 for carrying out town-planning schemes.

In reply, Mr. John Burns said the number of local authorities who had applied for permission to prepare town-planning schemes was twenty-six. These applications related to thirty-four schemes. The number of local authorities to whom the permission had been granted was fifteen in respect of twenty schemes. Three schemes had been prepared and submitted for approval, but had not yet been finally approved. The answer to the last inquiry was in the negative. The information asked for was contained in a White Paper presented to the House on the 12th inst., except that one application for authority to prepare a scheme had been received since that date.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President Mr. R. J. Thomas, M.Inst.C.E., County Surveyor, Buckinghamshire.

EASTERN DISTRICT.

Chairman Mr. Alfred Fidler, M.Inst.C.E., Northampton.

An Eastern District meeting is to be held at Lyons' Victoria Mansions Restaurant, Victoria-street, Westminster, on Saturday, December 7th.

Programme.

5 p.m.—Meeting of the Eastern District Executive Committee at the offices of the institution, 11 Victoria-street, Westminster, S.W. Note.—The members of this committee were elected at the Grays meeting, and have been so notified.

6 p.m.—Dinner at Lyons' Victoria Mansions Restaurant (Victoria-street, Westminster). Tickets 2s. 6d. each.

7 p.m.—Discussion on the report of the Departmental Committee of the Local Government Board in reference to Intercepting Traps on House Drains, to be opened by Mr. H. P. Boulnois, M.Inst.C.E.

8 p.m.—Music and conversation.

8.30 p.m.—Suggestions and discussion in regard to the work of the institution, with special reference to the Eastern District.

Notices.

In order that the necessary arrangements may be made, members must give notice of their intention to be present not later than Monday, December 2nd, and remittances for dinner tickets should also be sent by this date. Members are requested to make a special effort to attend this meeting, and, if convenient, the dinner, as the hon. district secretary has had to agree to take a certain number of tickets for the latter. A cordial invitation is given to members of the institution outside the Eastern District to attend the dinner and discussion.

Ernest J. Elford, M.Inst.C.E.,
Hon. District Secretary.
Borough Engineer,
Southend-on-Sea.

SOUTH-EASTERN DISTRICT.

A meeting of members of the above district will take place at Sidcup at 2.30 p.m. on Wednesday, January 8th, when the road sections will be inspected.

Mr. Maybury has kindly consented to supply the revised cost of the trial lengths up to December 31st;

the meeting will be followed by a dinner at Frascati's Restaurant, Oxford-street, at 6.30 p.m.

A meeting of the institution will be held at Caxton Hall, Westminster, on Friday, December 6th, at 8 p.m., to discuss a paper to be read by Mr. H. T. Wakelam on "Tramway Rail Corrugation."

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. Frank Latham, M.Inst.C.E.I., F.S.E., Borough Engineer and Surveyor, Penzance.

JOINT WESTERN AND SOUTH-WESTERN DISTRICT MEETING.

A Joint Western and South-Western District Meeting will be held at Gloucester and Exeter to-day and to-morrow.

Programme.

Gloucester Meeting, to-day.

3 p.m.—Meet at the New Inn, Gloucester.
Business meeting of the Western District.
Short address by the president.
4 p.m.—Discussion of Mr. A. Winter Gray's paper, "Superannuation and Security of Tenure," which will be taken as read.
5 p.m.—Adjourn for tea.
6 p.m.—Informal meeting, at which Mr. Latham will preside.

Exeter Meeting, to-morrow.

3 p.m.—Meet at the Bude Hotel, Exeter.
Business meeting of the South-Western District.
Short address by the president.
4 p.m.—Discussion of Mr. A. Winter Gray's paper, "Superannuation and Security of Tenure," which will be taken as read.
Discussion on the question of "Working-Class Housing," when two or three short papers will be presented. Members are requested to contribute what information they can on the question, in order that it may be fully discussed, with a useful interchange of views and experience.
6 p.m.—Adjourn for tea.
7 p.m.—Social evening, with musical programme, at the Bude Hotel, to which members and their friends are invited.

John Brook,
C. Owen Baines,
Joint Hon. District Secretaries.

November 11, 1912.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District was held at the Victoria Hotel, Manchester, on November 20th. Mr. A. R. Bleazard, the district chairman, presided, and the proposed social was the first matter dealt with. It was decided, after full discussion, to proceed with the arrangements for a dinner and social evening, commencing at 6 p.m. prompt on December 7th, members to be accompanied by gentlemen friends only, and the charge to be 4s. per head. (Morning dress.)

In order to extend the usefulness of the institution to members residing some distance from headquarters, a scheme of local "correspondents" based on the new list was considered, and the hon. district secretary was requested to write certain members thereon. A draft programme for 1913 was approved.

The principal business dealt with was the discussion on the "Merits of the Intercepting Trap," introduced by Mr. E. Walker (Stretford). Special reference was made to the trap being an obstacle to ventilation, the inlet-outlet nuisance, the question of cost, and the obstruction to the flow of sewage. Mr. Walker dealt at length with the points raised against the intercepting trap, and laid special stress on the conditions of provincial industrial towns being very different to the drainage systems required by London, Birmingham, &c. The usefulness of the separate trap and the relationship between the size of traps and the diameter of inlets to the number of stoppages were also referred to. Mr. Walker afterwards answered several questions, and the discussion became general. The meeting concluded with a hearty vote of thanks to Mr. Walker for his paper.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*

SOCIETY OF ENGINEERS.

A meeting of the Society of Engineers will be held at the Institution of Electrical Engineers, Victoria Embankment, W.C. (south end of Savoy-street, near Waterloo Bridge), on Monday, December 2nd, when a paper on "The Deflection of Reinforced Concrete Beams" will be read by Mr. Percy J. Waldram, F.S.I., M.C.I., the following being a synopsis:—

Relation of stiffness to strength—Reinforced concrete weaker than steel or fir—Small deflections not a proof of strength—Deflection of beams under stress—Stress for given deflection—L.C.C. draft regulations—Suggested standard of deflection—Effect of end fixing not yet fully determined—Importance of correct standard of deflection—Calculation of deflection with given loading and unknown stress—Deduction of moment of inertia from moment of resistance—Moment of inertia of rectangular and T beams with single and double reinforcement—The difference between calculated and actual deflection in the Talbot and other tests—Effect of shear members on deflection.

The chair will be taken at 7.30 p.m. precisely.

A. S. E. Ackermann.
17 Victoria-street, Westminster, S.W. *Secretary.*

INSTITUTION OF WATER ENGINEERS.

President—Mr. J. S. Pickering, M.Inst.C.E., borough surveyor and water engineer, Cheltenham.

WINTER GENERAL MEETING.

The seventeenth Winter General Meeting of the Institution of Water Engineers will be held at the apartments of the Geological Society, Burlington House, W., on Saturday, December 14th. The proceedings will commence at 10.30 a.m., or as soon as the business of the special general meeting called for 10 o'clock, is completed. The usual informal dinner will be held on Friday evening.

The following papers have been promised for reading and discussion:—

(1) "Some Recent Examples of Pollution of Public Water Supplies," by J. C. Thresh, D.Sc., M.D., &c.
(2) "The Valuation of Water Undertakings on Transfer to Local Authorities," by E. J. Silcock, M.Inst.C.E., F.S.I.
(3) "Recent Advances in the Science of Water Purification," by Adolph Kemna, D.Sc.

Advance copies of these papers will, it is hoped, be available for the use of those wishing to take part in the discussions, but as only a limited number will be printed early application should be made.

Programme.

10.30 a.m.—The minutes of the seventeenth ordinary general meeting and of the special general meeting will be read and submitted for confirmation; ballots will be taken for council for the year 1913-14, and for new members; reading of papers and discussions thereon.

The meeting will be adjourned for luncheon or otherwise as circumstances may require.

Percy Griffith.
20 Victoria-street, S.W. *Secretary.*

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

President—Mr. John D. Watson, M.Inst.C.E., F.R.San.I.

ANNUAL GENERAL MEETING AND DINNER.

The eleventh annual general meeting and dinner of the Association of Managers of Sewage Disposal Works will take place on Thursday, December 12th, at the Holborn Restaurant, London.

Programme.

11 a.m.—Council meeting.
2 p.m.—Annual general meeting; chairman's annual report; balance-sheet; reading of papers; discussion.
6.30 p.m.—Reception.
7 p.m.—Annual dinner.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

INSPECTOR OF NUISANCES.—November 30th.—Newquay Urban District Council.—Mr. G. F. Nicholls, clerk.

DEPUTY CITY SURVEYOR.—November 30th.—Corporation of Manchester. £750 per annum.—Mr. Thos. Hudson, town clerk.

ASSISTANT SURVEYOR.—December 2nd. Runcorn Rural District Council.—Mr. G. F. Ashton, clerk, 71 High-street, Runcorn.

BUILDING INSPECTOR.—December 2nd.—Hale Urban District Council. £2 10s. per week.—Mr. J. G. Whyatt, clerk.

CLERK OF WORKS.—December 2nd.—Ipswich Education Committee. £3 5s. per week.—Mr. R. C. Wrinch, architect, 16 Museum-street, Ipswich.

DISTRICT SURVEYOR OF MAIN ROADS.—December 3rd.—East Sussex County Council. £160—£200.—Mr. F. Merrifield, clerk.

CLERK OF WORKS.—December 3rd.—Rhymney Urban District Council. £2 5s. per week.—Mr. L. Reynolds, clerk. Milbourne Chambers, Merthyr Tydfil.

ARCHITECTURAL ASSISTANT.—December 4th.—Corporation of Birkenhead. £170—£185.—Mr. Chas. Brownridge, borough engineer and surveyor.

CLERK OF WORKS.—December 4th.—Corporation of Portsmouth. £3 5s. per week.—Mr. G. H. Etherton, town clerk.

INSPECTOR OF NUISANCES.—December 5th.—Oundle Rural District Council. £90 per annum.—Mr. G. Coombs, clerk, New-street, Oundle.

TEMPORARY SURVEYING ASSISTANT.—December 7th.—Hazel Grove and Bramhall Urban District Council. £2 2s. per week.—Mr. Frederick Pidgeon, clerk.

HIGHWAYS SURVEYOR.—December 7th.—Keynsham Rural District Council. £175 per annum.—Mr. Frank G. Whittuck, clerk.

ROAD FOREMAN.—December 11th.—Tonbridge Urban District Council. 35s. per week.—Mr. W. L. Bradley, engineer and surveyor, The Castle, Tonbridge.

CLERK OF WORKS.—December 11th.—Corporation of Ramsgate. £4 4s. per week.—Mr. A. B. Clarke, town clerk.

BOROUGH SURVEYOR AND INSPECTOR OF NUISANCES.—December 21st.—Corporation of Ludlow. £200 per annum.—Mr. John H. Williams, town clerk.

INSPECTOR OF NUISANCES.—Abingdon Rural District Council. £110—£120 per annum.—Messrs. B. and E. M. Challenor, clerks.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

WANDSWORTH.—November 30th.—Designs for a public swimming bath at Balham.—Mr. P. Dodd, borough engineer, 215 Balham High-street, S.W.

BELFAST.—January 1st.—Designs for 126 houses of two apartments each, and 126 houses of three apartments each, for the corporation. Premiums are offered of £25, £15, and £10.—Mr. R. Meyer, town clerk.

ORSETT (Essex).—January 1st.—For the construction of a sewerage and sewage disposal scheme in the parish of South Ockendon, for the Orsett Rural District Council. Premiums of £50 and £25 are offered.—Mr. James Beck, clerk, 2 Orsett-road, Grays.

HARROGATE.—February 3rd.—Designs for a council school, for 675 children.—Mr. C. E. Rivers, ASSOC.M. INST.C.E., borough engineer.

DUBLIN.—February 6th.—Designs for municipal buildings for the corporation. The proposed expenditure is £50,000, and the author of the design placed first will be appointed to carry out the scheme on a 5 per cent basis. Premiums of £150 and £100 are offered. The assessor is Mr. Albert E. Murray, F.R.I.B.A. —The Town Clerk.

FOLKESTONE.—No date.—Designs for a band pavilion, cost not to exceed £20,000, for the corporation. Premiums of 100 guineas, 50 guineas and 25 guineas are offered.—The Town Clerk.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

Buildings.

GLASGOW.—November 30th.—For the construction of public conveniences, for the corporation.—Mr. J. Lindsay, town clerk.

GUILDFORD.—November 30th.—For the erection of cemetery chapel and lodge, iron fencing and gates, and forming paths, for the Joint Burial Committee.—Messrs. Potter & Crundwell, joint clerks, Farnham.

WEST HAM.—December 2nd.—For the erection of a handicraft centre, for the corporation.—Mr. Fred. E. Hilleary, town clerk.

ESSEX.—December 2nd.—For the erection of a new bridge over the river Roding in ferro-concrete work on the Hennebique system, for the county council.—Mr. Percy J. Sheldon, county surveyor.

ESSEX.—December 2nd.—For the reconstruction of Burnt Hill Bridge, for the county council.—Mr. Percy J. Sheldon, county surveyor.

GLAMORGAN.—December 2nd.—For the erection of a new school, for the county council.—Mr. T. Mansel Franklen, clerk, County Hall, Cardiff.

CULLEN (Banff).—December 2nd.—For the construction of harbour extension works, for the corporation.—Mr. W. C. Paterson, town clerk.

RAMSGATE.—December 2nd—11th.—For the erection of a school, for the corporation.—Mr. A. D. Clarke, town clerk.

MAESTEG.—December 3rd.—For alterations to town hall and market buildings, for the urban district council.—Mr. R. Scale, clerk.

LANCS.—December 3rd.—For the erection of an elementary school, for the Education Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

HYDE.—December 3rd.—For extensions to public baths, for the corporation.—Mr. Thomas Brownson, town clerk.

WOLVERHAMPTON.—December 3rd.—For the erection of a horse repository, for the corporation.—Mr. G. Green, borough engineer.

LLANFAIRFECHAN.—December 3rd.—For constructing public convenience and footbridge, for the urban district council.—Mr. W. H. Ellis, clerk.

MENAI.—December 3rd.—For the erection of council chambers and fire brigade station, for the urban district council.—Mr. Owen Jones, Prince's Pier, Menai Bridge.

HUNSTANTON.—December 4th.—For the erection of shelters, for the urban district council.—Mr. J. S. B. Glasier, clerk.

KENT.—December 4th—19th.—For the erection of a school, for the Education Committee.—Mr. F. W. Crook, secretary, Caxton House, Westminster, S.W.

WEST HAM.—December 10th.—For the erection of fire brigade station and firemen's dwellings at Silvertown, for the corporation.—Mr. Fred. E. Hilleary, town clerk.

MANCHESTER.—December 7th.—For the erection of a school, for the Education Committee.—Accountant, Education Offices, Deansgate.

DUNGANNON.—December 12th.—For erecting twenty-two single and eighteen double cottages, for the rural district council.—The Clerk.

WIMBLEDON.—December 13th.—For alterations and additions to slipper baths, for the corporation.—Borough Engineer and Surveyor.

DOVER.—December 14th.—For additions and alterations to a school, for the corporation.—Mr. R. F. Knocker, town clerk.

ABERAVON.—December 14th.—For the construction of offices and boundary wall, for the corporation.—Mr. James Roderick, borough surveyor.

CHELMSFORD.—December 16th.—For sinking a borehole, for the corporation.—Mr. George Melvin, town clerk.

ABERDARE.—December 16th.—For the erection of twenty-three playsheds at council schools, for the Education Committee.—Mr. T. Botting, Education Offices, Aberdare.

KENT.—December 19th.—For the erection of a school at Tonbridge, for the Education Committee.—Mr. F. W. Crook, secretary, Caxton House, Westminster.

TWICKENHAM.—December 27th.—For the construction of a stone-pitched inclined embankment along the river frontage, for the urban district council.—Mr. H. Jason Sanders, clerk.

Iron and Steel.

SWANSEA.—December 2nd.—For the extension of water mains, for the rural district council.—Mr. Edward Harris, clerk.

GRAVESEND.—December 2nd.—For supplying and laying high-tension cables for the corporation.—Mr. H. H. Brown, town clerk.

CLACTON.—December 4th.—For the supply of 50 tons of British cast-iron plates and connections, for the urban district council.—Mr. G. T. Lewis, clerk.

SOUTHEND.—December 6th.—For the supply of 200 tons of Sanberg steel rails and fish-plates, for the town council.—Mr. E. J. Elford, borough engineer.

CHISWICK.—December 6th.—For the supply of unclimbable fencing and gates, for the urban district council.—Mr. E. E. Collins, clerk.

HAMPTON.—December 10th.—For the supply and erection of a duplicate set of condensing steam engine air compressors and other subsidiary works, for the urban district council.—Mr. Sidney H. Chambers, surveyor.

Roads.

SEAFORD.—November 30th.—For the supply of granite flake and broken granite, for the urban district council.—Mr. W. H. Pawson, clerk.

CAMBRIDGE.—December 2nd.—For the supply of broken granite, syenite, basalt or similar stone, for the corporation.—Mr. J. E. L. Whitehead, town clerk.

HITCHIN.—December 2nd.—For the supply of broken granite, for the urban district council.—Mr. W. Onslow Times, clerk.

WOMBWELL.—December 2nd.—For the supply of 800 tons of granite, 400 tons of whinstone, 500 tons of blue rock limestone, 1,000 tons of tarred dross, 15,000 tons of lump slag and rejections, 400 tons of basalt, and 200 tons of dross chippings, for the urban district council.—Mr. Percy Milnes Walker, clerk.

MIDDLETON.—December 2nd.—For private street works, for the corporation.—Mr. F. Entwistle, town clerk.

TAUNTON.—December 2nd.—For making up Gordon-road, for the corporation.—Mr. D. Edwards, borough surveyor.

BRIERLEY.—December 2nd.—For work of paving, for the urban district council.—Mr. B. Halstead, surveyor.

GILDERSOME.—December 2nd.—For the supply of granite, limestone, and slag, for the urban district council.—Mr. W. Wilby, surveyor.

WOLVERHAMPTON.—December 2nd.—For carrying out private street works, for the corporation.—Mr. G. Green, borough engineer.

BROMLEY.—December 3rd.—For work of making up, for the corporation.—Mr. F. H. Morgan, town clerk.

EALING.—December 3rd.—For supplying and laying patent or other road materials, for the corporation.—Mr. Geo. Brydges, town clerk.

RHYMNEY.—December 3rd.—For works of street improvement, for the urban district council.—Mr. L. Reynolds, clerk, Melbourne Chambers, Merthyr.

TOTTENHAM.—December 3rd.—For making up South-grove (section 1) and the road between Avenue-road and South-grove, for the urban district council.—Mr. Edward Crowne, clerk.

BLAYDON.—December 3rd.—For works of making up, for the urban district council.—Mr. Henry Dalton, clerk.

BARNSLEY.—December 3rd.—For work of making up, for the corporation.—Mr. W. P. Donald, town clerk.

HOVE.—December 4th.—For paving and other works, for the corporation.—Mr. H. Endacott, town clerk.

GRIMSBY.—December 4th.—For work of making up, for the rural district council.—Mr. J. F. Wintringham, clerk.

BRIDGWATER.—December 6th.—For the supply of stone for the roads, for the rural district council.—Mr. T. M. Reed, clerk.

WEST SUSSEX.—December 7th.—For the supply of broken granite, quartzite or other approved stone, chippings, tarred macadam, picked surface flints, pit flints, sand or binding material, cartage and team labour, for the county council.—Mr. H. W. Bowen, county surveyor.

DORKING.—December 7th.—For the supply of broken granite, granite chippings, and coal-tar, for the urban district council.—Mr. W. A. Clegg, surveyor.

SOUTHAMPTON.—December 9th.—For the supply of refined tar for surface treatment of the main roads, for the county council.—Mr. H. Barber, clerk.

BECKENHAM.—December 9th.—For making up Overbury-avenue and Hampden-road, for the urban district council.—Mr. F. Stevens, clerk.

SOUTHAMPTON.—December 9th.—For the supply of columnar basalt, Clee Hill basalt, Welsh granite, coverack, or similar syenite, quartzite, and tarred-macadam, for the county council.—Mr. H. Barber, clerk, The Castle, Winchester.

SOUTHAMPTON.—December 9th.—For the hire of steam rollers, for the county council.—Mr. H. Barber, clerk.

STRETFORD.—December 9th.—For paving certain passages, for the urban district council.—Mr. Geo. H. Abrahams, clerk.

WAKEFIELD.—December 9th.—For the execution of private street works, for the corporation.—Mr. J. P. Wakeford, city surveyor.

WILTS.—December 10th.—For the supply of granites, basalts, flints, limestones and gravel, for the county council.—Mr. J. George Powell, county surveyor.

WILTS.—December 10th.—For steam rolling main roads, for the county council.—Mr. J. George Powell, county surveyor.

WILTS.—December 10th.—For the supply of tools for road work, for the county council.—Mr. J. George Powell, county surveyor.

KENT.—December 11th.—For the supply of 60,000 tons of broken road stone, such as Rhenish basalt, Guernsey, Jersey or Alderney granites, Clee Hill basalt, Leicester granite, Penlee, St. Keverne or other Cornish granites, Northumberland whinstone, Penmaenmawr or other North Wales granites, quartzite, Norway granite, or Quenast or lassines, for the county council.—Mr. W. B. Prosser, clerk.

CHEADLE.—December 11th.—For making good two roads, for the urban district council.—Mr. Arthur Briggs, clerk.

WEST RIDING.—December 11th.—For paving with granite and grit setts, for the county council.—Mr. F. G. Carpenter, County Hall, Wakefield.

WESTBOURNE.—December 12th.—For the supply of hand-picked field stones, and Portfield or Lavant gravel and shingle, for the rural district council.—Mr. J. W. Loader Cooper, clerk, Queen-street, Emsworth.

BERKS.—December 12th.—For the supply of broken road materials, gravel and sand, for the county council.—Mr. J. Fred. Hawkins, county surveyor, Shire Hall, Reading.

GODSTONE.—December 14th.—For tar-washing the surface of certain highways, for the rural district council.—Mr. Geo. E. Crowter, surveyor of highways.

SOUTHAMPTON.—December 20th.—For the supply of tools for use on the main roads, for the county council.—Mr. H. Barber, clerk.

SOUTHAMPTON.—December 20th.—For the supply of surface-tarring machines, for the county council.—Mr. H. Barber, clerk.

SOUTHALL-NORWOOD.—December 24th.—For making up and channelling work, for the urban district council.—Mr. R. Brown, engineer and surveyor.

MERTON.—December 27th.—For the supply of tar for road surfacing, for the urban district council.—Mr. G. Jerram, clerk.

Sanitary.

STOCKTON-ON-TEES.—November 30th.—For emptying ashpits and privies, for the rural district council.—Mr. T. H. Faber, clerk.

AUCKLAND.—December 2nd.—For laying earthenware pipe drains and manholes, for the rural district council.—Mr. Sam Adams, clerk.

LEEDS.—December 2nd.—For the supply of 6 No. independent units of combined centrifugal sewage pumps direct, coupled to 3-phase alternating current motors, and other incidental work at the new pumping station, for the corporation.—Mr. Robert E. Fox, town clerk.

CHEPPING WYCOMBE.—December 3rd.—For the supply of stoneware pipes and coal, for the corporation.—Mr. T. J. Rushbrooke, borough surveyor.

MALLING.—December 3rd.—For work of scavenging, for the rural district council.—Mr. F. J. Allison, clerk, West Malling.

CARSHALTON.—December 4th.—For the construction of stoneware pipe sewers, manholes and lamp-holes, for the urban district council.—Mr. C. P. Loveclock, clerk.

AUDENSHAW.—December 4th.—For the removal of nightsoil, for the urban district council.—Chairman of Sanitary Committee.

DOVER.—December 4th.—For the removal of house refuse, for the corporation.—Mr. W. C. Hawke, borough engineer.

LEEDS.—December 5th.—For the construction of sewers in certain streets, for the corporation.—Mr. W. T. Lancashire, city engineer.

UXBRIDGE.—December 5th.—For the collection and removal of house refuse, for the rural district council.—Mr. C. Woodbridge, clerk.

SOUTH SHIELDS.—December 6th.—For the supply of disinfectants, for the corporation.—Mr. J. M. Hayton, clerk.

BIRMINGHAM.—December 7th.—For the construction of stoneware pipe sewer and other works, for the corporation.—Mr. H. L. Stringer, city engineer and surveyor.

SWANSEA.—December 7th.—For the extension of sewers, and construction of manholes and flushing chamber, for the rural district council.—Mr. Edward Harris, clerk.

LEEDS.—December 9th.—For the construction of main intercepting sewers, consisting of a new intercepting outfall sewer 4½ miles in length, two new branch sewers, conduits and other works incidental thereto, for the corporation.—Mr. Geo. A. Hart, sewerage manager.

SOUTHAMPTON.—December 10th.—For the construction of soil sewer and manholes, for the corporation.—Mr. R. R. Linthorne, town clerk.

HAMBLEDON.—December 10th.—For laying stoneware-pipe sewer and manholes, for the rural district council.—Mr. Ferdinand Smallpiece, clerk.

NANTWICH.—December 14th.—For the construction of sewage disposal works, comprising detritus, settling, storm-water and stand-by tanks, filter-beds, humus tanks, and laying sewers and manholes, for the rural district council.—Mr. Charles E. Davenport, engineer.

YEOVIL.—December 14th.—For laying stoneware-pipe sewer, and constructing manholes, tanks, and sludge well, and digging irrigation channels, for the rural district council.—Mr. J. E. Rodber, clerk.

RUNCORN.—December 14th.—For the conversion of privies into water-closets, for the urban district council.—Mr. James Wilding, surveyor.

GUILDFORD.—December 18th.—For the construction of 972 yds. of 18-in. and 12-in. surface-water drain, manholes, gullies, and connections, for the corporation.—Mr. A. D. Jenkins, town clerk.

Stores.

ABERDEEN.—December 2nd.—For the supply of stores for the Water Department.—Mr. C. H. Roberts, water engineer.

NOTTINGHAM.—December 5th.—For the supply of cement, blue lias lime, red bricks, timber, earthenware pipes, iron castings, gulleys, Yorkshire flags, kerb, granite setts, broken granite, ironstone slag, chippings, river gravel, coal, picks, shovels, scoops, ironmongery, scavenging and other brushes, disinfectants, refined tar, pitch, and creosote oil, for the corporation.—Mr. W. J. Board, town clerk.

RHONDDA.—December 10th.—For the supply of bricks, stoneware-pipe sewers, bass brooms, ironmongery, wrought-iron tubes, iron castings, paving, kerb, channel, Portland cement, and haulage of macadam, for the urban district council.—Mr. W. J. Jones, engineer and surveyor.

HARTLEPOOL.—December 10th.—For the supply of bass brooms, ironmongery, iron castings, oils, disinfectants, Portland cement, stoneware or fireclay pipes, and broken or unbroken whinstone or slag, for the corporation.—Mr. Percy Horsley, borough engineer.

Miscellaneous.

EAST COWES.—December 6th.—For sinking an artesian borehole, for the urban district council.—Mr. A. Damant, clerk, Cowes, Isle of Wight.

ISLE OF WIGHT.—November 27th.—For work of pumping at waterworks, for the rural district council.—Mr. H. Eldridge Stratton, clerk.

LAMBETH.—December 10th.—For the supply and installation of three electric lifts, and dismantling and removal of existing lifts, for the Board of Guardians.—Mr. James L. Goldspink, clerk, Brook-street, Kennington-road. Tenders to be endorsed "Tender for lifts."

New Public Slaughter-house at Johnstone.—A new public slaughter-house at Johnstone was opened recently. The slaughter-house is estimated to cost £2,583, and the scheme has engaged the attention of a committee of the council for the past four years.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

CAMBRIDGE.—For the erection of cottages, for the corporation. Mr. J. Julian, borough surveyor:—
Kidman & Sons, Cambridge, £1,724.

DEPTFORD.—For the supply of two water supply tanks at the town hall, for the borough council:—

H. Green, London	£230
Wilson & Smith, Limited, London	209
J. Fraser & Son, London	189
F. Bird & Co., London	162

DOVER.—For making up two roads, for the corporation.—Mr. W. C. Hawke, borough surveyor:—

Paramore, Limited, Margate	£731
G. Munro, Dover	589
Austen & Lewis, Dover	502

LLANTWIT FARDRE.—For laying stoneware pipe sewer, for the rural district council:—

G. L. Morgan, Pontypridd	£860
D. Bussell, Treforest	860
H. Murray, Pontypridd	808
W. Cox, Llandaff	693
A. G. Collins, Cadoxton	638
J. Murray, Mountain Ash	633
D. W. Hughes, Church Village	579
John & West, Llantrisant	567
Johnson Brothers, Gloucester	518
W. Jenkins, Bedwas	455

METHLEY.—For works of flagging and kerbing, for the urban district council.—Mr. T. Thompson, surveyor:—

A. Rex, Garforth	£383
Rhodes Brothers, Shipley	362
Brookes, Limited, Halifax	356
J. Rodger & Son, Castleford	340
F. C. Trentham, Handsworth	330
J. Lee, Harrogate	329
G. Walker & Son, Castleford	325
Ward & Fetley, Bradford	322
E. A. Greaves, Castleford	293
J. W. Slack & Son, Methley*	289

RICHMOND (Surrey).—For extension of the public baths.—Mr. J. H. Brierley, borough surveyor:—

Lowe & Co., London	£3,951
Speechley & Smith, Richmond	3,476
E. Peddle, West Norwood	3,424
Offer & Sons, Kingston-upon-Thames	3,376
Jarman & Co., Richmond	3,289
Dorey & Co., Brentford*	3,250
M. Pearson, London	3,240
Crosby & Co., Farnham	4,167

Borough surveyor's estimate, £3,250.

SITTINGBOURNE.—For the supply of Guernsey granite and granite chippings, for the urban district council.—Mr. W. L. Grant, surveyor:—
Guernsey granite and chips.—J. Mowlem & Co.,* 13s. 1d. and 9s. 11d. per cubic ft.; W. Griffiths & Co., 13s. 8d. and 10s. 2d.; Penlee and St. Ives Stone Quarries, Limited, 13s. 5d. and 11s. 5d.; Rowe & Mitchell, 14s. and 10s. 3d.; A. & F. Manuelle, 13s. 8d. and 9s. 11d.; Fry Brothers, 13s. 5d. and 10s. 5d.; United Stone Firms, Limited, Bristol, 14s. 10d. and 12s. 1d.; Croft Brick and Concrete Company, Limited, Leicester, 14s. 3d. and 12s. 2d.
Pit flints, Granuzion & Sons,* 3s. 7d. per cubic yd.; T. Standen & Sons, 3s. 9d.
Tar (17,000 galls.).—Sittingbourne District Gas Company,* 8s. per barrel of 40 galls.; J. Smart & Son, Poplar, 4¾d. per gal.; Grindley & Co., Limited, Poplar, 5d. per gal.

WANDSWORTH.—For making up and paving part of Southcroft-road, for the borough council.—Mr. P. Dodd Manser.c.e., borough engineer:

J. Mowlem & Co., Limited, £759, and 10 per cent. above schedule prices for extras or omissions.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

NOVEMBER.

29-30.—Institution of Municipal Engineers: Joint Western and South-Western District at Gloucester and Exeter. Mr. A. Winter Gray on "Superannuation and Security of Tenure" (Gloucester; discussion on "Working-class Housing" (Exeter).

30.—Institution of Municipal and County Engineers: North-Eastern District Meeting at York.

DECEMBER.

2.—Society of Engineers: Mr. Percy J. Waldram, F.S.I., M.C.I., on "The Deflection of Reinforced Concrete Beams." Institution of Electrical Engineers, Victoria-embankment, W.C. 7.30 p.m.

3.—Illuminating Engineering Society: Messrs. F. W. Wyllen and H. C. Wheat, on "Modern Methods of Indirect Lighting: their Advantages and Merits." 8 p.m.

6.—Institution of Municipal and County Engineers: Meeting in London. Mr. B. T. Wakelam on "Tramway Rail Corrugation." Caxton Hall. 8 p.m.

7.—Junior Institution of Engineers: Visit to Works of Messrs. Thos. Glover & Co., Limited, Gas-meter Manufacturers and Engineers, Edmonton. 3 p.m.

7.—Institution of Municipal and County Engineers: Eastern District Meeting, Lyons' Victoria Mansions Restaurant, Victoria-st., S.W.

7.—Institution of Municipal Engineers: North-Western District, Social Evening, Mitre Hotel, Manchester. 6 p.m.

7.—Institution of Municipal and County Engineers: South-Eastern District Meeting, 11 Victoria-street, S.W.

12.—Association of Managers of Sewage Disposal Works: Annual General Meeting and Dinner, Holborn Restaurant.

12.—Concrete Institute: Messrs. R. Chalmers and Laurence Gould, F.S.I., on "The Effects on Concrete of Acids, Oils and Fats." 7.30 p.m.

14.—Institution of Water Engineers: Seventeenth Winter General Meeting, Burlington House, W. 10.30 a.m.

18.—Institution of Municipal and County Engineers: Metropolitan District Meeting, 11 Victoria-street, S.W.

19.—Quantity Surveyors' Association: Conversazione, Connaught Rooms, Great Queen-street, Kingsway, W.C. 8 p.m.

JANUARY.

8.—Institution of Municipal and County Engineers: South-Eastern District Meeting at Sidcup.

9.—Concrete Institute: Mr. W. Valentine Ball, Barrister-at-Law, on "Concrete in its Legal Aspect." 7.30 p.m.

APPOINTMENTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for them are requested to arrange that they should reach* The Surveyor *not later than* **Wednesdays** *to ensure their insertion in the current issue. In case of advertisements may, in case of emergency, be telephoned* (No. 1539 *Holborn*) *subject to later confirmation by letter.*

BOROUGH OF LUDLOW.

APPOINTMENT OF BOROUGH SURVEYOR AND INSPECTOR OF NUISANCES FOR THE BOROUGH OF LUDLOW.

Notice is hereby given that the Town Council will, on Thursday, the 16th day of January, 1913, appoint a competent and fully qualified person to perform the duties of the above joint offices.

The salary for the joint offices is £200 (allocated as follows: £80 for the Borough Surveyor and £120 for the inspector of nuisances), with office accommodation, including stationery.

The duties will be:—

(*a*) The ordinary duties of a Borough Surveyor.

(*b*) The ordinary duties of an Inspector of Nuisances, as defined by the Sanitary Officers (Outside London) Order, 1910.

(*c*) The duties imposed by the Housing and Town Planning, &c., Act, 1909, and the Orders of the Local Government Board thereunder on an Inspector.

(*d*) The duties of an Inspector under the Petroleum Acts.

The appointment (as to the Inspector of Nuisances) is under the terms of Article IX. of the foregoing Order of the Local Government Board, and is subject to the approval of the Board.

The person appointed will (to comply with the Public Health Acts) be required to give security for the due performance of his duties, which security is fixed at £25. And will be required to give an undertaking not to be concerned in any work that may interfere with his official duties.

And also will be required to agree to give at least one month's notice previous to resigning the office or to forfeit the sum of £5 as liquidated damages.

Applications, with copies of testimonials, endorsed "Borough Surveyor," to be delivered at my office not later than 5 o'clock in the afternoon of Saturday, the 21st day of December next.

The Council does not bind itself to make any appointment.

Personal canvassing of the members of the Council will be considered a disqualification.

JOHN H. WILLIAMS,
Town Clerk.

Town Clerk's Office, Ludlow.
November 23, 1912.

KEYNSHAM RURAL DISTRICT COUNCIL.

APPOINTMENT OF HIGHWAY SURVEYOR.

The above Council invite applications for the appointment of Surveyor of Highways for their District (about 10 miles by 7, embracing 14 parishes), at a salary of £175 per annum. Duties to commence early in the New Year, probably about the end of January.

The person appointed will be required to carry out all the duties appertaining to the office of a Surveyor of Highways, including the keeping of all necessary books and accounts, and be capable of making estimates and plans, to devote his whole time to the duties of the office, and to provide a horse or other suitable means of locomotion.

Preference will be given to Candidates between the ages of 25 and 40 years, with experience as aforesaid.

Applications, stating age, experience, and qualifications, and accompanied by copies of not more than three recent testimonials, endorsed "Surveyor, &c.," to be delivered to me not later than Saturday morning, the 7th December, 1912.

Selection of Candidates will take place on the 10th December, 1912, and appointment on the 17th December, 1912.

The Appointment will be subject to the approval of the Somerset County Council.

Canvassing Members of the Council, directly or indirectly, will disqualify.

FRANK G. WHITTUCK,
Clerk to the Council.

Keynsham, Bristol.

HAZEL GROVE AND BRAMHALL URBAN DISTRICT COUNCIL.

TEMPORARY SURVEYING ASSISTANT.

Wanted, temporary Surveying and Engineering Assistant for Town Planning purposes. Salary £2 2s. per week.

Applicants must be expert Surveyors and Levellers, and neat and expeditious Draughtsmen, and have had such experience as to fit them for Town Planning work.

Applications, stating age, experience and qualifications, with copies of three recent testimonials, to be sent to the Surveyor, Council Offices, Hazel-grove, not later than Saturday, the 7th December next, endorsed "Surveying Assistant."

(By order)
FREDERICK PIDGEON,
Clerk.

Council Offices, Hazel-grove,
Near Stockport.
November 26, 1912.

TENDERS WANTED.

BOROUGH OF GUILDFORD.

The Town Council invite Tenders from responsible persons for the Construction of about 972 yards of 18-in. and 12-in. Surface-water Drain in Woking and Woodlands roads, Guildford, with necessary manholes, gullies and connections.

Plans and sections may be seen, and copies of the Specification, Bill of Quantities and Form of Tender obtained, on application to Mr. C. G. Mason, Assoc.M.Inst.C.E., Borough Engineer and Surveyor, on payment of Two Guineas, which will be returned on the receipt of a *bond-fide* Tender.

Sealed Tenders, endorsed "Tender for Woking-road Drain," must be sent to me before 12 noon on Wednesday, the 18th December, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

A. D. JENKINS,
Town Clerk.

Town Clerk's Office,
Bridge-street,
Guildford.
November 26, 1912.

GODSTONE RURAL DISTRICT COUNCIL.

HIGHWAYS AND BRIDGES DEPARTMENT.

The above-mentioned Council hereby invite Tenders for Tar-washing the Surfaces of certain Highways in their District during the season of 1913.

The area cannot be definitely stated or guaranteed.

Tender forms can be obtained from the undersigned upon the receipt of a stamped and addressed envelope.

Tenders must be sealed, and endorsed on the outside "Tender for Tar-washing," and must be delivered to me not later than Saturday, the 14th day of December, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

GEO. E. CROWTER,
Surveyor of Highways.

High-street,
Godstone,
Surrey.
November 26, 1912

CITY OF LEEDS.

LEEDS CORPORATION ACT, 1908 (SEWERAGE).

SEWAGE DISPOSAL SCHEME AT THORPE STAPLETON.

TO PUBLIC WORKS CONTRACTORS.

CONTRACT No. 41.

For the construction of Main Intercepting Sewers, consisting of the execution of the following work:—

A New Intercepting Outfall Sewer, mainly in Brick and Concrete, ranging in size from 8 ft. 6 in. to 3 ft. 6 in. internal diameter, of a total length of about 4¼ miles, commencing in Meanwood-road, traversing North-street, Skinner-lane, York-road, Pontefract-lane, to the New Sewage Works Site at Thorpe Stapleton; also two new Branch Sewers to be connected with the existing Sewers in Roseville-road and Chapeltown-road respectively, together with all Manholes, Lamp Chambers, Storm Overflow Chambers, Conduits and other Work incidental thereto.

The Sewerage Committee of the Leeds Corporation are prepared to receive applications for Contract Documents from Public Work Contractors who are desirous of submitting Tenders for the above Contract. The latest date on which such applications will be received by the undersigned is December 9th, 1912.

The Tenderers, when notified by the Sewerage Engineer, will be required to deposit with the Corporation the sum of Ten Pounds (£10) to cover the Contract Documents necessary for preparing a Tender can be forwarded or supplied, such sum will be returned when the Council have accepted a Tender, provided that a *bonâ-fide* Tender shall have been sent in, and that the same shall not have been withdrawn.

The Sewerage Committee reserve the right to decline the application of any Tenderers, and do not bind themselves to accept the lowest or any Tender.

Persons tendering must do so at their own cost.

(By order)
GEO. A. HART,
Sewerage Engineer.

26 Great George-street, Leeds.
November 19, 1912.

CITY OF LEEDS.

LEEDS CORPORATION ACT, 1908 (SEWERAGE).

SEWAGE DISPOSAL SCHEME AT THORPE STAPLETON.

TO MAKERS OF CENTRIFUGAL SEWAGE PUMPING MACHINERY.

CONTRACT No. 42.

For the Supply, Delivery and Erection of 6 No. Independent Units of Combined Centrifugal Sewage Pumps direct coupled to 3-Phase Alternating Current Motors and other incidental Work required in the New Pumping Station to be constructed at the Low-level Sewage Works at Knostrop, in the City of Leeds.

The Sewerage Committee of the Leeds Corporation are prepared to receive applications for Contract Documents from Makers of Centrifugal Sewage Pumping Machinery only who are desirous of submitting Tenders for the above Contract. The latest date on which such Applications will be received by Mr. Geo. A. Hart, Sewerage Engineer, 26 Great George-street, Leeds, is December 2nd, 1912.

The maker of the centrifugal sewage pumps will require to take full and complete responsibility for both the pumps and the whole of the electrical equipment required in accordance with the terms of the Conditions of Contract, Specification (both mechanical and electrical), Drawings and Diagrams which have been prepared, and to enter into a formal Agreement with the Corporation accordingly.

The Tenderers, when notified by the Sewerage Engineer, will be required to deposit with the Corporation the sum of Ten Pounds (£10) to cover the Contract Documents necessary for preparing a Tender can be forwarded or supplied. Such sum will be returned when the Council have accepted a Tender, provided that a *bonâ-fide* Tender shall have been sent in, and that the same shall not have been withdrawn.

The Sewerage Committee reserve the right to decline the application of any Tenderer, and do not bind themselves to accept the lowest or any Tender.

Persons tendering must do so at their own cost.

(By order)
ROBERT E. FOX,
Town Clerk.

Pearl Chambers, Leeds.
November 18, 1912.

KENT COUNTY COUNCIL.

BROKEN ROAD STONE AND TARRED MACADAM.

The Bridges and Roads Committee of the County Council invite Tenders for the Supply of the undermentioned Materials, to be delivered between the 1st of April, 1913, and the 31st of March, 1914, as follows:—

60,000 tons (more or less) of Broken Road Stone, such as:

(1) Rhenish Basalt.
(2) Guernsey, Jersey or Alderney Granites.
(3) Clee Hill Basalt.
(4) Leicestershire Granites.
(5) Penlee, St. Keverne or other Cornish Granites.
(6) Northumberland Whinstone.
(7) Penmaenmawr or other North Wales Granites.
(8) Quartzite.
(9) Norway Granite.
(10) Quenast or Lessines.
(11) Or other equally durable Material.

Tenders are also invited for Tarred Macadam, and special forms for the supply of this material will be furnished upon application.

Also the following Local Materials:—

7,500 yards (more or less) of Surface picked or Grubbed Flints.
3,000 yards of Kent Rag.

Specification and Forms of Tender can be obtained upon application to the County Surveyor, Maidstone.

Sealed Tenders, endorsed "Tender for Road Metalling," must be sent to the undersigned (upon the prescribed forms not later than 12 noon on Wednesday, the 11th day of December next.

The Committee reserve the right to apportion the order as they may feel disposed, and will favourably consider offers of small consignments.

The lowest or any Tender will not necessarily be accepted.

W. B. PROSSER,
Clerk to the Council.

Sessions House, Maidstone.
November, 1912.

MERTON URBAN DISTRICT COUNCIL.

SUPPLY OF TAR FOR ROAD SURFACING.

The above Council invite Tenders for the Supply of Tar for Road-surfacing Works in the Parishes of Merton and Morden, such tar to be supplied as and when required during the six months ending 30th September, 1913.

Tender forms can be obtained from the undersigned on or after the 13th December.

Sealed Tenders, endorsed "Tender for Tar," must be delivered at the Council offices before 12 o'clock noon on Friday, the 27th day of December, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

G. JERRAM,
Surveyor to the Council.

Council Offices,
Kingston-road, Merton, S.W.
November 29, 1912.

COUNTY OF SOUTHAMPTON.

MAIN ROADS.

SUPPLY OF TOOLS.

Tenders are invited for the Supply and Delivery of Tools for use on Main Roads throughout the County during the year ending 31st March, 1914.

Conditions and Form of Tender may be obtained on and after November 20th from Mr. W. J. Taylor, County Surveyor, The Castle, Winchester.

Tenders are to be delivered to me on or before Saturday, 21st December, 1912, in sealed envelopes, endorsed "Tender for Tools."

H. BARBER,
Clerk of the County Council.

The Castle, Winchester.
November 15, 1912.

COUNTY OF SOUTHAMPTON.

MAIN ROADS.

HIRE OF STEAM ROLLERS.

The County Council invite Tenders for the Hire of Steam Rollers for use on the Main Roads throughout the County during the year ending 31st March, 1914.

Conditions and Form of Tender may be obtained on application from Mr. W. J. Taylor, County Surveyor, The Castle, Winchester, on and after November 20th.

Sealed Tenders, marked "Tender for Hire of Steam Rollers," are to be delivered to me on or before Monday, the 9th December, 1912.

H. BARBER,
Clerk of the County Council.

The Castle, Winchester.
November 15, 1912.

COUNTY OF SOUTHAMPTON.

MAIN ROADS.

TAR.

Tenders are invited for the Supply of Refined Tar for surface treatment of the Main Roads during the year ending March 31st, 1914.

Specification, Form of Tender, General Conditions and Schedule of Stations to which the Tar is to be delivered, may be obtained on and after November 20th from Mr. W. J. Taylor, County Surveyor, The Castle, Winchester, on deposit of One Guinea, which will be returned on receipt of a *bona-fide* Tender.

Tenders, endorsed "Tar," to be delivered to me on or before Monday, the 9th December, 1912.

H. BARBER,
Clerk of the County Council.

The Castle, Winchester.
November 15, 1912.

COUNTY OF SOUTHAMPTON.

MAIN ROADS.

SURFACE TARRING MACHINES.

Tenders are invited for the Supply and Delivery of Surface Tarring Machines.

Conditions and Form of Tender may be obtained on and after November 20th from Mr. W. J. Taylor, County Surveyor, The Castle, Winchester.

Tenders are to be delivered to me on or before Saturday, 21st December, 1912, in sealed envelopes, endorsed "Tender for Tarring Machines."

H. BARBER,
Clerk of the County Council.

The Castle, Winchester.
November 15, 1912.

WILTS COUNTY COUNCIL.

MAIN ROADS UNDER DIRECT MANAGEMENT.

ROAD METAL.

The Roads and Bridges Committee of the County Council invite Tenders from Quarry Proprietors, Stone Merchants and others for the Supply of Road Metal for a period of one year commencing 1st day of April next.

The Material required will consist of Granites, Basalts, Flints, Limestones, Gravel, &c., particulars of which are set out in Specifications. Schedules of approximate Quantities and Forms of Tender to be obtained of the County Surveyor, Trowbridge. The bulk of the Material will be required to be delivered at railway station or wharves, except in the case of local material.

Sealed Tenders to be addressed to the Clerk of the County Council, County Offices, Trowbridge, must be delivered on or before the 10th day of December, 1912.

All Tenders to be endorsed "Tenders for Road Metal."

No pledge is given that the lowest or any Tender will necessarily be accepted.

(By order)
J. GEORGE POWELL,
County Surveyor.

County Surveyor's Office,
Trowbridge.
November 20, 1912.

WILTS COUNTY COUNCIL.

MAIN ROADS UNDER DIRECT MANAGEMENT.

STEAM ROLLING.

The Roads and Bridges Committee of the County Council invite Tenders for Steam Rolling on 316 miles of Main Road, for a period of one year, commencing on the 1st day of April next.

Specifications, Schedule of approximate Quantities and Form of Tender can, on application, be obtained from the County Surveyor.

Sealed Tenders, addressed to the Clerk of the Council, and endorsed "Tender for Steam Rolling," must be delivered on or before the 10th day of December, 1912.

No pledge is given that the lowest or any Tender will necessarily be accepted.

(By order)
J. GEORGE POWELL,
County Surveyor.

County Surveyor's Office,
Trowbridge.
November 20, 1912.

WILTS COUNTY COUNCIL.

MAIN ROADS UNDER DIRECT MANAGEMENT.

TOOLS FOR ROADWORK.

The Roads and Bridges Committee of the County Council invite Tenders for Tools for work on 316 miles of Main Road, for a period of one year, commencing on the 1st day of April next.

Specification and Form of Tender can, on application, be obtained from the County Surveyor.

Sealed Tenders, addressed to the Clerk of the Council, and endorsed "Tender for Tools," must be delivered on or before the 10th day of December, 1912.

No pledge is given that the lowest or any Tender will necessarily be accepted.

(By order)
J. GEORGE POWELL,
County Surveyor.

County Surveyor's Office,
Trowbridge.
November 20, 1912.

BRIDGWATER RURAL DISTRICT COUNCIL.

Tenders are invited for the Supply of Stone for the Roads within the above District. The Contracts will be for one year, from 1st April, 1913, to 31st March, 1914.

Printed Forms of Tender, containing full particulars and conditions of Contract, will be supplied on application to the undersigned, or the Council's Surveyor, Mr. W. A. Colton, 56A Eastover, Bridgwater.

Sealed Tenders, endorsed "Highway Tenders," to be addressed to the undersigned, postage paid, on or before Friday, the 6th day of December, 1912, and samples of Stone to be delivered at the Surveyor's Offices on or before such date.

The Council do not bind themselves to accept the lowest or any Tender.

T. M. REED,
Clerk to the above Council.

Bridgwater.
November, 1912.

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

London Water: Dr. Houston's Annual Report.

Once again Dr. Houston states very clearly, in his sixth annual report to the Metropolitan Water Board, that there are certain matters which need attention in the methods of purification at present in use for the protection of the London water supply. It is perhaps remarkable that the technical Press, in reviewing Dr. Houston's reports, seems to overlook his very serious warnings, and to regard only the optimistic portions, which, while they tell us how the water supply of London may be made reasonably safe, certainly do not tell us that the safety has been secured. If the report is read carefully it will be seen that the most optimistic statements are made in the most guarded manner. Conclusion 39 in the report contains the words :—"I consider that the means now adopted, or in process of adoption, for the purification of the Metropolitan water supply are such as to render the water reasonably, if not absolutely, 'safe' for drinking purposes." If these were the only words in the recommendation they would not be very reassuring. If Dr. Houston were called in to report upon any other water supply in the kingdom but that of London, and said that he could not describe the water as being absolutely safe, it would create a very unfavourable impression ; but Dr. Houston does not even say this. The recommendation quoted above is prefixed by the words "subject to these qualifications." It is necessary to read the preceding report and thirty-eight previous conclusions in order to understand thoroughly what the qualifications referred to are. They do not afford much comfort, and are certainly open to the construction that Dr. Houston does not consider that the means now adopted for the purification of the Metropolitan water supply are such as to render the water reasonably safe at all times. Owing to the fact that the Water Board no longer possess an unrestricted right to draw water from the river during times of drought, when its quality is good, their reservoirs are partially emptied, and when wet weather succeeds the drought and the rivers are full of flood-water of very inferior quality the reservoirs have to be filled quickly, and this polluted water has to be drawn off at once and passed on to filters. These filters cannot possibly purify it properly, and further, owing to the fact that water cannot be run to waste from the filters, such impure water may pass through a sand filter which has just been cleaned and receive practically no purification at all. The water issuing from such a filter cannot be sampled until it has been mixed with the water from other filters, and thus the bacteriologist is quite unable to obtain any real proof as to the quality of the worst water coming from a filter.

The report states that 80 per cent of the London water is derived from sewage-polluted rivers. There are few places which would acquiesce in the use of such a source of supply at all, and seeing that we are here dealing not with a supply of a rural district or small town, but with that of the largest city in the world, it is surely most unnecessary folly to omit any step in the process of purification which is recommended by the bacteriologist and the water authority itself. Dr. Houston has urged for some time past the importance of occasional pretreatment of flood waters taken into the reservoirs. Why the board have neglected to follow this advice is inconceivable. The risk run is extraordinary, and the saving in expense cannot be great, and if great is not justified.

* * *

Capital Expenditure and Road Maintenance.

Several important points were raised by Mr. Thomas Jones in a letter which he contributed to the correspondence columns of our issue of November 22nd. For the present our own comments will be confined to that part of his letter which deals with the relation between capital expenditure and annual maintenance. With respect to methods of construction specially devised to resist wear, a prime difficulty, in most cases, is that the materials do not wear fast enough to remain rough to the extent necessary to provide foothold and wheelhold. If there be a material, and a method of using it, which will present a surface permanently of sufficient roughness without considerable wear, let it be produced, if it can be put down at a reasonable cost. A very considerable range of expedients is, however, put out of court as regards any but a small proportion of the total mileage of roads simply because their first cost is too high. These methods are not good because they are not cheap enough to compete with present methods. In a series of methods of increasing cost the mileage affected becomes rapidly less as we advance from the less costly to the more costly. Take surface tarring. Such tarring as may be done for £25 a mile cannot possibly reduce the cost of maintenance of roads which already cost less than £25 a mile, nor is it likely to reduce the cost of roads which are now maintained for less than some such figure as £40 to £50 a mile. Surface tarring costing £40 a mile per annum is obviously limited as a cost reducer to roads costing some £60 or £70 a mile, probably to roads on which the present cost of maintenance is much higher. If tarring does not save its own cost it is obviously no direct economy, but for the sake of argument we have assumed that it pays for itself with a good deal to spare. Tarring exceeding £50 a mile in annual cost is clearly limited to a small proportion only of country roads as a direct economy.

Turning now to the matter of capital outlay, there are, of course, many roads the cost of maintenance of which may be reduced by a considerable outlay of capital ; but the economic outlay is strictly limited by the present position, in each case, as regards annual maintenance. To be well on the safe side let us assume that the cost of maintenance in every case can be reduced to £20 a year for roads now costing under £60, and to £30 a year for roads costing more than this. Allowing 4 per cent for interest and repayment, a capital of £1,000 cannot be economically spent on roads costing, at present, more than £60 a mile per annum. The economic expenditure of £2,000 capital is limited to roads which now cost £110 a mile. A sum of £2,650 has a range extending only to roads now costing £136 a

year or more per mile. After reading Mr. Jack's annual report on the main roads of Herefordshire, we made some calculations which showed that in such cases as those he described, even if we assume that suitable foundation stuff is very cheap, and that the effect of providing foundations would reduce the annual cost of maintenance very much, the amount of capital which can be spent with direct economy is very small. The problem need not be regarded as insoluble, but it certainly presents special difficulties. Indirect economy is quite another matter. If the better state of the road will lead to a reduced cost of transport, and a reduction of indirect expenses in cleaning vehicles, horses and clothing, the sum which the Road Board may spend economically in such a case is considerably greater than that which limits the financial horizon of the surveyor. The latter can, however, reckon as at least no loss a contribution by the local authority amounting to, say, £500 for every £20 reduction in the future cost of maintenance.

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The Group Names of Rocks: Their Significance in Highway Work.

A bulletin recently issued by the United States Office of Public Roads contains a table showing the results, up to January last, of physical tests of samples of rocks used in road-making. On another page we have summarised portions of this table and quoted several notable passages from the general conclusions as to the behaviour of similar rocks in service. For purposes of comparison the figures giving maximum and minimum values are much affected by differences in the numbers of samples tested, the larger the number tested the greater being the probability of a high maximum and a low minimum being reached. The figures relating to a rock of one kind are therefore more informative than those relating to different rocks under the same test. Thus in each case the maximum and minimum values show a range which applies to a definite number of samples. To obtain a clear idea of the significance of the ranges of values found we should require a column giving in each case the number of quarries, or distinct parts of quarries, from which the rocks came, and in each case a range of values based upon an equal number of tests of each sample, an equal number of samples being taken from each source. If this be not done the divergence between laboratory results and those of service conditions will be greater than that due to natural causes. One might, and perhaps should, go further, and test in each case a number of specimens proportioned to the output of the quarry for road purposes. These considerations are based upon the assumptions that there is some value in generalisation and that a connection between group names and service results is a matter of importance. It is obviously necessary that in addition to its group name the sample tested should in each case be designated by a definite name such as one of the compound names of the mineralogist, or a group name qualified by an adjective. The range of values found for each of the stones so defined would usually be much smaller than that found for the group. This more precise information is, of course, recorded at the laboratories. What we are now concerned with is a matter of generalisation, such as may be of value in the preliminary stages of selecting a road stone. Even then, when he is considering a group as a whole the highway engineer finds the separate statements giving the results under the different tests of more value than any figure of merit obtained by combining these results as separate factors. If, for instance, his climate is a very wet one the wet attrition test is more important than the dry attrition test, and nearly useless unless the wet attrition test has no value except in the absence of a record of dry tests. In any ordinary climate the relative importance of wet and dry tests will be nearly proportionate to the average number of wet and dry days respectively during the year.

The Relative Values of the Groups: British and American Experience.

The conclusions to which the authors of the bulletin arrive with respect to the supreme test of service conditions as compared with the results of laboratory tests are of considerable interest. More importance attaches, however, to their very remarkable conclusions as to the general character of each class of rock, as disclosed by the results of experience on the roads of the United States. It is impossible to say to what extent the notable divergence from results obtained in this country and elsewhere is due to a difference in the proportions of good and bad rocks coming under the class names, or how much of it is due to differences in climate and in traffic conditions. In the case of sandstones, which seem, as a class, to give much poorer results in the United States than they do in this country, a consideration of their behaviour under laboratory tests, on both sides of the Atlantic, suggests that the better service results obtained here are largely due to our climate, which is much more favourable for sandstone roads than are most of the climates of the United States. Even more remarkable is the opinion expressed as regards the value of quartzite, in which case, however, the same differences in climatic conditions may considerably affect the results. With respect to granites and gneisses, the former class, as a surfacing material, is condemned without qualification, and the latter fares little better. If climate comes in here as well as in the case of sandstones and quartzite, the United States has to reckon with a very costly factor in road maintenance generally; and, no doubt, it has a climate far worse than ours in its effects on roads. The divergence in this case is, however, more probably due either to some difference in class fication or to a lack, in the United States, of those valuable stones which in this country come under the general group name of "granite," and the absence of those tough and very durable gneisses such as are found in large quantities in South Africa and India. It must be borne in mind that the conclusions embodied in the bulletin do not relate especially to main roads, and are, indeed, confined to roads on which the traffic is principally horse drawn. Possibly, then, the divergences to which attention has been drawn are due in part to differences in nomenclature and in climate, and in part to the relative poverty of the United States in certain groups of road stones, and possibly in some degree to a superiority in other classes, such as the trap rocks; but when all is said we should be interested to know whether the highway engineers of the States are substantially in accord with the Office of Public Roads in this matter.

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Rural and Urban Housing.

The public interest which is being shown on every hand in regard to the housing of the working classes is reflected in the frequency with which this important question is discussed by meetings of surveyors, architects, municipal engineers, and others whose professional duties give them a practical interest in the matter. The latest meeting at which this subject was under consideration was held by the Institution of Municipal Engineers at Exeter, when communications were presented in regard to both rural and urban housing. The former aspect was dealt with in a paper by Mr. L. Caplen in which he gave a description of the scheme recently completed at Montacute, Somerset, by the Yeovil Rural District Council. This scheme was undertaken in consequence of inquiries which showed that in at least five of the parishes in the district there was either a deficiency in housing accommodation or a considerable number of existing houses were in a condition so insanitary as to be unfit for human habitation. Details of the scheme and drawings of the houses which have been erected will be found in another column; but it is worthy of note that an analysis of the

cost shows that with a rental for each house of 3s. 9d. a week the scheme is entirely self-supporting, the cost per house being approximately £152—an exceedingly satisfactory result. Mr. B. Wyand, the secretary of the institution, presented an interesting note descriptive of a scheme which it is proposed to carry out in the East-end of London. This scheme is partly philanthropic in character, and only a dividend of 4 per cent. upon the capital invested is anticipated. Although each "apartment" will be occupied by a separate family the evils of the one-room tenement will be prevented or at least minimised by the adoption of a number of ingenious devices. For example, the beds will fold back into the walls when not in use, and privacy will be preserved at night by means of collapsible screens. The whole building will be heated by radiators, so that fireplaces and coal will be dispensed with, while for cooking small gas cookers on the slot system will be provided. Further, there will be ample common room accommodation, including crèche, refreshment-room, washhouses, smoking-room, library, reading-room, and kitchen. The average inclusive rent per apartment will be 6s. 6d. per week, the only extra being the cost of the gas used for cooking. This scheme contains many points of novelty and its execution will be watched with great interest.

Quantity Surveyors and Reinforced Concrete.

The subject has raised questions of the position of the quantity surveyor in regard to reinforced concrete work was the subject of a very complete paper read at the last meeting of the Concrete Institute by Mr. John M. Theobald, A.R.I.B.A. A full extract of the paper will be found in another column. Mr. Theobald dealt in detail with each of the three usual forms of contract under which reinforced concrete construction is carried out. The first and most unsatisfactory was the lump sum contract. Here it is clear that, unless a quantity surveyor is employed, when the time for a final settlement arrives the contractor's account for extras must be accepted without means of settlement. In the second form of contract—the measurement one in practice—the bills of quantities (prepared by the contractor) do not form part of the contract, but the contractor undertakes to deposit a copy of the priced bill, it being stipulated that the prices shown are to form the basis for arriving at the value of extra work executed. If a lump sum contract of this kind is entered into, it is evident that errors in the bills of quantities may occur which may tell either in favour of the building owner or the contractor. The third kind of contract discussed by Mr. Theobald is that in which the bills of quantities form part of a lump sum contract. This is a much better arrangement from every point of view. It is fair to both building owner and contractor, provided that the bill of quantities is prepared by a competent surveyor. Finally, there is the lump sum contract, to which the bills of quantities form a schedule, the entire building being executed by the contractor. This would be a perfectly satisfactory method save on the score of extravagance. We forbear in this place from commenting further on the various forms of contract referred to, but we would direct the attention of our readers to Mr. Theobald's paper for a fuller discussion of the matter.

Colonel Jones' Retirement.

The retirement of Lieut.-Colonel Alfred St. Jones, C.B., M.INST.C.E., from the management of the Aldershot Camp Sewage Farms is to be marked by a presentation from his professional *confrères* and other admirers, to be made at the forthcoming annual dinner of the Association of Managers of Sewage Disposal Works. The wide circle of Lieut.-Colonel Jones' friends includes many who are not members of the association, but who would doubtless like to associate themselves with such an interesting function as that which is to take place next week, and to express their goodwill and esteem on his coming retirement by their presence. The secretary of the association, Mr. Charles Ball, of Manchester, will be glad to hear from any gentlemen to whom this intimation may specially appeal. Our readers will probably not need to be reminded that Lieut.-Colonel Jones has a double claim to distinction. His military career was crowned by the conferring of that coveted distinction the Victoria Cross, given in recognition of "a well conceived act gallantly executed." On the civil side he has been consulting engineer to the Borough of Wrexham for sewage disposal, and he is a member of the Institution of Civil Engineers, the Institution of Municipal and County Engineers, the Royal Sanitary Institute, and other professional and learned bodies. Born in 1832, he is relinquishing his work full of years and honour, and we are confident that we may speak on behalf of all our readers wherever they are dwelling when we express the hope that he will have a happy retirement.

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Sludge Disposal.

On another page we give an abstract from a paper read by Mr. W. J. Dibdin, on Monday last, at a meeting of the London section of the Society of Chemical Industry, together with a report of the discussion which followed its presentation. In this paper an account was submitted of the success of the slate-bed treatment of sewage in recent years, and while the author might take exception to the above heading on the plea that his system does not produce sludge in the ordinary sense of the term, we have adopted it because we consider that slate-beds form the most hopeful solution of the sludge problem that has been brought into practical operation up to the present. The most interesting part of the paper is that which gives an estimate of the probable quantity of the humus discharged from slate beds, and describes the utilisation of the humus, after it has been air-dried, for manurial purpose. The experiment made with this material by a well-known firm of horticulturists is a very practical test, and if it can be sold for such purposes, even at a price that will defray the cost of carriage and handling, much will have been attained. Up to the present the amount of humus available has not been sufficient for experiments in its utilisation as a manure on a large scale, but as slate beds are adopted more generally all over the country there will be greater opportunities for making tests of the kind referred to in this paper, and we shall expect to hear more of this method of utilisation in the future.

Reinforced Concrete Tests.

In another column of our present issue will be found an abstract of a paper on "Test Deflections in Reinforced Concrete," which was read on Monday before the Society of Engineers by Mr. Percy J. Waldram, F.S.I. In view of the rapid increase in reinforced concrete construction and the draft regulations which have been devised by the London County Council, the subject of Mr. Waldram's paper is of great immediate interest. The draft regulations received full consideration, and some criticism; their further consideration by those who are directly affected by them is important because they require the approval of the Local Government Board before they come into force, and it is highly desirable that they shall be brought to a high state of efficiency by criticism and amendment before such approval is given. Moreover, it must be borne in mind that although their scope may nominally be limited to London, when once they are confirmed they will certainly be regarded as a standard over a much wider area. Those of our readers who are interested in the matter should obtain a copy of the paper.

The Contour Survey of Bushey, Herts.

By A. J. LAING, A.C.G.I.

Correspondence has lately appeared in THE SURVEYOR on the necessity of having a contour survey made previous to the consideration of a town planning scheme.

The writer, who recently assisted on such a survey executed for the Bushey Urban District Council, proposes to give a brief description of the method employed in carrying out the work.

The Bushey Urban District Council necessarily wished to have the fullest information as to the suitability of their district for town planning, and, in varying with the nature of the country, being less on irregular ground and greater where a more regular formation obtained.

Each line of contour was denoted by a different colour. Three colours were used in succession—viz., red, white and blue—red being reserved for altitudes divisible by three, as 180, 210, &c., thus avoiding confusion in the field book.

For the survey lines were poled out to run as far as possible parallel to the direction of the contours and were then chained, offsets being taken to the arrows.

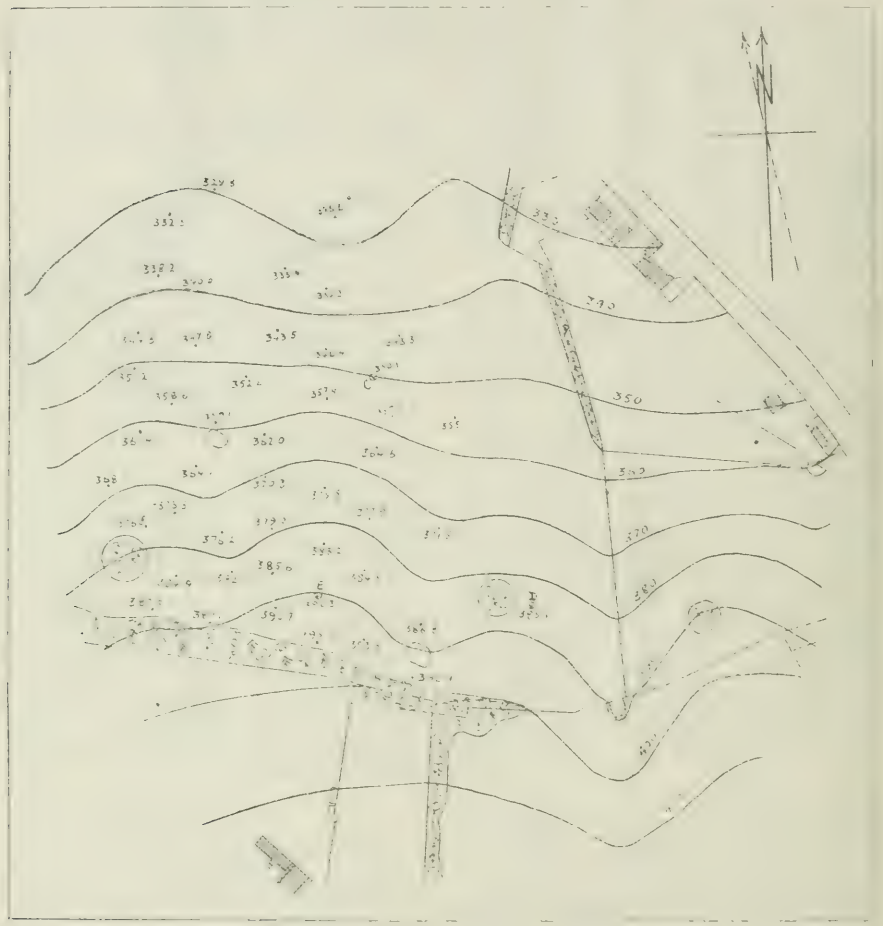


FIG. 1.

preliminary step before going further into the question.

about 3 miles long by 1½ miles wide. The country is

at every 10 ft. variation of altitude.

up from point to point.

driven into the ground to mark the stations on which the instrument was subsequently to be set. These station pegs were placed some 500 to 600 ft. apart and levelled with a dumpy, their position and the direction of the line having been first determined by an examination of the ground ahead. The stations were indicated by letters and referenced by the number of the field given on the ordnance—for example, station A, field 463.

The instrument was then set up over the first peg

on the line great care being taken to see that it reversed truly. The bubble of the vertical circle was frequently tested and, if necessary, adjusted to ensure the correctness of the vertical angles. After having measured the height of the instrument above the peg, the horizontal plates were clamped in the zero position, and the telescope turned in azimuth until the trough compass needle pointed north. The top plate was then released and the telescope directed towards the forward station, on which an arrow was held. Having taken the horizontal angle for bearing, a staff was placed on this station and rocked slightly while the distance and vertical angle were read.

Points in the field were next taken at every change of slope, readings for the distance, bearing and altitude being observed. Two persons were employed at the instrument, one for reading and the other for booking, the order of reading being, (1) the wires (2) the bearing, (3) the vertical angle.

An engineer had charge of the men carrying the staves and directed them over the ground, at the same time making notes of the different points taken, and, where necessary, sketches, and taking such subsidiary measurements as were required. The points were numbered and referenced to their station, and also to the field in which they were taken. The engineer was careful to watch each point as it was read from the instrument, so that, in making his notes the number of all points referred to in his field-book corresponded with those entered in the tacheometer book.

Having taken the necessary number of observations from the station, the tacheometer was transferred to the forward station, where it was again set up. Here the horizontal plates were set to the bearing of the line, the telescope transited and directed towards the back station, readings of the distance and vertical angle being taken as before. The telescope was again transited, the top plate released and brought to zero, and the north checked. If this was found to be correct the next forward station on the line was read and points taken, as already described. To enable the traverse to be plotted, some of the stations were referenced by direct measurements to details shown on the ordnance, and also by bearings to corners of buildings, or to other prominent features.

OFFICE WORK.

The first work undertaken was the reduction of the tacheometer books. For obtaining the altitude of each point, the difference between the readings of the outer wires (called the generating number), the reading of the centre wire (or axial reading), and the vertical angle were used. Multiplying the generating number by $\frac{1}{2}$ (sin. 2 vertical angle), and adding to or subtracting from this the difference between the axial reading and the height of instrument, the difference in level between the point and its station was arrived at.

From the formula generating number $\frac{1}{2}$ cos. vertical angle, the true horizontal distance was calculated. The reduction of the tacheometer books being completed, the plotting was next taken in hand. A line representing the magnetic north was first drawn. Then, having fixed the position of known stations, the traverse was laid down, the angles being plotted by tangents in the usual manner. On the scale of 1/2500 this method was found to be quite satisfactory. In order, however, to further determine the accuracy of the work, a polygon of thirteen sides was checked by co-ordinates, and the error was found to be 6 in. in 1,000 ft., a degree of accuracy equal if not superior to chain measurement.

For plotting the points, a protractor, semi-circular in shape, with the scale marked on its diameter, and zero coinciding with a pinhole at its centre, was used. A needle was fixed at the station and the protractor rotated until the bearing of the point agreed with the north line drawn through the station, when the distance was marked off along the scale and the reduced level written against the point.

In this way all the points taken in the field were plotted on the ordnance sheets, together with the notes and measurements extracted from the engineer's fieldbook. From these points contour lines were

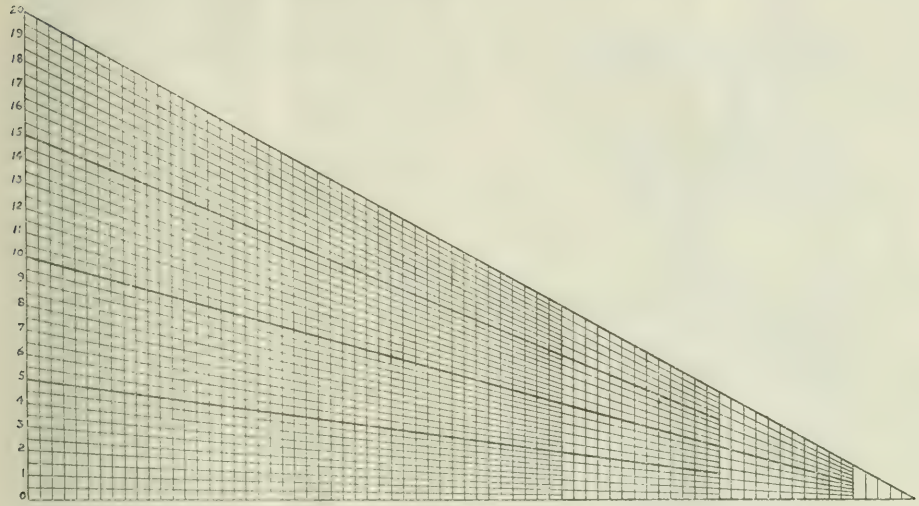


Fig. 2

traced (Fig. 1), the use of a proportional scale (Fig. 2).

The progress of the work proved the tacheometer method to be considerably faster than the dumpy, besides giving a greater amount of useful information.

The diagrams accompanying this article are reproduced by permission of the engineers, Messrs. P. W. Macvay & Co., of Westminster, who carried out the work.

Junior Institution of Engineers.—"Staff Officers in Industrial Works: Their Scientific and Practical Training and Duties" will be the subject of the presidential address of Sir A. Travor Dawson, R.N., M.INST.C.E., before this body on Wednesday evening next. Tickets of admission to the meeting, which opens at 8 o'clock, can be obtained by any of our readers on application to the secretary of the institution, 39 Victoria-street, S.W.

SEA-COAST EROSION. For a very complete and inexpensive library on the cause, prevention and repair of coast erosion the following three works are recommended: "Coast Erosion and Foreshore Protection," by John S. Owens, M.D., Assoc.M.Inst.C.E., F.R.G.S., and Gerald O. Case (price 7s. 6d., post free 7s. 10d.), with numerous illustrations and diagrams; "Sea-Coast Erosion and Remedial Works," by R. C. Allanson-Winn, M.Inst.C.E.I. (price 1s., post free 1s. 1d.); and "Erosion of the Coast and its Prevention," by F. W. S. Stanton, Assoc.M.Inst.C.E., F.S.I. (price 3s., post free 3s. 2d.), with numerous maps and other illustrations. The publishers are the St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, London, E.C.

E

Housing of the Working Classes in Rural Districts.

SCHEME RECENTLY COMPLETED AT MONTACUTE, SOMERSET, BY THE YEOVIL RURAL DISTRICT COUNCIL.*

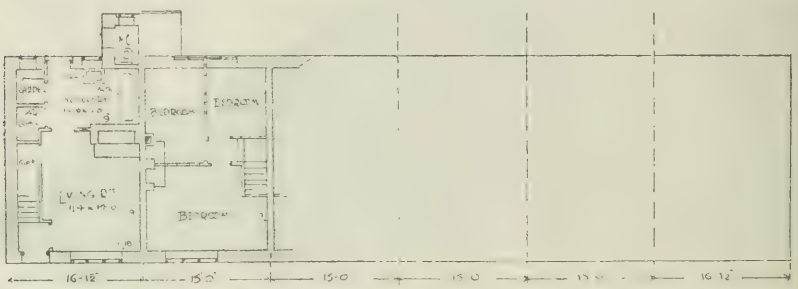
By L. CAPLEN.

Owing to the important place that the housing question now occupies in the many duties of a public official, I trust that the description of the small scheme just completed at Montacute by the Yeovil Rural District Council may prove of interest to the members of the institution.

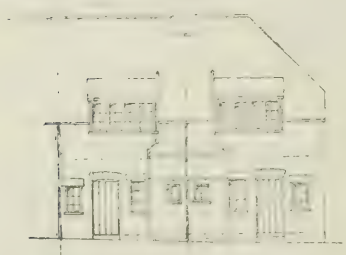
In consequence of the lack of suitable houses for the working classes, in 1905 the rural district council were approached as to the best methods that could be adopted to secure better housing conditions. The council caused full inquiries to be made throughout the district through the respective parish councils, as to whether there was sufficient housing accommodation, and in consequence of replies sent in found that some five or six parishes were either deficient in houses or that some of the existing ones were in such a state as to be unfit for occupation.

Before proceeding further it was thought that every opportunity should be given to local enterprise to meet the demand, and the council issued posters in the various parishes asking that the demand for houses should be given consideration by local builders and private individuals, and in the meantime postponed the adoption of the Housing Act for twelve months. It cannot, therefore, be said that the fullest opportunity was not given to local speculators or investors to supply such houses as were required.

Front Elevation.



Ground Floor Plan. First Floor Plan.



Back Elevation.

Section A A.

Yeovil Rural District Council's Housing Scheme at Montacute: Plans of Twelve Cottages Recently Erected.

In Montacute there was no response to the demand, and a housing scheme had to be adopted. After some difficulty a good site was obtained sufficient for the erection of twelve houses. An important advantage that the land offered to the scheme was the fact that no new approach road had to be constructed, while the water main and main sewer already existed. A Local Government Board inquiry was held, and sanction was obtained to borrow £1,776, for a term of sixty years, for both land and buildings, at the rate of 4 per cent.

* Paper read on Saturday last at a meeting of the Institution of Municipal Engineers held at Exeter.

The houses have just been completed, and were recently inspected by the Right Hon. John Burns, President of the Local Government Board, who expressed himself as being well pleased with them, both as regards accommodation and appearance.

They are built in two blocks of six each, with Ham Hill stone for all external walls. With the exception of the end houses, each has a frontage of 15 ft. and depth of 24 ft. 4 in.; all internal walls are of brickwork. When selecting stone facings the council had in view that the work would employ both local labour and material, as the Ham Hill Quarries are situated fairly close to the site. The stonework is of uncoursed rubble, rough axed, and set in lime mortar. All main angles are formed in large, roughly squared quoin stones, and the whole pointed up stone colour.

As will be seen from the plans, the roof spans from front to back, and is hipped at each end of the blocks. A feature is that the covering consists of patent "Eternit" roofing slates, laid in diagonal pattern.

The accommodation is as fallows:—

Ground Floor.—Living room, 11 ft. 4 in. by 14 ft., cupboard under stairs; scullery, 10 ft. 6 in. by 7 ft.; larder, coal store, and water-closet. Each living room has a combination cooking range and boiling copper fitted. When cooking with these ranges hot water can be obtained from the coppers, which are fitted in the sculleries at the back of the ranges. Baths and sinks are fitted to sculleries, concrete paving to back of each house, and asphalt paths from the road to front doors.

First Floor.—Three bed-rooms, partially in the roof, with dormer windows; two bed-rooms have fireplaces. All windows are casements, and woodwork is treated with "Solignum."

The cost of the scheme is set out below, and it will be seen that, with a rental of 3s. 9d. per week per house, it is an entirely self-supporting one.

The council had numerous applications for the houses, which were let immediately on completion.

Cost of Houses.	£	s.	d.
Land, 4,000 sq. yds.	110	0	0
Architects' fees (agreed)	27	0	0
Compensation to tenant of land	5	0	0
Stamping of bond, contract and agreement	2	6	8
Advertising	2	15	0
Redemption of land tax	1	7	6
Public Works Loan Board charges	20	10	0
Contract for houses	1,534	0	0
Contract for boundary wall	85	0	0
Front wall, paths, &c.	17	10	0
Bill of costs, conveyances, &c.	21	0	0
Extras	1	0	0
Total	£1,827	9	2

Excess over loan, £51 9s. 2d. Cost per house, say, £152.

Cost of Upkeep.	£	s.	d.
Repayment of principal and interest at 4 per cent on loan of £1,776	71	0	9½
Do. if excess over loan of £51 9s. 2d. is borrowed	2	1	2
Rates—£7 per house gross, £6 rateable at 3s. 6d. in £ = £19 4s. 6d.; less 30 per cent reduction (£5 15s. 2½d.)*	13	8	9½
Water rate, 2d. per house per week	3	4	0
Income property tax, less rebate in consideration of interest paid to Public Works Loan Board	2	15	0
Insurance of houses, £1,000 at 1s. 6d. per cent		15	0
Collection of rents, at 2 per cent on £117	2	6	9½
Repairs, 10 per cent on gross rental	11	14	0
Allowance for voids, arrears, &c., two weeks' rent per house per year†	4	10	0
Collectors' books, stationery, &c.	1	0	0
Total	£114	15	6½

Gross rental, at 3s. 9d. per week, £117 0s. 0d.
Balance in favour of council, £2 4s. 5½d.

The houses were designed and supervised by Messrs. Petter & Warren, architects, Yeovil, and they are to be congratulated upon the results they have obtained.

"The Civic Engineer's Who's Who."—The first issue of "The Civic Engineer's Who's Who" (London: St. Bride's Press, Limited, 24 Bride-lane, E.C., 2s. 6d nett) gives wonderfully complete lists of the engineering officials of England and Wales. For a first issue it is very creditable.—*Glasgow Herald.*

* Half cost of work, as district council effected a considerable road widening opposite houses by taking portion of site.
† Reductions obtained, as rates are to be paid whether houses are empty or not.

COST OF REPAVING WORKS.

AN OBJECTION BY THE LOCAL GOVERNMENT BOARD AUDITOR.

The Hammersmith Borough Council have for some time past allocated a certain sum of money raised out of the rates each year for the purpose of bearing the cost of repaving with wood the main roads in the borough which are at present paved with that material. This policy, it was considered, was in accordance with the views of the London County Council as the loan-sanctioning authority with regard to the method of bearing the cost of works of this nature. Owing to difficulties which have arisen during the past few years between the borough council and the local tramway authority, it has been impossible to relay several of the main roads at the time when originally it was anticipated such work would be carried out, with the result that the funds raised from year to year have reached a considerable sum, although by no means sufficient to cover the estimated cost of carrying out the whole of the works of repavement which, if circumstances had permitted, would before now have been completed.

It is in these circumstances the Local Government Board auditor has raised a somewhat serious question in his report upon the audit of the accounts for the last financial year. The auditor points out that the sum raised up to and including March 31, 1912, is £18 067, which he considers exceeds anything which can be justified by financial or by legal argument, and goes on to say:—

"I am aware that special circumstances in connection with the tramways have occasioned delay in the work of repairing some of the most important roads, and that this to some extent gives financial justification for the accumulation of the 'reserve.' But under ordinary circumstances, it is obvious that the retention of a balance equivalent to a penny rate would be sufficient to equalise this cost, for, as I am informed, a tenpenny rate would be amply sufficient to renew all the wood pavements which have been laid in the borough. It is seventeen years since the first of these pavements was laid, and this renewal would normally be spread over a considerable number of years. The intention of this report is to call attention to the fact that there is no authority in law for collecting in advance the sums which are to cover the cost of works which will be enjoyed in the future, and that indeed there is no financial argument to support such a practice. The question of equalising the cost is the only one which arises, and it is a matter of a totally different character involving far smaller financial provision."

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

WEST MIDLAND DISTRICT MEETING AT BIRMINGHAM.

A general meeting of the members of the West Midland District of the Institution of Municipal and County Engineers was held at Birmingham on November 21st, with Mr. A. T. Davis, chairman of the committee, in the chair.

The resignation of Mr. H. Richardson as hon. district secretary was received with very much regret, and a hearty vote of thanks was accorded him for his services. Mr. F. C. Cook, of Nuneaton, was elected in his place.

The following members were elected to the Executive Committee:—

WARWICKSHIRE.—Messrs. S. Douglas, Kenilworth; A. K. Gray (associate member), Birmingham; H. Richardson, Birmingham; E. J. Goodacre (associate member), Nuneaton; and John Willmot, Warwickshire County.

WORCESTERSHIRE.—Messrs. F. Woodward, Stourbridge; and C. F. Gettings, Worcestershire County.

STAFFORDSHIRE.—Messrs. A. Burton, Stoke-on-Trent; W. B. Chancellor, Lichfield; H. J. Clarson, Tamworth Rural; A. D. Greatorex, West Bromwich; G. Green, Wolverhampton; and J. Moncur, Staffordshire County.

SHROPSHIRE.—Mr. G. W. Lacey, Oswestry.

HEREFORDSHIRE.—Mr. J. Parker, Hereford.

Mr. H. E. Stilgoe, city engineer, Birmingham, gave a very interesting account, illustrated by maps and diagrams, of the town planning schemes now in hand by the Birmingham Corporation.

Institution of Municipal Engineers.

JOINT SOUTHERN AND SOUTH-EASTERN DISTRICT MEETING.

At a joint Southern and South-Eastern District meeting held in the council chamber, 4 Southampton-row, London, on Wednesday, November 27th, a paper, "The Effect of Recent Decisions upon the Arbitration Clause" by W. Valentine Ball, M.A., barrister-at-law, was read and discussed. The president of the institution, Mr. Frank Latham, occupied the chair, and among the members present were Messrs. E. A. Stickland (past-president), Horace Boot (vice-president), H. Shepard (London), J. R. Fayers (Watford), E. A. Rogers (East Ham), W. H. Scott (Northwood), A. Winter Gray (Lambeth), W. H. J. Prior (London), C. T. Fulcher (Shoreditch), T. Mundy (Woolwich), P. R. Gibbs (Cookham) F. E. Ennals (Billericay), J. Lewis (Yiewsley), J. Taylor (Uckfield), and A. N. Hudswell (Woolwich). The visitors included Messrs. H. Percy Boulnois (London), Arthur J. Martin (London), H. Lester Baker, C. H. W. Biggs (London), and Captain F. Lugg, chairman of the Harbour, Docks and Quays Committee of the Penzance Corporation. Messrs. Arthur Palmer, honorary district secretary of the Southern District of the institution, J. Woolford Brook, honorary district secretary of the South-Eastern District of the institution, and B. Wyand secretary of the institution, also were present.

THE EFFECT OF RECENT DECISIONS UPON THE ARBITRATION CLAUSE.

By W. Valentine Ball, M.A.,
Barrister-at-law.

(1) Preliminary.
(2) The usual form of arbitration clause.
(3) The effect of an agreement to refer to arbitration.
(4) The allegation of bias.
(5) Where the arbitrator is practically judge in his own cause.
(6) Where the personal conduct of the arbitrator comes into question.
(7) Summary of the cases.
(8) Suggested reforms.
  (*a*) The deletion of the clause.
  (*b*) Reference to an independent arbitrator.
  (*c*) An amendment of the clause.
(9) Conclusion.

(1) PRELIMINARY.

In the present paper I propose to discuss the clause which is usually inserted in contracts for the erection of building and other works in order to secure the reference of disputes to arbitration.

One of the chief objects of arbitration appears to be to avoid actions at law. Whether there is wisdom in this general boycott of the law courts is a question upon which I do not wish to enter. I propose to consider whether, and by what means, the parties to a contract can make sure that the disputes which may arise during or after the execution of the works shall be referred to an agreed arbitrator, whose decision shall be final. I shall not discuss the complicated question whether the municipal engineer acting in the discharge of his duty to his corporation is an arbitrator or not. For instance, the question whether he is an arbitrator in granting his certificate, or in deciding whether a certain thing is an extra or not, might be the subject of very profitable discussion; but I shall not touch upon it. For convenience and to avoid needless repetition I use the term "employer" to signify the local authority, corporation company, or person for whom work is being carried out; and the term "contractor" to mean the company or person who is bound by contract to do the work. In dealing with decided cases I shall be careful to give accurate references to the text-books and law reports which may easily be consulted in any law library.

(2) THE USUAL FORM OF ARBITRATION CLAUSE.

Let me refer, in the first instance, to the material parts of a form of arbitration clause with which most municipal engineers are familiar. It is to be found in the form of contract approved by the Royal Institute of British Architects. As a matter of fact the difficulty with which it is my object to deal in the present paper is not likely to arise if the R.I.B.A. form is adopted in its entirety, because the arbitration clause which it contains need expressly provide that the "architect" and the "arbitrator" shall be two distinct persons. The material words of that clause (No. 32) are as follows: "Provided always that in case any dispute or difference shall arise between the employer or the architect on his behalf and the contractor, either during the progress of the works or after the determination, abandonment, or breach of the contract, as to the construction of the contract or as to any matter or thing arising thereunder . . . then either party shall forthwith give to the other notice of such dispute or difference, and such dispute or difference shall be and is hereby referred to the arbitration and final decision of A B, or in the event of his death or unwillingness or inability to act, of C D, or in the event of his death or unwillingness or inability to act, of a person to be appointed on the request of either party by the president for the time being of the Royal Institute of British Architects, and the award of such arbitrator shall be final and binding on the parties." As I have said, this is merely an extract from the clause. I have omitted those parts of it which touch upon the nice question whether the architect is or is not arbitrator in relation to any question which may arise between the employer and the contractor.

The question between the employer and the contractor when the contract is being prepared will be: "Whose name is to be inserted as arbitrator?"

That the parties will easily agree to the appointment of a person who is familiar with the kind of work to be done under the contract may be conceded They would also find it easy if a perfectly independent person was to be chosen to select a person eminent in his profession, whose decision would be satisfactory to ratepayers on the one hand and to shareholders on the other. But in recent years the practice has grown up of appointing an engineer or surveyor who is actually in the employment of a municipal or other local authority to act as sole arbitrator under a contract to which that authority is a party. There are probably hundreds of such contracts in existence at the present time. How far may the contractor be compelled to submit to them?

(3) THE EFFECT OF AN AGREEMENT TO REFER TO ARBITRATION.

It is necessary in this place to say one word on the subject of arbitration in general. A man cannot enter into a contract on the terms that neither he nor the person with whom he contracts shall have recourse to the legal tribunals of the land. As to arbitration, however, the Courts have long since held that the decision of an arbitrator may be made a condition precedent to bringing an action. The jurisdiction of the Courts is not really ousted.

If A agrees with B that, any dispute arising thereafter between them, it shall be decided by C, neither party can sue unless it be shown that C is dead or has refused to act. If A refuses to submit to C's decision, he can in effect be compelled to do so by the Court.

In actual practice the arbitration clause with which we have to deal, to-day closely affects the engineer or surveyor who is employed by a local authority in connection with the execution of a contract. When disputes arise they are referred to that engineer or surveyor, and the contractor—not unnaturally from his point of view—sometimes tries to get away from the decision of the very man with whom he has been at issue. He brings matters to a head by ignoring the "agreement to refer." This he does by commencing an action. The local authority then take out a summons pursuant to sec. 4 of the Arbitration Act, 1889, to stay the proceedings on the ground that there is no sufficient reason why the matter should not be referred in accordance with the submission.

(4) THE ALLEGATION OF BIAS.

The question is, What will the Courts hold to be sufficient reason? It is obvious that bias clearly proved would be sufficient to justify the Court in refusing to allow a particular man to sit as arbitrator; but the question of *bias* is not easy when considered in relation to a man who was a servant of the employer when the contractor agreed to his name being inserted in the contract as arbitrator. *Ex hypothesi* such

a man is obviously bound to his employer to some extent.

What, then, is sufficient *bias* in the legal sense?

I propose to deal with a number of recent and very important cases on this subject, with a view to showing that the time has arrived for local authorities to reconsider the whole position.

In order to succeed because of alleged bias a probability, not a mere possibility of bias must be shown (*Eckersley* v. *Mersey Docks*, 1894, 2 Q.B., 667). The mere fact that the arbitrator is the servant of one of the parties is not sufficient to disqualify him; for this is a fact which must have been known when the contract was signed. In *Ives* v. *Willans*, 1894, 2 Ch., 478, referring to the arbitration clause, in which the contractors had bound themselves to abide by the decision of the engineer, Lindley, L.J., said: "How does it happen that a man will agree to be bound by such a very stringent provision? The explanation of it is to be found in two circumstances. First of all, competition for this kind of work is very keen, and contractors compete with each other; and, in the second place, it has been ascertained by long experience that engineers of the highest character may be trusted, and when a contractor enters into such a very stringent provision as this he knows the man he has to deal with. I take it that a contractor such as Mr. Willans would not submit to be bound by a clause of that kind unless he had confidence in the engineers, and unless the engineers were persons of the highest character. If he had not confidence he would not submit to it; but, knowing the engineers, he does submit to it, because he has confidence in them, and knows that they can be trusted, even although it is their duty to look after the work of the contractor, to deal fairly with him in case of a dispute which is in substance, although not in form, a dispute between the contractor and themselves."

A distinction is to be drawn between circumstances known to exist at the time of the contract and those which afterwards supervene. For instance, in a Scotch case, a firm of contractors who had undertaken to build a public building agreed with the town council that a particular gentleman should act as arbitrator in case of disputes. The gentleman subsequently became elected "dean of guild," and thereby, *ex-officio*, a town councillor. It was held that this disqualified him from acting as arbitrator (*Edinburgh Magistrates* v. *Lawrie*, 1903, 5 F., 711).

The case of *Belcher* v. *Roedean School*, 1901, 85 L.T., 469, shows that the Court will be reluctant to revoke a submission to arbitration on the ground of interest. In that case a contract provided that all disputes and differences arising on a building contract were referred to the decision of the architect appointed by the building owners. The builders issued a writ against the architect for fraud and misrepresentation, and took out a summons to revoke the submission to arbitration. The architect declined to admit the charges made against him. It was held that an application to revoke a submission to arbitration was one to be granted with great caution, and that the submission ought not to be revoked.

(5) Where the arbitrator is practically judge in his own cause.

It is important to notice that *Belcher* v. *Roedean School Board (supra)* was decided on the principle that to have made the engineer arbitrator would substantially have made him judge in his own cause. Where, however, the matter in dispute is something in which the arbitrator is only indirectly interested, a reference to him would not be prevented. For instance, in *Skinner* v. *Uzielli*, 1908, 24 T.L.R., 266, the plaintiff had employed the defendants as underwriters under an agreement. Disputes were to be referred to a member of Lloyds as arbitrator. A dispute arose, one of the questions being whether it was the general practice at Lloyds to charge commissions. The Court allowed the arbitration to proceed upon the ground that members of Lloyds were the most convenient tribunal to decide the fact whether the alleged custom to take commissions at Lloyds existed. It was not impressed with the suggestion that a member of Lloyds would be inclined to find in favour of a practice which he followed himself.

It has been held that a mere expression of opinion in favour of one party is not sufficient reason to disqualify an arbitrator unless it appears that he has so made up his mind as not to be open to argument (*Jackson* v. *Barry Railway Company*, 1893, 1 Ch., 238). The following passage from the judgment of Lord Justice Bowen in that case is still good law. "It was an essential feature in the contract between the plaintiff and the railway company that a dispute such as that which has arisen between the plaintiff and the company's engineer should be finally decided, not by a stranger, or a wholly unbiassed person, but by the company's engineer himself. Technically the controversy is one between the plaintiff and the railway; but virtually the engineer on such an occasion must be the judge, so to speak, in his own quarrel. Employers find it necessary in their interests, it seems, to impose such terms upon the contractors whose tenders they accept, and the contractors are willing, in order that their tenders should be accepted, to be bound by such terms. It is no part of our duty to approach such curiously coloured contracts with a desire to upset them, or to emancipate the contractor from the burden of a stipulation which, however onerous, it was worth his while to agree to bear. To do so would be to attempt to dictate to the commercial world the conditions under which it should carry on its business. To an adjudication in such a peculiar reference the engineer cannot be expected, nor was it intended that he should come with a mind free from the human weakness of a pre-conceived opinion. The perfectly open judgment, the absence of all previously formed or pronounced views, which, in an ordinary arbitrator are natural and to be looked for, neither party to the contract proposed to exact from the arbitrator of their choice. They knew well that he possibly or probably must be committed to a prior view of his own, and that he might not be impartial in the ordinary sense of the word."

In a later case (*Freeman* v. *Chester Rural District Council*, 1911, 75 J.P., 132) facts were as follows: There a contractor brought an action to recover the price of certain works constructed for a local authority under a contract which provided for the reference of disputes thereunder to the engineer of the local authority. In answer to a summons to stay proceedings under sec. 4 of the Arbitration Act, 1889, he challenged the conduct of the engineer in relation to the works, the question in dispute being whether the engineer had not precluded himself by his own admissions from saying that the works had not been completed to his satisfaction, and that the period of maintenance had not expired.

The Court (affirming the decision of Mr. Justice Lush), in the exercise of the jurisdiction conferred upon it by the Arbitration Act, 1889, refused to order the action to be stayed.

The Master of the Rolls said: "Corporations are, in my opinion, often too fond of putting officers of theirs in the position of engineers under a contract, and these officers forget that, as they are performing other duties to the corporation, there may arise a conflict between their duties in these other offices and their duties as engineers under the contract which may give rise to unfair treatment of the contractor by the zeal with which they perform their other duties. Of course, if you have exalted an officer of that kind as the arbitrator under the contract, you cannot say, merely because he is an officer, that therefore he is an unfit judge; but if facts subsequent to the contract have given rise to a substantial dispute in which there are allegations of continued unreasonableness on his part, and that is the real dispute between the parties, I think we should not be acting in the real spirit of the law if we shut the doors of the Court to such a dispute, and forced it to be referred to arbitration." What they relied upon was his professional honour, his position, his intelligence; and the contractor certainly had a right to demand that whatever views the engineer might have formed, he would be ready to listen to argument, and at the last moment to determine as fairly as he could, after all had been said and heard.

(6) Where the personal conduct of the arbitrator comes into question.

The cases already cited have this common feature: the conduct of the arbitrator himself did not form the subject-matter of any of the disputes. In certain recent cases, however, the Courts have laid down a very clear principle applicable in such circumstances. It seems that in considering the question whether a person who is the servant of one of the parties can act as arbitrator in a dispute, the Court will consider the nature of the question which he has to decide. In *Blackwell & Co.* v. *Mayor, &c., of Derby*, 1909, 75 J.P., 129, the plaintiffs had contracted to carry out certain tramway work for the defendant corporation. The engineer had given a certificate, but had held back a sum of £1,500 under a penalty clause for delay. The company having brought an action, the corporation

objected that under the arbitration clause the dispute must be referred to the arbitration of the engineer. To this the company objected on the ground that their case was that the engineer did not allow them to have proper facilities for proceeding with the work. The Court of Appeal refused to stay the action, Lord Justice Buckley saying: "The fact that the referee was the officer of the corporation was not sufficient ground, but the point is here that the contractor's case—whether true or not is a matter to be determined—is this: 'I could not complete my contract in time, and the reason why I could not complete it in time was that you, the contractual referee, were an unreasonable person. You hindered me in every conceivable way; you would not let me deposit my materials in such a way as it is usual to allow me to deposit my materials—in advance of my work—you placed all sorts of impediments in my way.' How could you expect him to say, if he is a person of any character at all, that the acts which he did were unreasonable acts? It is not human nature to suppose that he can properly determine that he himself is an unreasonable person. That is the subject of the dispute. . . . I think that there is sufficient reason why the matter should not be referred, being such as this is, to this particular gentleman."

To this extent, then, have contractors secured emancipation from the arbitration clause; but the principle laid down by the Court of Appeal is not likely to be extended. The Courts are very jealous of any interference with contract. The fact that this jealousy exists makes it impossible for a contractor to hope to escape the other obligations imposed upon him by the contract. If he has underestimated the amount of excavation necessary, or the amount of materials to be provided for completion, the fault and the loss will be his. Again, if he has underestimated the time which the works will take, or if unforeseen circumstances for which the employers are not responsible have arisen to cause delay, the loss is the loss of the contractor. It is difficult to see how any of the losses arising from these causes can be avoided if the contractor has signed a contract which binds him hand and foot.

The most recent case on the subject, which was heard by the Court of Appeal in March last—namely, *Aird* v. *Lord Mayor of Bristol*, Court of Appeal, 1912—shows that the Court will not extend, although it still adheres to, the principle above laid down. If the conduct or dealings of the engineer himself is in question, the matter will be taken from his hands. In that case the dispute arose under a contract entered into between the plaintiffs and the defendants, and dated March 17, 1902, for the construction and completion of a new wet dock at Avonmouth, and entrance lock, two entrance piers, a new wall, and other work in connection therewith.

The contract contained an arbitration clause referring all disputes arising during the progress, or after the completion of the works, concerning the works or their cost, or the quantity or quality of the materials, or in respect of any additions, omissions, alterations, or deviations made to, in, or from the works or any part of them, to the engineer having the superintendence and control of the works of the Docks Committee of the Council of the City of Bristol, who should be competent to enter upon the subject-matter of such dispute with or without formal reference or notice to the contractors or the corporation. The value of the work done and materials supplied under the contract was £1,923 977 9s. 4d., in respect of which the defendants had paid £1,752,761 10s. 11d., and the action was brought by the plaintiffs to recover the balance—namely, £171,215 18s. 5d.—and damages for breach of contract.

The summons taken out by the defendants for an order staying the action, so that the dispute between the parties might proceed to arbitration in accordance with the arbitration clause, was opposed by the plaintiffs on the grounds (*inter alia*) that the engineer had, by his conduct in his capacity as engineer under the contract during the progress of the works, rendered himself unfit to be arbitrator.

Lord Justice Vaughan Williams, after pointing out that there was nothing in the facts as disclosed to show that the engineer had been guilty of any misconduct, said that of all the matters which had been alleged against the engineer, there were really only two of any substance. As regards these, they did not arise out of the original agreement between the parties, they did not fall within the schedule of prices where the price paid depended on the original schedule. The affidavits stated that specific agreements had been entered into, and that the engineer had departed from them. In such a case it was true to say that in so far as the engineer differed from the statement that agreements had been entered into and actually denied it, he was really acting as arbitrator in his own case. The question therefore to be determined was whether the engineer had in fact entered into these agreements, and whether he had departed from them. In his judgment, there was a strong *primâ-facie* case made as to the existence of these agreements, as well as a *primâ-facie* case of a departure from them. He would not go into details, because the action would have to go on, and it was not desirable at this stage to discuss the evidence. Putting it shortly, he was of opinion that in these two matters it was not desirable that the engineer should act as arbitrator. Under these circumstances, therefore, the appeal failed. In the event the trial was allowed to proceed. The last case to which I desire to refer is the decision of the House of Lords in *Roberts* v. *Hickman* (only reported in the second supplement to *Hudson's Building Contracts*). It was there held that the grant of a certificate by an architect will not be a condition precedent to the builder's right to sue, if, by writing letters to the employer, and allowing himself to be influenced by his views, the architect has disqualified himself from acting judicially, although guilty of no fraud or improper conduct.

It appears that in this case the architect had written to the contractor: "I regret I cannot enclose certificate, my clients' instructions being that the certificate I next give you is to be a final one, including for a complete settlement of the work done, into which I shall be prepared to go after Easter." He also wrote on another occasion: "Had you not better call to see my clients, because, in the face of their instructions to me, I cannot issue a certificate, whatever may be my own private opinion in the matter."

In this case, as will be seen from the above extracts, the conduct of the architect as *arbitrator* was not considered; it was his conduct in relation to the grant of certificates which was under discussion.

The Court held in effect that he had so mistaken his position and lost his independence by listening to the employer that the grant of a certificate could no longer be considered a condition precedent to the contractor's right to sue.

(7) SUMMARY OF THE CASES.

Let me attempt to summarise the cases to which I have alluded. The contractor will not be compelled to submit to the decision of the employer's engineer as arbitrator (1) if the matter in issue is an unseemly personal dispute raising a vindictive feeling between the engineer and the contractor, and the engineer has so strongly expressed his view that it amounts to a prejudgment (*Nuttall* v. *Manchester Corporation*, 1893, 8 T.L.R., 513); (2) if the nature of the dispute is such that the cross-examination of the engineer is essential; (3) if the matter in issue is something outside the original agreement—*e.g.*, a dispute as to whether the engineer and contractor had agreed to vary the original agreement; (4) if the conduct of the engineer himself is practically the only point in dispute.

(8) SUGGESTED REFORMS.

I hope I have said enough to show that, although there are probably hundreds of contracts now in force in various parts of the country in which the arbitrator is the engineer of the employer, circumstances may arise at any time which will prevent his acting when the time for his services arrives. Is it not therefore time to consider what alternative to adopt? I propose to consider a few of them.

(*a*) *The Deletion of the Clause.*—Deletion of the arbitration clause would involve recourse to legal proceedings for the settlement of all disputes. Doubtless it might open a vista of litigation, and would therefore be rejected on that ground; but there is one fact in this connection which it is well to bear in mind—namely, that a dispute arising under a building or engineering contract would not come before the Court and a jury, but before a special referee (*i.e.*, an engineer appointed by the Court), or before an official referee. In the result the proceedings would be very similar to those which would take place before the arbitrator named in the contract. It is a trial of this kind which takes place if litigation ensues owing to the failure of an arbitration clause. Save that a reference to an official referee is reference to a lawyer, it very much resembles a reference to arbitration.

(*b*) *Reference to an Independent Arbitrator.*—Reference to an independent arbitrator appears to present

almost if not quite as many objections as a reference to the Court. An independent person, even if he is an eminent engineer, has to be taught all about the nature of the work at the expense of the parties to the dispute. Witnesses to fact must be called in enormous numbers, while the expert witness, whose fees are considerable, must also be called at the expense of both parties. In the result the proceedings may drag on for days or even weeks. There are various ways of selecting an independent arbitrator. He may be named in the contract. If named, his independence may to some extent be affected by his being brought into business contact with one or other of the parties; but they would no doubt select a man who was not likely to have any such dealings with them. His appointment or selection may also be left to the president of the Institution of Civil Engineers for the time being, or to some other eminent personage. To leave it to a person who may happen to be president of an institution for the time being does not appear to be a very wise proceeding, inasmuch as the capacity of such person to select and appoint an arbitrator is a matter of pure speculation. It is much wiser, if it is desired to have an independent arbitrator, to leave him to be selected by agreement when the dispute arises, or, failing agreement, to be nominated by some eminent engineer of known capacity.

(c) *An Amendment of the Arbitration Clause.*—All the above proposals are open to the objection that they entail the expense inseparable from the appointment of an independent person. Numerous questions might arise in relation, say, to a sewerage contract, which could be decided by the engineer on the job without any objection being raised by the contractor. Suppose, for instance, the question was whether the cement supplied was capable of withstanding the prescribed tests. To have to refer such a matter to arbitration would be ridiculous. Again, the question whether a delay of, say, two days was justifiable could be decided in five minutes by the engineer who had been on the job, but could not be decided until after a long hearing by an independent arbitrator. Short of arbitration by the engineer "on the job," I have endeavoured to make it plain that the next best thing is for the parties to retain their hold over the selection of the arbitrator by means of one or other of the above methods. At present the alternative to the arbitrator mentioned in the contract is settlement of the matter in dispute by litigation. It would seem that by slightly modifying the usual form of arbitration clause the desired result can be attained.

I venture to make the following suggestion: Frame the arbitration clause so as to leave the decision of every question arising under the contract to the engineer, but subject to a proviso that, should it appear to the Court on an application to stay any action or proceeding brought in relation to the contract that the engineer is disqualified from acting as arbitrator, the matters in dispute will be referred to an engineer, to be agreed between the parties, or, failing agreement, to be nominated by the president of the Institution of Civil Engineers. Another alternative is suggested by Mr. E. J. Rimmer, in his "Arbitration Clause in Engineering Contracts" (Constable & Co.). It is that, while preserving the finality of the decision of the engineer upon certain special points, a proviso should be added to the arbitration clause, stating that if any action is brought the defendant may either (*a*) have the action stayed and remitted to the engineer, or (*b*) have the matter referred to an independent arbitrator appointed in one or other of the manners above suggested. The same gentleman suggests that the decision in *Aird* v. *Bristol Corporation* (*supra*) may be got over by a new clause preventing the engineer entering into any agreement with the contractors unless certain conditions are complied with. I do not attempt to draft a form of clause: the actual wording would have to vary according to the other conditions of the contract and the circumstances of the case.

It might be argued that such an agreement would operate as an attempt to oust the jurisdiction of the Court; but it really would not have this effect. It simply means that the various steps above mentioned must be taken before the law courts can be asked to decide a dispute or refer a matter to an official or other referee.

(9) CONCLUSION.

It will be noticed that I have been compelled to raise some broad general propositions on but a few cases. The fact that they are so few would seem to show that the demand for reform is not one of great exigency. But my researches in this matter have led me to think that what the local authority, which is responsible to the ratepayer, desires in relation to a contract is certainty. Certainty, so far as humanly possible in the matter of price and time; certainty that work shall be done under trustworthy supervision; and last, but not least, reasonable certainty that disputes shall be settled economically and expeditiously by a man in whom they have confidence. The suggestions I have put forward may, if adopted, avoid a good many of the pitfalls laid bare by the cases which I have cited.

The actual conduct of proceedings in an arbitration is hardly within the scope of the present paper. I cannot, however, conclude better than by reminding him who is about to act as arbitrator of the duty of a judge. Lord Bacon, in his essay entitled "Of Judicature," wrote: "Judges ought to be more learned than witty, more reverend than plausible and more advised than confident." And again: "Patience and gravity of bearing is an essential part of justice; and an overspeaking judge is no well-tuned cymbal. . . . The parts of a judge in bearing are four—to direct the evidence; to moderate length, repetition or impertinency of speech; to recapitulate, select and collate the material points of that which hath been said; and to give the rule or sentence."

DISCUSSION OF MR. VALENTINE BALL'S PAPER.

The President (Mr. Frank Latham), in thanking Mr. Valentine Ball for his admirable and excellent paper, said he was sure he was expressing the feelings of every member in proposing a hearty vote of thanks to that gentleman for the great amount of pains, time and thought he had bestowed upon it. It was a paper which he had heard read with a very great deal of pleasure, and he was sure that pleasure would be felt equally by others when they read it in the columns of The Surveyor and other journals. He moved a hearty vote of thanks to Mr. Valentine Ball for his kindness in preparing his paper and presenting it to the members of the institution.

Mr. Horace Boot (vice-president) said that, as chairman of one of the districts represented that night, it was with great pleasure that he seconded the proposition. As an engineer he had on many occasions stood in the position Mr. Ball had indicated—*viz.*, as arbitrator, as expert witness, and also as defendant and plaintiff on behalf of corporations. He could, therefore, having a certain amount of experience, say that very largely what Mr. Ball stated in his paper did actually take place. In his (the speaker's) opinion engineers, when acting for corporations, were not the right people to be appointed arbitrators. It was not fair, but unfortunately the duty was thrust upon them, not by the engineering profession, but by the legal profession—by the town clerks, who were so anxious to make engineers the sole arbitrators in all contracts. It was held that this was the only way to avoid litigation, which certainly to the lay thinker was always a good thing to do. There were few of them who had not had experience of litigation; they knew its expense and delays, and how often a wrong decision, especially on technical matters, was obtained. It was for this reason, if for no other, that this institution owed Mr. Ball a deep debt of gratitude for placing before the members such an able paper.

Mr. H. Percy Boulnois (London) said he had some knowledge of the subject, because, as they were aware, he had been himself surveyor at certain small towns—at Exeter, Portsmouth and Liverpool. The arbitration clause which was generally inserted, making the engineer arbitrator, was to his mind a mistake. Personally, he could safely say he had never had to go to arbitration in any contract he had carried out; but there were engineers and engineers, and some of them started with the idea that a contractor was like a poacher, and that he (the surveyor) should act the part of gamekeeper, or that it was a case of a cat watching a mouse. There was ill-feeling from the start of the work, and if this was so, was it fair that the engineer should be the arbitrator? Would it not be much better that an independent person should go in and act as arbitrator, who could thresh out all the points absolutely unbiassed, and come to a definite and proper conclusion? It seemed to him monstrous that a contractor should sign a contract containing such a clause, because he was thereby binding himself down to the engineer, not only as master during the execution of the works, but also as arbitrator practically upon his (the engi-

neer's) own doing. Of course in the case that had been placed before them that night the trouble the contractor always had in preventing the engineer from acting as arbitrator was that he must prove some sort of bias, or try to prove he had already acted as arbitrator, and hitherto the courts had been shy in throwing out the engineer as arbitrator. Again, it was better to have an independent arbitrator, because points might arise in his mind which might escape the mind of the engineer and contractor, while he would also hear evidence which the engineer would hardly be likely to call, because he would be calling his own servants, who would not give evidence in the same way as before an independent person. Then, again, there were a number of legal points that arose in disputes. The engineer was not a lawyer, neither, possibly, was the contractor, but the arbitrator had the power to call to his assistance a legal assessor, and all legal points could be threshed out with his assistance. Next, with regard to a reference to an official referee. This gentleman was not always a lawyer. The author of the paper said there was more delay before the expert arbitrator than before the official referee, but he (Mr. Boulnois) failed to see why. He had been before the official referee——

Mr. Ball: I don't think I could say that. There might be as much, or nearly as much.

Mr. Boulnois: That did not make much difference. It was, he thought, more difficult for the witness to make his explanation to the official referee—to a layman—than to an engineer, and he could not help thinking that if there was to be a reference at all, it was far better to go to an expert engineer than to an official referee. Then as regarded cost. He did not think that the cost of going to arbitration was, as a rule, very large, unless a very large sum was involved, and he thought that both the employers, whether a corporation or not, would not grudge the expense of going before an arbitrator, because they knew an outside arbitrator was absolutely unbiassed, and would give justice to both sides. He himself had quite recently held an arbitration which lasted for forty-four days, and the council employed a large number of expert witnesses. He was perfectly certain that no official referee could have grasped the technical details of that heavy arbitration, and it would have been almost an impossibility for him to come to the conclusion that he (Mr. Boulnois) came to when he came to give the award. The paper, he considered, was a most valuable one. It was the first of the kind he had read, and it had given him a number of valuable hints and much to think about. He was much struck with the advice given by the great Lord Bacon (who, incidentally, wrote "Shakespeare")—daunting to and he thought that what that great man had advised all judges and arbitrators should take to heart and try to act upon.

Mr. A. J. Martin (London) coupled with Mr. Ball in expressing thanks to Mr. Ball for his very interesting, thoughtful and well-balanced paper. Mr. Boulnois, the last speaker, had dealt with the matter from the point of view of a municipal engineer. His (Mr. Martin's) experience had been as a subordinate municipal engineer and as a consulting engineer. There were differences between the position of the latter and the municipal engineer in charge of a contract. The consulting engineer in the nature of things had to work for a number of local authorities, and consequently he was less liable to pressure from anyone of them than the municipal officer who gave his whole time to one authority. Many authorities, it appeared to him, had mistaken ideas of the position of the engineer when he was carrying out a contract for them. They thought he was acting as their servant, and that it was his business to give effect to their desires or any views they might express with respect to the contract. It was, he thought, the duty of the engineer to find out their minds on that, and, having it clear that he was not their servant, but was called on to deal out even-handed justice between the parties. At the same time the municipal engineer was in a more difficult position than the independent consulting engineer, who could keep his finger at the local authority. There was another difference between the consulting and the municipal engineer. His pecuniary interest of the consulting engineer lay with the contractor. He was mostly paid by commission. He had heard it suggested that the result of the system of payment was to give the engineer an interest to spend the contractor to enhance the value of his work in order to derive increased commission. He would not place much trust in the integrity of the professional man who would make such a suggestion as that. He must have a low standard of conduct who thought his brother professional man would be guilty of such temptation. The engineer was undoubtedly subject to certain influences which might impair his impartiality, such things as his relation to his clients, and also when any dispute arose out of his own conduct as engineer of the works. From that point of view he was unsuitable to occupy the position of arbitrator. But, on the other hand, he possessed an important qualification for the position that outweighed any disadvantages, and that was his intimate knowledge of the progress of the work. The most important qualification of an arbitrator as to impartiality was that he should possess such knowledge of the case as to enable him to weigh facts, and all the bearings, and have judgment, and this the engineer who had charge of the work possessed in a high degree. The fact they had to face was that contractors did take contracts in which this clause occurred. As had been pointed out, this might be through the pressure of competition, but his experience was that the contract was signed with no unwillingness. He had found that contractors were ready and willing to accept the arbitration of the engineer under whom they were working, and that in nineteen out of twenty cases they were satisfied with his award. That, he thought, was a high tribute to the fairness and impartiality of the engineering profession, though he should not say so if the tribute was not well deserved. He had known engineers in this country, Canada, the United States and Australia, and he was firmly convinced there was no body of men who had a higher sense of professional duty than they had. How had that high standard been reached? It was due to many causes. One was that the position was one of great responsibility. If they wanted to bring out the best in a man, the surest way was to trust him. They found that in dealing with workmen, with an office staff, or—he was a Territorial—in dealing with junior officers, if they trusted a man they put him on his honour to do his best. He believed that the great trust reposed in the engineering profession was one of the contributing causes of the high standard of professional conduct they maintained in their ranks, and for that reason it would be a mistaken policy to detract from the responsibility of the profession unless there was grave reason for so doing. He did not say the engineer should always be the sole and final arbitrator between the local authority and the contractor. It was only fair to give the contractor a final court of appeal. He did that in his own contracts. He had adopted a plan which seemed to him to be an eminently fair one, and that was that if a point of dispute arose the decision of the engineer should be paid while the work was in hand: the work was not to be held up by referring the matter to an outside party. But, at the completion of the work, if there should be any question of dispute remaining, and the contractor was not satisfied with the decision given by the engineer in the course of the work, he should have the right to appeal to an outside arbitrator. He could not agree with the contention that to leave the appointment of arbitrator to the president of an institution for the time being was not wise. He ventured to say that human fallibility entered into everything we did, but he could conceive no better or fairer way of appointing a person of responsibility as arbitrator than by the choice of a man for this purpose who had been selected by his professional brethren to fill the highest office in the profession.

Mr. A. E. Stickland, borough surveyor of Windsor, past-president, observed that after two speakers had made speeches upon a subject with which they were perfectly cognisant, it was unfortunate that he should be called upon, because during the last twenty years he had been concerned with the carrying out of many contracts, and had never had cause for arbitration. He believed the fairest way of dealing with a contractor was to meet him in an honest, straightforward manner. Personally he did not like the surveyor as arbitrator in any scheme. In some cases it might have a satisfactory result but it might lead to trouble. In the case of large towns, like Liverpool, Manchester or Leicester, the surveyor was arbitrator, but who carried on the work? It was left almost entirely to the subordinate officials; therefore the surveyor was more the referee than the arbitrator of the job. It seemed to him that when a surveyor passed his first exam. that he had placed himself in the position of the arbitrator, and how could he afterwards be set on one side? They had associations of all sorts and kinds in these days, and he

was looking forward to the time when there would be formed an Association of Arbitrators, whose members would be nominated by the president of the Institution of Engineers.

Captain F. LUGG, chairman of the Harbour, Docks and Quays Committee of Penzance, said he did not profess to know anything about building, though he did about shipbuilding, but as one went about the world one saw many things which bore upon the matters under discussion. The Avonmouth case had been mentioned in which the decision was left with the engineer, and if they made the engineer the arbitrator they would almost invariably have such a result as they had in that case. As he understood the facts, the engineer agreed with the contractor's representatives upon a considerable number of alterations of the work which the contractor was to do without extra expense. When it came to settling up the engineer complained that extras had been charged, and he declined to sign for something like £250,000. The case was taken to the House of Lords, and in the long run the firm of Aird lost. The case appeared to him (the speaker) to prove that if they allowed the engineer to be his own arbitrator, he was bound to act for himself. If the contract was once departed from, the best thing was to have every little alteration set down in black and white. It was inevitable in a great dock scheme to have alterations, and while there was a possibility of give and take, it was very desirable to make sure as they went along that the alterations met with the approval of the principals, and that they were duly recorded in black and white. That was one of the thoughts that occurred to him after reading Mr. Ball's paper. He did not say that they could make the engineer the sole arbitrator. He remembered a case in which there was an agreement made between the owner's representative and the shipbuilders with respect to the construction of a ship. It was certain that the alteration was made at the request of the owner's representative, but care was taken to avoid putting anything on record. The alteration increased the carrying capacity of the ship by over 100 tons. This was all right when the ship was afloat, but it happened that when the ship was high and dry she broke in two. When inquiry came to be made there was disclosure of the arrangement between the owner's representative and the builders. How far the owner knew of this he did not know, but it was quite certain that his representative had made it verbally. The case cost the shipbuilders an enormous sum of money, and nearly ruined them. He only quoted it to show how necessary it was when there was any deviation of the contract that the arrangement should be placed on record in black and white.

Mr. J. R. FYFFES (Watford) said he had listened with considerable interest to the paper, all the more so perhaps because he remembered having been subjected to a heckling in the witness-box by Mr. Ball for three quarters of an hour. It was difficult to agree with the proposition, so far as the arbitrator was concerned, that the lawyer element should come in, and personally he supported the view of Mr. Boulnois that the arbitrator should really belong to the profession to which the matter dealt with belonged. Although the author said that the lawyer was to have all the facts explained to him, it must be recognised that he would have a better grasp of them if he had a knowledge of the particular profession of the business in which the case occurred. It must be easier for the arbitrator who was a professional man to grasp the circumstances than it would be for a lawyer. There were, of course, legal aspects of a case which called for the assistance of the lawyer, but in the majority of cases a professional arbitrator was the better of the two.

Mr. C. H. W. BIGGS (London) remarked that he had come to the conclusion that directly they had to take extras they talked about the inexperience of the engineer, and that where there was a large contract involving a large amount of extras, the engineer seemed to be incapable of designing what he ought to design. If they could have a perfect design they would be all right, and they could have a perfect design when they restricted their architect to a building. The architect was different to the contracting engineer, and personally he had always differentiated between the two. The architect appealed to one branch—building: he knew almost exactly what was wanted from the foundation to the roof, and therefore there should be no extras. If there were the architect did not know his work. But, on the other hand, there was no engineer who could undertake to make a perfect design: directly he commenced to make out the work there must be changes, and these brought all the trouble. Who was to arbitrate that the changes were required? The engineer had to decide the requirements. He always thought the main question that the engineer of the work should decide was whether the work was carried out satisfactorily, and with materials satisfactory to him. If there had been changes the cause of the changes should be left to the decision of an independent arbitrator. If not the contractor had not the opportunity of going over the whole question as to what changes would interfere with the ordinary course of the work. He believed in an engineer being arbitrator, and in having an arbitrator to consult in the case of the engineer and contractor coming to loggerheads; in other words, there must be an independent arbitrator. Personally he believed in seeking to settle differences with friendly counsel, and in trying to keep parties out of the lawyers' hands. Mr. Boulnois had referred to a forty-four days' arbitration. The cost of such proceedings was not a nice thing, even if it was a case involving £70,000, which, he thought, was the amount of the contract in the first instance. If they got a perfect engineer they would have no trouble. He had known scores of cases where there was no trouble, but cases arose where an independent authority must be appointed to decide the differences between the parties.

The PRESIDENT (Mr. Frank Latham) said they must all have felt enlightened by the remarks they had heard from Mr. Boulnois and others upon an almost unique paper. He had never in his experience come across a paper of the kind presented that night—a paper presented by a barrister-at-law to engineers. He was sure they were grateful to Mr. Ball for the trouble he had taken in the matter. He was sure the districts in connection with which that meeting was held must specially appreciate the author's valuable paper. Mr. Boulnois had suggested that they should not treat contractors as thieves until they found them so. There was no doubt that a good many considered the contractor should be watched as a cat watched a mouse, and he thought they ought to carefully note the remarks of Mr. Boulnois. The contractor was of considerable value to the engineer, a great deal more valuable than the builder to the architect. There were difficulties which the contractor had to compete with in carrying out an engineering contract, as any one could see at a first glance. He undertook to carry through the work for the engineer, and the latter had simply to look on and see the structure he had developed from his brain take form and effect. Every engineer ought to feel grateful when he had a contractor who would come forward and tender for his work, and carry it out according to the best of his ability, thus maintaining the good name he had acquired for doing his work. After all it was to the advantage of the contractor to carry out the work in the best way possible. He was very pleased Mr. Boulnois had mentioned that aspect of the matter, because he had often thought of the difficulties of the contractor's position, and that, as a rule he did not want to bamboozle, but tried to do his best. Mr. Martin had stated that in nineteen cases out of twenty where the engineer was the sole arbitrator the engineer came out all right, and matters were settled amicably. But even so there was according to this one case out of twenty cases which was not settled amicably. He thought that much depended upon the engineer as to whether things were settled amicably or not. The whole of the contracts he had carried out amounted to a good round sum. He never had any trouble as far as the arbitration clause was concerned, and only once was the point disputed. The contractors wrote that they could not accept the clause leaving the arbitration in his hands, and it was altered. He could have made better terms for both sides if it had not been so, for he felt he was honest and he wished his work to be carried out well, and had every consideration for the contractor. Of course, the contractors did not know him, but they could have trusted him, and naturally he thought it would have gone better if the clause had been left in. The clause inserted was that any dispute was to be submitted to the president of the Institution of Civil Engineers. The absurdity of this arrangement became manifest in the case of a contract costing, say, £1,000. Something did not go right, and the appeal to such an authority might mean that the job would prove a pretty costly one before it was finished. Captain Lugg in his speech said it was most essential to have everything in writing. He (the president) would give his experi-

ence on that point. They were carrying out structural work, of which certain portions could be admitted. The firm of contractors would not fill up the schedule of prices. When it came to carrying out the contract it was decided to admit certain portions, while the contractors were to give certain concessions to the employers. Nothing was put down in writing, because each took the other's word, and there was a witness to what was said. The work went right until the completion, when the firm smashed. They gave a certificate for the whole amount of the contract, with extras on top of it. He (the president) was nonplussed. The official connected with the work was suspended from the firm's employ, and things got into a bad predicament, with the result that they had to pay the whole sum of the extras. Mr. Biggs had referred to the engineer *versus* the architect. Engineering had its pitfalls and difficulties, especially, as he knew, in estimating what water work was to cost. There was a schedule of prices and they had to do the work as near as they could. But the work was somehow carried out at less than 10 per cent over the estimate, and if this was so it was considered pretty satisfactory. In water work they had, of course, difficulties with foundations, and there were also floods and tides to contend with. He thought the details given in the paper would prove to be of great interest and value to engineers when they came to be read in their excellent journals.

Mr. W. VALENTINE BALL, in reply to the discussion, said all the speakers seemed to be agreed that some method of settling disputes between the employer and the contractor was essential. As Mr. Biggs had pointed out in engineering contracts it was exceedingly difficult to avoid the question of extras. Although this might be an easier matter in building contracts, it was not always possible to avoid extras, and there should be some person appointed to decide the points which arose. The question they had been discussing, of course, was who was the best person to give a decision on disputed points. Mr. Boulnois had referred to the question of having a lay as distinguished from a legal assessor. He (the speaker) had suggested in his paper that the reference to an official referee was much the same as the reference to an arbitrator, but there was this distinction, and it was in some cases an important distinction that whereas they had to pay the arbitrator, they did not have to pay the official referee. He was paid by the Treasury—which he did not consider too generous—and not by the litigants. It might be that the costs of litigation, which were necessary if they went before the official referee, were greater than the costs of arbitration, but still there was the fact. He was glad to hear Mr. Boulnois say that the contractors did not consider the costs of settling disputes a very serious matter.

Mr. BOULNOIS: I said both the contractor and the employer.

Mr. VALENTINE BALL, continuing, remarked that he had been struck by what Mr. Martin had said—*viz.*, that it was in the pecuniary interest of the engineer that the contractor should be paid liberally, because his commission depended, he (Mr. Ball) supposed, upon the amount of the certificates. Having regard to the few cases in which he had been able to find any question raised against engineers, that fact tended to raise the high sense he had always had of the engineering profession. As to what was said about his suggestion with regard to the president of the Institution of Civil Engineers, he hoped they would regard that expression of opinion as his individual impertinence. He would point out that he had been rather inconsistent because in making his recommendation as to what should be done he stated that in the last resort the arbitrator should be nominated by the president, his suggestion being that the necessity for appealing to him should be postponed until the parties to the contract had come to the conclusion that the engineer in the employ of employer was not a suitable person. As to another suggestion made by Mr. Martin, it seemed to him to be an admirable one, and he was grateful to that gentleman for having brought it forward. It was that if a dispute arose during the contract the settlement should be held over until after the work was finished. Strangely enough, that was what usually took place under the form used by the Royal Institute of British Architects. If the architect stated that something was not an extra, he told him to do the work, and the question whether it was an extra, and how it should be paid, was left over to be decided by the arbitrator at the end of the work. Mr. Biggs made the suggestion that in work of a certain amount instead of an arbitration clause there should be appointed an arbitrator who was to be paid a small percentage on the whole, the arbitrator to overlook the work and settle the certificates. That might be a way of dealing with the matter, but he supposed the powers of the arbitrator would have to be defined in some way in the contract. If they were, it might get over difficulties if the parties could agree. Mr. Stickland, he thought it was, pointed out that the instant the employer had paid for any extras on the certificates he had made the engineer arbitrator, and that it was difficult for him to get away from the position thereafter. He (the speaker) thought there were always a number of small questions arising in a contract as to whether the decision of the engineer was final, and he did not think the fact of his doing so should prevent his being arbitrator on the contract as a whole. He was grateful for the attention the members had given to the paper, and the kind way they had received it, and last of all, he was exceedingly grateful for the very valuable suggestions and comments that they had made on the somewhat technical paper which he had put before them.

The proceedings closed with the passing of a vote of thanks to the president for taking the chair.

MADRAS MUNICIPAL ENGINEERSHIP.

APPOINTMENT OF MR. J. R. COATS.

Mr. J. R. Coats, B.Sc., Assoc.M.Inst.C.E., has been appointed municipal engineer to the Corporation of Madras in succession to Mr. E. P. Richards, now chief engineer to the Calcutta Improvement Trust. After graduating in engineering at Glasgow University in 1904, Mr. Coats joined the city engineer's staff of the Glasgow Corporation, and was engaged on the construction of the southern scheme of main drainage for the city, acting as an assistant to Mr. W. C. Easton, the engineer of construction. In 1909 he left the city to take up an appointment with the Leeds Corporation as an assistant to the sewage engineer there, and two years later was appointed drainage assistant to the special engineer for the water and drainage schemes of Madras. Mr. Coats is in his thirtieth year.

Mr. A. Lindsay Houston, who was also trained in the city engineer's office under Mr. M'Donald, and whose special work was also on the main drainage scheme of the city under Mr. Easton, the engineer on construction, has, after a service of some twelve months in Madras, been appointed to succeed Mr. Coats as drainage assistant to the special engineer for the water and drainage scheme of that city.

Drainage Works and Sanitary Fittings.—A third edition, revised and brought up to date, particularly as regards the questions of concrete sewers, sewer ventilation and flushing, and the Public Health Acts Amendment Act of 1907, still further evidences the success of this little manual,* which manifestly deserves the attention and confidence of all concerned in the important subject with which it deals.—*The Bookseller*.

The Housing Problem at Stafford.—On Tuesday, at a meeting of Stafford Town Council, a letter was read from the Local Government Board with respect to a recent inquiry as to the complaint that the town council had failed to exercise their powers under the Housing Acts in cases where those powers ought to have been exercised. In their letter the board stated it was clear from the evidence given at the inquiry that the town council had not taken action under part 2 of the Act of 1890 in many cases in which such action was called for. In regard to a decision of the town council to erect twenty artisans' cottages under part 3 of the Act, the board state that the scheme is quite inadequate to meet the position as brought out at the inquiry. The board added that the position in the town demanded the immediate erection of no fewer than sixty houses, to be let at rents from 5s. to 6s. 6d. a week inclusive of rates, and it was not clear that further action on the part of the town council might not be necessary in the immediate future.

* "Drainage Work and Sanitary Fittings." By Wm. H. Maxwell. Price 2s. nett. London: St. Bride's Press, Ltd., 24 Bride-lane, E.C.

Utilisation of Humus from Slate Beds.

MR. W. J. DIBDIN AT THE SOCIETY OF CHEMICAL INDUSTRY.

On Monday evening last, Mr. W. J. Dibdin, F.I.C., F.C.S., read before the London section of the Society of Chemical Industry, at a meeting held at Burlington House, Mr. G. T. Holloway in the chair, a paper on "The Slate Bed Treatment of Sewage." In the course of his remarks Mr. Dibdin said:—

As a result of very careful experiments during a period of eighteen months carried out by Mr. T. J. Rushbrooke, the borough engineer of High Wycombe, the following facts are available, by his kind permission, as to the quantity of sewage treated and humus obtained from the slate beds, from which data the quantities per 1,000,000 gallons of normal sewage are deduced, after allowing for the percentage of moisture.

QUANTITY OBTAINED.

Gallons of sewage treated	Residue from slate beds. Cube yds.	Tons.	Tons per 1,000,000 gallons on a 15-gallon per head sewage.	Moisture per cent.	Tons dry	Tons 5 per cent moisture.
8,874,000	10·0	7·5	0·84	72·0	0·23	0·46
Corrected to a normal flow of 30 gal. per head per day these figures become						
5,916,000	10·0	7·5	1·26	72·0	0·34	0·68

or 3·4 tons of 90 per cent moisture per 1,000,000 gallons against 6·5 tons of 90 per cent moisture per 1,000,000 gallons from a septic tank, according to the Royal Commission Report.

COST OF DISPOSAL.

Sludging and 'agooring in connection with the old open septic tanks	Slate bed residue from drainage bed.
850,000 gallons of a 15-gallon per head sewage per day. Equal to— 570,000 gallons of a 30-gallon per head sewage per day. Actual cost— £40 per annum labour, £360 per annum carriage, &c. Corrected to 1,000,000 gallons daily of a 30-gallon per head sewage £70 per annum labour, £635 per annum carriage, &c. Against Royal Commission estimate of— £75 per annum, £— cost of land for digging in, &c.	The disposal of an inoffensive manurial earth will require little land. $\frac{34 \times 70}{65} = £36$ per annum

The difference between £70 and £36, or £34, represents the saving on handling only, and to this should be added, on the assumption that farmers will remove the air-dried humus at their own cost, £635 in regard to sludge removal and disposal, making £669 as the annual economy per 1,000,000 gallons daily. This sum capitalised at 3½ per cent equals £19,114, which is far more than sufficient to repay the whole cost of the slate beds. There is the further advantage that the whole of the nuisance of sludge disposal is abolished.

It will be noticed that no credit is taken for the value of the "manurial earth," as the amount of this is a debatable point.

How far, however, the above assumption that farmers will remove the humus free of cost is warranted may be judged from the fact that, from actual experiments made by Messrs Barr & Sons, of Taplow, on a 10-ton sample of air-dried humus, they report that it is evident that, while it possesses undoubted manurial properties, it has a very beneficial mechanical advantage in lightening heavy soils. To obtain best results the material should be stacked until it has attained a friable condition. Once it has attained this condition, it would, in their opinion, be an excellent medium for mixing with potting soils for general purposes, in addition to being a good manurial agent to dig into the soil.

Taken in conjunction with the fact that the Corporation of Manchester is making and selling at 25s. per ton a good manure made from the washings of the clinker contact beds, which are of the same character as that from the slate beds, this evidence of the utility of the only residue from sewage treated by the aërobic method in slate beds more than fully justifies the belief, without entering into any question of possible profit from its sale, that, when once farmers realise the difference between this residue and ordinary "sewage sludge," they will readily remove it free of cost and thus save all expense in connection with its disposal.

The following comparison of the above-mentioned Manchester manure with weather humus obtained from the slate beds at Devizes, as analysed by Dr. J. Gilbert Fowler, will be of interest:—

—	Manchester. Dried sewage manure.*	Devizes. Dried weathered humus †
Moisture	10 to 12 per cent	0·0 per cent
Organic matter	35 to 45 "	40·1 to 45·0 "
Containing nitrogen	1·25 to 2·0 "	1·85 to 1·99 "

EXPERIENCE AT PHILADELPHIA.

The following extracts from the report of the Bureau of Survey upon the purification of the sewage of Philadelphia, 1910, may be usefully referred to, as entirely independent evidence:—

"Between sedimentation and contact processes may be classed the Dibdin Slate Bed No. 16.—The best results were accomplished when this bed was filled twice a day, or at the rate of 2,000,000 gallons per acre per day. Crude sewage applied deposited three-fourths of the suspended solids; the effluent was slightly nitrified and rendered partially stable.—The result was obtained aërobically, and the bacterial work is undoubtedly largely supplemented by worms and other lower forms of animal life.—As the results accomplished by this bed are more than mere sedimentation, including oxidation of the applied sewage, it has been considered in two ways: first, as a sedimentation tank in which the resulting sludge has been digested and concentrated; second, as a contact bed producing partially a stable effluent. If looked upon as a sedimentation process, it would consist of nineteen superimposed quiescent basins, each about 3 in. deep. The bed should be filled at such a rate that the velocity is not high enough to disturb the deposit on the slates, and then the bed be allowed to remain quiescent for, say, one hour.—Before the bed is again filled the worms and other animals and the bacteria have attacked the organic matter of this deposit and are ready for the next thin layer of food, when the bed is subsequently filled. If considered as a contact bed, its large void space, as compared with a contact bed, filled with ordinary media, is of great aërating value, also due to the construction in horizontal layers, one slate resting upon another; on the under side of many slates a large, flat bubble of air must be entrained, which would tend to oxygenate the sewage while in the bed. The deposit upon the slates was inodorous mud, even gritty when rubbed between the fingers, and the microscopic examination revealed large amounts of sandy matter. When heated in a dish to obtain the dry residue, the worms came to the surface and their activity showed the aptness of the term 'living earth.'"

As an instance of one of the many varying conditions under which slate beds are working satisfactorily the installation at the Kazan Railroad Station at Moscow may be mentioned. This plant deals with 20,000 gallons per day, and the engineers responsible for its construction, Messrs. Simin & Co., of the Neptune Company, Moscow, report that the Kazan Railroad Board of Managers were so satisfied that they decided to instal the system for the first Russian garden city, in the suburb of Moscow, which has been established by the railroad company to celebrate its jubilee.

SPECIAL POINTS FOR CONSIDERATION IN NEW DESIGNS.

Although in many instances the albuminous solids in solution are reduced in a slate bed to the extent sometimes of 50 per cent, a slate bed effluent is not and has not been claimed as a final effluent. Some slate bed effluents are good enough to discharge into tidal waters, but in general some further treatment is required. It is necessary to point this out again, because in many quarters one meets with the idea that

* Ogden, "Proceedings" of Association of Managers of Sewage Disposal Works, 1910, p. 106.

† Dibdin, "Disposition and Analyses of Sewage Débris," Society of Public Analysts, March, 1907.

finality is claimed for the single contact in such beds. It was hoped that in the earlier papers it had been made clear that these beds were designed as sludge digesters.

Duration of the Beds. The permanence of the slate has a distinct bearing on the question of the period for which loans could be granted. For land treatment sixty years are allowed for repayment. For artificial systems thirty years only are allowed. In view of the indestructibility and permanent character of the slate beds it is worth considering whether the rate might not be lessened by the extension of the period for repayment and part of the cost laid on the next generation, who will profit by the installation as in the case of land, and a period of sixty years allowed for the repayment. This point is now raised in view of the proof of the value of the process. Hitherto time was needed to substantiate the method and the question was consequently postponed.

From the facts above set out it is clearly demonstrated that by means of the slate bed treatment the foul matters in sewage are resolved into an inoffensive residue which has a distinctly manurial value. Our ideas respecting sewage works and nuisance must be modified in view of the benefits secured by the conversion of the solid matters into a valuable aid to agriculture. The long expressed wish for the economical utilisation of the chief waste products of the community is satisfied by the healthy functions of aërobic organisms.

DISCUSSION OF MR. DIBDIN'S PAPER.

Mr. W. C. TYNDALE (War Office), in opening the discussion, denied that there was any resemblance between slate beds and septic tanks. After drawing attention to the necessity for humus traps, he stated that in his experience the only occasions when choking occurred in slate beds was when a great deal of cavalry refuse, including chaff and horse dung, came down from the barracks. That, of course, was not a fair sewage to put on to a slate bed, and they overcame the difficulty by screening. The speaker added that he had arranged experimental slate beds in his own office, feeding the mud on the slate beds with particles of meat and so forth, and had observed the development of the growth of organisms. When these experiments ceased the whole of the mud dried up to good garden earth.

Dr. J. A. VOELCKER said he considered some injustice was done to Mr. Dibdin in the Royal Commission's report. From his own personal experience of installations, he believed that all Mr. Dibdin's claims were justified. He was not inclined to assert that a really valuable manurial substance had been obtained from sewage, but there was one good thing about the humus from slate beds, and that was that the quantity was very small. The real value of such humus was in its mechanical effect on certain soils, such as clays, though farmers might think that as a manure it did not smell enough. With regard to the installations which had been so-called "failures," if one put one's hat on upside down and complained that it did not fit, one could not blame the maker; and so with sewage installations. If they worked them wrongly and sent down stable litter and dead cats and dogs, they could not blame Dibdin.

Mr. J. W. BARR (Barr & Sons, horticulturists, Taplow, spoke of 10 tons of humus which he had made use of, said he had at first been disappointed with the amount of moisture it contained. The benefit to the crops was in some cases doubtful, and in others slight, but it had a distinct value in opening and aërating the soil and assisting in retaining moisture.

Mr. H. Percy Boulnois (Westminster) referred to the first inquiry at Blaneau Festiniog, at which Mr. Dibdin suggested that a contact bed should be made with slates, but as the speaker's impression was that on that occasion the suggestion was to use slates thrown in anyhow. With regard to the Local Government Board, which he had long an inspector, naturally the board looked rather askance at new schemes until they were sure of the ground. He had only recently studied, and had been thinking of recommending, slate beds, and he wished to ask Mr. Dibdin a question as to the amount of sludge. He had been surprised at the small quantity having regard to the quantities he had been familiar with elsewhere. If Mr. Dibdin could reduce the sludge to the small amount given in the paper there would be a very great advantage. But would not the use of a mere settling and ventilation tank assist in the diminution of the sludge? As regarded the possible extension of the system, he thought Mr. Dibdin would have some difficulty in persuading the Local Government Board that slate beds would last as long as land. Bacteria did not attack slate, but there were political bacteria which attacked land, and he suggested that Mr. Dibdin might succeed if he forced the political aspect on the notice of the board.

Mr. A. J. MARTIN (Westminster) said he did not know much about the Malden installation, but he was under the impression that at Trowbridge a by-pass had been put in to divert the septic tank effluent from the slate beds. He was sorry not to see any officers of the Royal Commission present that evening to answer Mr. Dibdin's criticisms. He did not think Mr. Dibdin had been quite fair to the commission. The latter did not refer to the nature of the process, but to the results, which they considered were no different to those obtainable from a septic tank. He had been informed that the fine beds at Devizes had sludged up. But the gist of Mr. Dibdin's paper lay in the difference between slate bed sludge—he begged pardon, humus—and ordinary sludge. Here Mr. Dibdin seemed to have compared the best slate bed sludge with the worst tank sludge. World-famous experts had testified to the inodorous character of septic sludge. As to the slate beds, it was impossible to obtain perfect aërobic conditions owing to the changes in the rate of flow, especially seeing that the beds were to be emptied as slowly as possible.

Mr. DIBDIN: As quickly as possible.

Mr. MARTIN said he had always understood they were to be emptied slowly.

Mr. DIBDIN: From the time of the first contact bed I have always stated that they should be emptied as quickly as is reasonably possible.

Mr. MARTIN: I am referring to slate beds.

Mr. DIBDIN: They are contact beds.

Mr. MARTIN, continuing, observed that during the slow night flow the bottom of the bed could not be aërobic. The humus at Devizes was indistinguishable from completely septicised sludge. Mr. Dibdin had not given any figures as to the suspended matter in the effluent. That was most important, because the primary function of a preliminary process was to produce an effluent free from suspended matter for further treatment. Digestion of the solids was not of importance in comparison with that function. The slate bed was a very valuable means of avoiding nuisance, but they must not expect too much because of the slow flow at night. If that difficulty were removed Mr. Dibdin would have given them a process practically free from smell.

Dr. S. RIDEAL (Westminster) said he thought the analyses of the humus shown did not warrant the drawing of any definite conclusions. He thought the condition of the beds must be aërobic, because of the presence of fat in the humus. With regard to the suspended solids, he believed a good many went forward to the catchpit, to the filters, or to the land, and that somewhere they would find the missing tons. He noticed no analyses had been put forward as to the quality of the effluent, which was most important, especially in view of the Eighth Report of the Royal Commission, which made recommendations as to the discharge of effluents into tidal and other waters; but the effluents from slate beds would require, except under exceptional conditions, the removal of the suspended matters and further treatment.

Mr. H. C. H. SHENTON (Westminster), in a communication on a paper, said the slate bed and the coarse contact bed were identical in working, and the results were similar when the coarse bed was formed of such a material and drained in such a manner that it could discharge its humus. In a paper he read before the Society of Engineers thirteen years ago, the following statements were made: "Possibly a very coarse bed of durable material, very well drained, would produce the result of a more or less sludgy effluent from the first bed. The object is that the first beds should not sludge up. The author would therefore beg those interested in the subject to give this matter careful consideration. What is needed to perfect the bacteria bed system is some way of preventing the sludging up of the first beds. Were it not for the sludging up of the first beds, the tank treatment would be unnecessary. It [sludge] can be more easily removed from among the very coarse material than from among the very fine, with which it will form one mass." From that time to the present he had had considerable experience with coarse contact beds, dealing sometimes with crude sewage and sometimes with sewage which had passed through a tank, but which contained all the organic

matter in a broken-up form, special steps having been taken in order that this matter should be discharged from the tank into the contact beds, and he was ready to endorse to the fullest degree Mr. Dibdin's contention as to the merits of slate beds. He had found that where even a bed of clinker was provided with a false bottom, and with special draining channels for the full depth of the bed, a result was obtained comparable to that from the slate bed, but the construction of such beds was more expensive than that of slate beds, which were certainly superior, but even clinker beds constructed in that way were capable of discharging their humus, and did not become clogged, provided they had proper emptying arrangements. They would at certain times discharge their humus in large quantities, and that could be intercepted, and, as Mr. Dibdin had demonstrated, it had a considerable manurial value. He should like to be allowed to quote another statement made in a paper he read in the year 1904: "It would be a good thing to make provision for washing out the first contact beds to some extent occasionally—*e.g.*, by opening a large valve when the bed is full, so as to create a good rush out. The humus washed out might be caught in channels on the second beds, or it would probably remain on the surface, where it could be cleaned off, or it might be well to have a settling pool or channel to catch it between the first and second beds." He had constructed contact beds in a great many places upon the principles advocated by Mr. Dibdin, and where his teachings had been properly carried out the result had always been successful. The first beds, whether of slate or constructed on the slate bed principle, had unloaded their humus and had not required to be cleaned out. Further, the humus had been of an absolutely unobjectionable nature, and, above all, the clients had been well satisfied with the results. The same results had not attended the construction of settling tanks, the effluent from which was apt to become foul from various causes, and the sludge from which was objectionable in quality.

Mr. L. A. DIBDIN (Westminster) said he desired to reply to a few of Mr. Martin's points. At Trowbridge the by-pass had been constructed so as to affect only two out of the four slate beds, and it had not been used consistently even then. With regard to the night flow, the prolonged filling at night had been overcome by using a number of small beds, to and from which the flow was diverted automatically when the beds had been receiving sewage for a few hours. The beds were emptied as quickly as was possible without disturbing the fresh deposit. The actual rate depended upon the size and type of installation, and there could be no hard and fast rule.

Mr. W. J. DIBDIN said he did not think he had any reply to make to the first three speakers. With regard to Mr. Boulnois' statement as to the slate at Blaneau Festiniog, he had suggested the use of blocks of slate for contact beds, because it had been shown that any material that would not break down—glass, clinker, granite, ballast, or slate—was suitable. The idea of a plate bed had been in his mind for some time, but it was only when he found that he could get waste slate in plate form that he realised that the plate bed was economically practical. With regard to the actual quantities of sludge or humus, none had been removed from Devizes except one or two barrow loads required for the growing of cucumbers. They could go there and see for themselves what had been obtained. The figures from High Wycombe were not his figures, but were taken independently over a period of eighteen months on a system of careful measurement by Mr. Rushbrooke, the borough surveyor. As to Mr. Martin's suggestion that he (the speaker) had not treated the Royal Commission fairly, he (Mr. Dibdin) had quoted from the commission's own report, and might have quoted some passages which would have had a much stronger interpretation put upon them if placed in juxtaposition.

Mr. MARTIN: It is not the quotations, but your remarks that are unfair.

Mr. DIBDIN said he had stated that three sources of information were overlooked by the officers. The High Wycombe results were facts, and they had a distinct bearing upon the question. The annual expenditure at Devizes was very important, and the figures as to the quantity of sludge obtained at Devizes before the slate beds were introduced were equally important. There were certainly three sources of information as to the working of slate beds which were overlooked by the commission's officers. His only comment as to the report itself was that it would be of great interest if the officers of the commission would explain how that process, which was without nuisance even on a hot day, which produced the change between sludge and humus which they had seen that evening, and had an odour comparable with that of a damp cellar, could possibly be the same as a septic tank. With regard to the commission's estimate of the sludge or humus, they had calculated that only 1 per cent had been destroyed in effecting that change. He ventured to say that if he had come to that society and had claimed to have effected that conversion with a loss of only 1 per cent he should have had to meet some very severe criticism. The fine beds did not sludge up at Devizes. He had explained previously that in constructing the fine beds a lot of dust was introduced. It happened that the material came from ironworks, and rusted when wetted in the beds. In rusting it expanded, and caused loss of capacity, and lumps of iron cement were afterwards removed from the beds. It was utterly untrue to say that the fine beds had sludged up. As to the rate of emptying the beds, from the time of the first contact bed at Barking he had held that contact beds should be emptied as quickly as possible, so long as they did not pull the heart out of the bed, so to speak, in order to obtain the maximum aëration. With regard to the figures for suspended matters, those had been given in his previous papers before the society, and he had not seen the necessity for repeating them. With regard to Trowbridge, he was sorry about Trowbridge. He had offered, at his own expense, to take charge of the works and show that they could be used, but the offer was refused. Mr. Martin, after criticising him, had given him his whole claim. The slate beds were designed to avoid nuisance, and if it were effected the after treatment of the effluent was a small matter by any of the known processes. In reply to Dr. Rideal, anyone who liked to make the experiment with a piece of cheese, butter, or meat fat laid upon humus and treated as a model slate bed, would be able to see for himself that fat was very largely digested. He did not see the point of Dr. Rideal's remarks as to the necessity of treating slate bed effluents before discharge. As he (the speaker) had stated in his paper, and on all previous occasions, slate bed effluents were intended to be treated further, and only in exceptional cases could they be discharged direct into the stream. The suspended matters were now prevented from going on to the filters or contact beds by the provision of humus catchpits.

A New Type of Dwelling.—At the suggestion of the Local Government Board, the Billericay (Essex) Rural District Council on Wednesday decided to amend their building by-laws to allow an Australian. Mr. J. Good, to build a house at Wickford on a new plan. It was stated that the house was a type of Australian dwelling adapted to this country's needs by a system of pile foundations, and that it would go far towards solving the problem of erecting cheap workmen's houses in the district. Originally the council had refused sanction, as the plan was contrary to their by-laws, but Mr. Good appealed direct to the Local Government Board.

Manchester Main Drainage Works.—An event of a somewhat unusual character took place at Manchester last week when the Lord Mayor and Lady Mayoress (Mr. and Mrs. S. W. Royce), their daughter, and considerably over 100 members and officials of the corporation paid a visit of inspection to the new main drainage works which, as stated in our issue of the 29th ult., are being carried out from the plans of the city surveyor, Mr. T. de Courcy Meade, M.INST.C.E., at a cost estimated at about £1,000,000. Up to the present three contracts have been let, namely: Work No. 9—the one examined by the visitors—to Messrs. Aird, Limited, for about 1,290 yds. of sewer and storm overflow; Work No. 10 to Messrs. Kolne & King, Limited, about 5,407 yds.; and Work No. 16 to Mr. John Moffatt, the last-named being principally a rivers improvement, covering a distance of 1,770 yds., and including the provision of a large settling pond. All these works are in progress. At a subsequent luncheon at the town hall Mr. de Courcy Meade's services in connection with the scheme were the subject of a flattering tribute by the Lord Mayor, and the toast of his health—proposed by his lordship—was received with an enthusiasm which was as striking as it was obviously sincere.

Bills of Quantities for Reinforced Concrete.*

By JOHN M. THEOBALD, F.S.I., M.C.I.

I trust it is unnecessary for me to say that, in reading this paper, I am making no reflection upon the quantities supplied by the specialists under the present system, either upon the score of inaccuracy or otherwise. Such a charge would, of course, be quite unjustified and unjustifiable; my criticism is solely directed against the system, and not against its exponents.

The client who is about to erect a building goes, in the ordinary way, to an architect to prepare the plans, and then either he, or his architect with his permission, employs a surveyor to prepare the bills of quantities, who, when the final account is presented, can be cross-examined upon the items. This is what the client likes. This right of criticism gives him a sense of security and makes him feel he is getting value for his money, and it is the absence of this facility for cross-examination that makes some people light shy of availing themselves of the many advantages of reinforced concrete. This may strike you as being very absurd and unreasonable—as no doubt it is—but the feeling of insecurity is there, and any means by which it may be lessened or removed are surely well worth employment.

Lest you may think that this theory is an effort of my imagination, I may mention that, in my own experience, I know of two buildings in which steel construction was used in preference to reinforced concrete solely for this reason.

At the present time, when an architect decides to construct a building of reinforced concrete he sends a set of plans, sections and elevations to one or possibly more firms of specialists, who then submit a scheme of construction under their respective systems, together with an approximate estimate of the cost. The firm whose tender is accepted by the architect then prepare their working drawings, which, with a bill of quantities (also supplied by them), are sent to the contractors, and the accepted tender is either incorporated by the quantity surveyor in the quantities sent to the general contractors, or is the subject of a separate contract, as the case may be.

Reinforced concrete, from the point of view I am taking to-night—that of the quantity surveyor—has but recently emerged from a healthy infancy; but, now that its employment is being adopted on all sides, there is a feeling, not confined to the members of my own profession, that the specialist contractor should receive the same treatment as the builder, and it is with the grounds for that opinion that I propose to deal this evening.

In advocating the claims of the quantity surveyor in connection with reinforced concrete, I am well aware that I shall be told that time does not admit of his employment, and that until the details are complete he would be unable to commence his work, and the delay thereby entailed might be considerable. I may say at once that I admit the objection, and my reply is that the client must wait. If the building were, let us say for argument's sake, a steel-frame building, the steelwork details would have to be prepared, and I am sure that I should be libelling the members of the Concrete Institute if I were to suggest that they take longer to supply their details than do the steel manufacturers.

Of course there may be cases in which rapidity of construction is everything. Under those circumstances, I say at once that the preparation of bills of quantities by a quantity surveyor is impracticable. He may still, however, be advantageously employed in the preparation of a schedule of prices and subsequent measurement. It has been my experience—and I think all architects and engineers will agree—that the average client's conviction that the world will cease to revolve upon its axis unless his particular building is erected in an utterly impossible time is not warranted. It is only natural that he should require the work completed with the least possible delay, and a visit to quantity surveyors' offices at, say, eight, nine, ten, or even eleven o'clock at night should convince him that they fully recognise the necessity for "hustling."

Under the present system the quantities issued by the concrete specialists, by their own showing, are prepared before the working details are complete, and though granting the necessity (which I do not), I admit that they are in a better position to do their work under these conditions than would be the quantity surveyor, by reason of their employment of constants and formulæ of which he would have no knowledge. It must surely frequently happen, however, that in making the various details it is found necessary to alter the drawings from which the original quantities were prepared, and the latter are, consequently, inaccurate to that extent.

I believe that under the present régime their correctness is not guaranteed, which, assuming for sake of argument that the drawings from which the building is subsequently erected differ from those from which the quantities were prepared, would seem to press unduly hard upon the contractor. I say the contractor because I consider the risk in this case is more likely to be his than the building-owners', as the alterations would more probably tend to increase the cost of the building than to diminish it. If I am wrong in my statement or the deduction I have drawn from it, I shall, of course, be corrected. It is obviously not a point upon which a quantity surveyor can have first-hand knowledge.

FORMS OF CONTRACT.

The forms of contract under which reinforced concrete construction is carried out are, as far as my own experience extends, four in number:—

(1) The "lump-sum" contract, in which the contractor undertakes to erect the building for a stipulated amount—no mention being made of the method of dealing with any variations that may be made during the progress of the work.

Anything in the nature of a "lump-sum" contract of this description is, in my opinion, most unsatisfactory. As I am dealing more fully with this particular form of contract under the next heading, I will merely mention that, unless a surveyor be employed, the contractor's account for extras has apparently to be accepted—his original priced bill of quantities not being accessible, presumably, without his permission. This form of contract would not be entered into in the case of an ordinary building, and I fail to see why any exception should be made in favour of reinforced concrete.

(2) The "lump-sum" contract in which the bills of quantities do not form part of the contract, but the contractor undertakes to deposit a copy of his priced bill of quantities, which, as regards prices only, is to form a basis for arriving at the value of any extra or omitted work.

In a large reinforced concrete job upon which I was recently employed under this form of contract there were various mistakes in the bills of quantities—both for and against the building-owner—with which I was, of course, precluded from dealing, and one of the parties to the contract—I emphatically decline to state which—profited thereby.

I need hardly say that I am using this case solely to illustrate my point—the unfairness of the "lump-sum" contract—and not with a view to emphasising the possibility of errors in the quantities. Everybody makes mistakes, quantity surveyors among the number; but in cases of error in the original quantities, the disability under which one or the other of the parties to this form of contract is placed is so obvious that I cannot understand why it is ever entered into. In a few cases, of course, there may be some reason for so doing, but, speaking generally, I can find no argument in its favour.

(3) The "lump-sum" contract, in which the bills of quantities form part of the contract.

This form of contract has none of the disadvantages of the two previous examples. It is certainly fair to both employer and contractor, provided a competent surveyor is employed, but it relieves those responsible for the bills of quantities of all liability for their accuracy. If, however, as I said before, this liability is never accepted, the criticism, of course, has no point.

(4) The "lump-sum" contract, in which the bills of quantities form a schedule only, and the entire building is remeasured.

My only comment on this form of contract is that, unless under circumstances where the erection of the building in the shortest possible period is of

* Extracts from paper read at the last meeting of the Concrete Institute.

vital importance, it seems needlessly extravagant. It is quite possible, however, that the cost of the initial and subsequent measurements may not exceed the alternative cost of the preparation of bills of quantities and measurement of variations.

If, however, I urge the employment of a fully qualified quantity surveyor for the preparation of quantities for reinforced concrete, I do so even more emphatically when we arrive at the question of variations.

It is apparently not usual for the concrete specialists, who prepare the original quantities, to settle the extras and omissions at the completion of the contract. I hasten to add that I am speaking from my own experience only, and if I am wrong in my conclusion I shall doubtless be corrected.

Quantity surveyors, from bitter experience of variations, have learnt to "take off" with a wealth of detail which would probably surprise you if you were to take the trouble to wade through their dimensions.

The methods of the modern quantity surveyor are the outcome of three, if not four, generations' knowledge of the theory and the practice of his profession, and it has probably taken him between seven and ten years of constant application to acquire it. The education of an engineer—with which term I, of course, include the specialist in reinforced concrete—is even more arduous, and the exercise of both professions in the person of one individual requires a Superman!

Had I the good fortune to be an engineer instead of a quantity surveyor, I should welcome the opportunity of placing a laborious, and proportionately less remunerative, portion of my work upon other shoulders.

Let us just see whether the employment of a quantity surveyor would have obviated any of the disadvantages of the various forms of contract I have enumerated.

In the first case, that of the "lump-sum" contract purely and simply, the measurement of the extras by him would, I venture to think, result in a greater degree of accuracy, and would probably be advantageous from the building-owner's point of view. I have never yet been refused access to a contractor's priced bills of quantities, even when I was not legally entitled to see them, and I do not think any contractor would refuse permission to a quantity surveyor, although he would probably—and quite legitimately—decline to hand them over to the building-owner himself.

In the second case, that of the "lump-sum" contract, in which the quantities do not form part of the contract, his employment would be amply justified. For any shortage in the quantities he would be responsible to the contractor, and for any excess of measurement to the building-owner. If I am correct in saying that no responsibility is taken at the present time, the advantages are obvious, both to the building-owner and the contractor; while, assuming an error against the latter, the reinforced concrete specialist would possibly be saved a successful [illegible]

In the third example, that of the "lump-sum" contract where the quantities form part of the contract, the advantages of the introduction of the quantity surveyor are chiefly confined to the method of "taking off" the original quantities and the consequent facilities for dealing with the variations. The responsibility is less, admittedly; but I think any quantity surveyor worthy of the name would prefer to take the responsibility for the accuracy of his quantities at, of course, a slightly increased fee to compensate him for the risk.

In the last case, where the bills of quantities form a schedule only, and the building is remeasured, I rather fancy that no reinforced concrete specialist would be prepared to give the time to such remeasurement, and the quantity surveyor therefore gratefully takes the crumbs which fall from the rich man's table!

Should the employment of quantity surveyors become customary, it will undoubtedly lead to a greater degree of uniformity of method of measurement of reinforced concrete, as at the present time the acquaintance of my profession with yours is not of long standing. I hope, however, that this undesirable state of things, from our point of view, will shortly be remedied, when it is possible that you may find we may eventually prove a blessing in disguise, and even of some slight assistance to you, by relieving you of what I should imagine to be the least interesting portion of your work, and leaving you free to devote your time to that branch of structural engineering in which you have achieved such phenomenal success.

I apologised at the commencement of this paper for introducing a subject which, from its very nature, could be but of indirect interest to you, and I repeat that apology now. My object has been to introduce the subject as shortly as possible, with a view to giving the maximum amount of time to the subsequent discussion, which cannot fail to be of very great interest to the members of both professions.

A NOTE ON WORKING-CLASS HOUSING.*

By B. Wyand,
Secretary of the Institution of Municipal Engineers.

The following brief particulars of a scheme for working-class dwellings which is being considered in London may be of interest in view of to-day's discussion. I am not prepared to go beyond the details I give here, as my notes are gathered merely from an interview with Mr. Albert C. Freeman, consulting architect to the promoters, and from a pencil 16-scale block plan which he showed me.

The proposed building is to be erected in Mile End—an East-end district of London, inhabited by the very poorest population—on a site of 4¼ acres, and accommodation is to be provided for 1,000 tenants. The block will occupy the outside of the site, leaving a large central space for a playground. The entire roof space (some 1,200 ft. run) will form a garden, with a special section for children's "small holdings." Although the building is a continuous one, it will be cut up into what may be termed "blocks" of five apartments on each floor, the idea being to obviate the formation of long corridors, which are draughty, a source of nuisance, and extremely dangerous in case of fire. On the ground floor will be small shops, let at rentals which will enable their keepers to vend food and other commodities at a cheap rate.

Every apartment will be furnished upon a system which, I understand, has been in vogue in the United States for some time. Thus, the beds will fold back into the walls when not in use, and the privacy of the members of the family will be preserved at night by means of collapsible screens. It will be a case of one "apartment" one family. The whole building will be heated by radiators (on the low-pressure system), and neither fireplaces nor coal will be required. For cooking, a small gas-cooker, on the slot system, will be provided in each apartment. The radiators and fittings, it may be interpolated, will be protected by wire guards. In each apartment there will be a sink, and a bath and two water-closets will be provided for each block of five apartments.

The common rooms will include *crèche* (with trained nurses, taking children at one penny per day per head), refreshment-room (with licence), wash-house, smoking-room, library, reading-room and kitchen. Additional slipper baths will be provided at a moderate charge.

The building will, of course, be of fireproof construction throughout, and there will be fire appliances (of a more or less automatic nature) on every floor of every block. Reinforced concrete will be used largely in its construction. All floors will be of composition in colours, so as to obviate the necessity for coverings. The water supply will be from artesian wells on the site, and the electric current for lighting purposes will be generated by the utilisation of waste steam.

The average rental will be 6s. 6d. per week per apartment, and this will be strictly inclusive, the tenants paying for no extras except the slot gas they may use for cooking.

It is scarcely necessary to say that the scheme is, to some extent, a philanthropic one, although it is estimated that there should be a 4 per cent return on capital. Whether it will go through yet remains to be seen.

A West London Improvement.—It is recommended that the London County Council should make a contribution of £15,000 towards the cost of the widening of Argyll-place, Kingly-street, Great Marlborough-street, and Poland-street. The improvement will afford a direct connection between Great Marlborough-street and Noel-street, and will create an alternative route to Oxford-street for traffic proceeding between Bond-street and Soho. The total cost of acquiring the property needed for the improvement is estimated at £111,700.

* Paper read on Saturday last at a meeting of the Institution of Municipal Engineers held at Exeter.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

The premium for November is awarded to

Mr. H. E. LUNN,
Town Hall,
Islington,

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

QUESTIONS.

This week answers are invited to the following questions:—

288. Mechanics.—Explain clearly the distinction between a vector, a scalar, and a rotor quantity. ("Beginner.")

289. Strength of Materials.—Compare the resistances to bending of a wrought-iron I beam, flanges 6 in. by 1 in., web 8 in. by ¾ in., when upright, and when laid on its side, thus ⊢.

290. Design of Struts.—Explain why the resistance of a long strut depends more on the stiffness of the material than on its strength. ("Designer.")

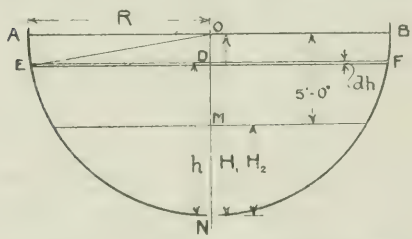
291. Hydrostatics.—Calculate the total and resultant pressures on the interior curved surface of a hemispherical bowl of radius r placed with its diametral plane horizontal and just filled with water. (W. H. B., *Bocking.*)

292. Foundations.—Sheet piling is required round the foundations of a warehouse to hold in the soil, which is of a loose, sandy nature. Give neat sketches showing how this would be carried out. (T. R.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

286. Hydraulics.—A hemispherical cistern is 20 ft. in diameter, and it is full of water. How long will it take to lower the depth of the water 5 ft. if the water escapes through a 3-in. diameter sharp-edged hole in the bottom of the cistern? The coefficient of discharge for the hole is 0·60. (H. V. O., *West Bromwich.*)



Referring to the above figure, suppose the water level to have fallen to any position, as EDF, and let the head DN over the orifice be h.

Let the initial head be H_1
" " final " " H_2
" " area of the orifice " A
and coef. of contraction " K

Then at any head h over the orifice, the discharge $= K.A.\sqrt{2gh}$ cubic ft. per sec.

Suppose during a very small period of time dt the water level falls a further distance dh, then in time dt,

discharge $= K.A.\sqrt{2gh}\,.\,dt.$

The area of water surface at EDF $= \pi.ED^2$ and volume discharged in time $dt = \pi.ED^2 \times dh$.

But $ED^2 = OE^2 - OD^2$
$= OE^2 - (ON - DN)^2$
$= R^2 - (R - h)^2$

$$\therefore \text{Volume} = \pi\left\{R^2 - (R-h)^2\right\}dh$$

$$\therefore K.A.\sqrt{2gh}\,dt = \pi\left\{R^2 - (R-h)^2\right\}dh$$

$$\text{or } dt = \frac{\pi}{K.A.\sqrt{2g}}\left\{R^2 - (R-h)^2\right\}h^{-\frac{1}{2}}\,dh$$

$$\text{or total time, } T = \frac{\pi}{K.A.\sqrt{2g}}\int_{H_2}^{H_1}[R^2 - R + h)^2]h^{-\frac{1}{2}}\,dh \text{ secs.}$$

$$= \frac{\pi}{K.A.\sqrt{2g}}\int_{H_2}^{H_1}(2Rh^{\frac{1}{2}} - h^{\frac{3}{2}})\,.\,dh$$

$$= \frac{\pi}{K.A.\sqrt{2g}}\left[\frac{4}{3}.R.H_1^{\frac{3}{2}} - \frac{4}{3}RH_2^{\frac{3}{2}} - \frac{2}{5}H_1^{\frac{5}{2}} + \frac{2}{5}H_2^{\frac{5}{2}}\right]$$

$K = 0{\cdot}60$; $A = \frac{\pi}{64}$; $\sqrt{2g} = 8$

$R = 10$; $H_1 = 10$; $H_2 = 5$.

$$\therefore T = \frac{\pi}{6 \times \pi \times 8}\left[\frac{4}{3}.10.10^{\frac{3}{2}} - \frac{4}{3}10.5^{\frac{3}{2}} - \frac{2}{5}.10^{\frac{5}{2}} + \frac{2}{5}.5^{\frac{5}{2}}\right]$$

$$= \frac{8}{6}\left[\frac{14}{15}.10^{\frac{5}{2}} - \frac{34}{3}.5^{\frac{3}{2}}\right]$$

$= 2251$ secs.
$= 37$ mins. 31 secs.

(H. E. L., *Islington.*)

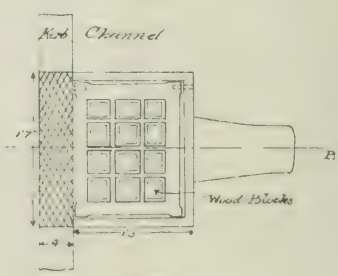
287. Street Gulley.—Will some reader kindly supply a sketch of some form of street gulley, the grid of which is in the face of the kerb and not in the channel of the roadway? ("Anxious.")

Referring to the section of the gulley:—

(*a*) is the well of a cast-iron street gulley, made from 3 to 5 ft. deep to catch the detritus from the surface water, so that a fairly clear liquid may go down the sewer. This part of a gully may be built in brickwork, but cast-iron gullies can be removed and used elsewhere.

(*b*) is the overflow weir in the face of the kerb.

(*c*) is a hinged cover which may be opened for cleansing. It is made of a cast-iron frame,



Plan.

filled with wooden blocks slightly raised from the iron.

(*d*) is a plate of cast iron supported in front of the sewer opening. The lower part of it dips into the water, forming a water-seal to prevent sewer gas rising through the opening to the street. There is a large grooved hole in the plate, which, when not in use is covered by a disc. The disc is removed to admit cleaning rods and for inspection purposes.

This type of gulley is not very effective, especially when the opening is covered by a grid, as water flowing swiftly down the channel will not readily enter an opening on the side of its course, unless the channel is dished round the gulley, when undesirably large pools of water will accumulate. It is better that the opening should be in the channel,

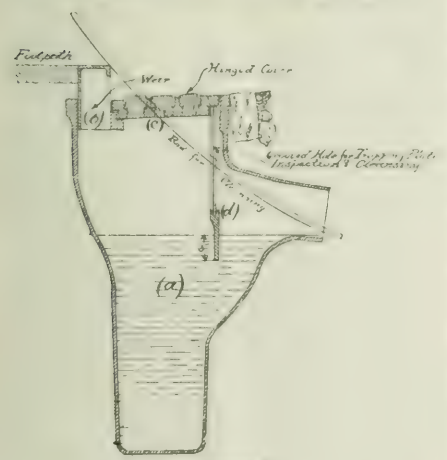
The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
Appointments Vacant	803
Assistants' and Students' Section	788
Association of Managers of Sewage Disposal Works	802
Bills of Quantities for Reinforced Concrete	771, 786
Bituminous Materials	789
Call to Arms	791
Capital Expenditure and Road Maintenance	769, 799
Colonel Jones' Retirement	771
Continental Visits	792
Contour Survey of Bushey, Herts	772
Correspondence	789
Cost of Repaving Works	775
Fire Protection and the London County Council	780
Group Names of Rocks Their Significance in Highway Work	770, 789
Housing of the Working Classes in Rural Districts	770, 774
Institution of Municipal and County Engineers	775, 801
Institution of Municipal Engineers:—	
Joint Southern and South-Eastern District Meeting	776
Notices	802
Institution of Water Engineers	802
Intercepting Traps in House Drains	791
Local Government Board Inquiries	792
London Water: Dr. Houston's Annual Report	769
Lower Thames Valley District Surveyors' Association	802
Manchester Appointment	791
Meetings	803
Municipal Competitions Open	803
Municipal Contracts Open	803
Municipal Work in Progress and Projected	794
Personal	796
Protection of Valves	797
Recent Publications	800
Sewage Pollution in New York Harbour	778
Tenders for Municipal Works or Supplies	805
Test Deflections in Reinforced Concrete	771, 804
Tests of Road Stones in the United States	770, 799
Utilisation of Humus from Slate Beds	771, 783
What is a Garden City?	792
Working Class Housing	787

and as there must be an opening for cleaning, let the cover be a grating, without the filling of wood blocks.

Such a combination of kerb and channel openings is working well in practice, and the grating in the



Section on A B.

channel is no inconvenience to vehicles drawn up at the side of the road.

The total weight of this gulley is about 4 cwts. and the cost runs from 30s. to £2.

(H. V. O., *West Bromwich*

Bath Cattle Market.—On Wednesday the Mayor of Bath formally opened the reconstructed Cattle Market. So complete have been the alterations and improvements that the market is now regarded as a model market in the West of England. By the reconstruction provision is made for 200 cattle and 810 sheep, while temporary accommodation is made for 300 sheep and 56 cattle.

CORRESPONDENCE.

"*be silent in arguance; for fierceness makes error a fault and truth discourteous*"
—GEO. HERBERT, "*The Temple*."

BITUMINOUS MATERIALS.

To the Editor of THE SURVEYOR.

SIR,—Mr. J. Hutchinson, in his letter which appeared in your issue of November 22nd, suggests a discussion in your columns "on the definition" and "the exact meaning to be attached to the words asphalt, bitumen, &c.," but I would point out that these words have always had proper and distinct meanings, and instead of inviting a discussion on the subject I consider it would be more advisable if authorities drew up and issued to road engineers, not merely the correct definitions of the different words, but also—as I suggested in my letter which you were good enough to publish in your issue of August 30th—a list of the countries where native and natural bitumen occur together, with analysis and other distinguishing characteristics of each.

Perhaps Mr. Hutchinson will kindly refer to my former letter. If the specification I suggest were drawn up in a complete manner, this should enable engineers, in the event of the source of any particular material not being stated, to ascertain or determine for themselves the locality from which any certain bitumen or asphalt has been derived.

One of your other correspondents mentions that the Road Board was in its infancy in 1910, and was then taught to say "tar"—a most unfortunate remark, by the way. If this is so it could hardly have grown up sufficiently in this short time to assume the position of instructor, and expound, as he suggests, to engineers the real meaning of the words bitumen and asphalt.

If the definitions of bitumen and asphalt are to be set forth,—and advice, I presume, would also be given as to the suitability, advantages and disadvantages of each material—then this should only be carried out by those who are without question in a position to furnish this information, as to be able to judge of quality it is necessary to have knowledge of the materials being reported upon.

There are, I must say, many points in Mr. Hutchinson's letter that I do not agree with; and may I ask if the definitions your correspondent gives of asphalt and bitumen are those which he suggests should be issued to engineers, or is his contribution subject to revision? It is, of course, impossible to go fully into a question of this kind by correspondence, but I have endeavoured to give in a pamphlet on this subject I hope shortly to issue a few particulars which I think may prove of service to engineers.

Mr. Hutchinson says "bitumens are either native or artificial," and although I have used the term "artificial bitumen" for some time past when describing various materials that are being introduced as "bitumen," I do not suggest or agree that "artificial bitumen" is an established commercial material. On the other hand, I contend that the word bitumen, in any form, should only rightly be applied to natural products, and seeing that the sources where all genuine natural bitumens occur are known, it will be understood, if specifications of all these known bitumens with their distinguishing characteristics are issued, that it would be possible for anyone, by comparing the distinguishing points of any certain material with those given in the specifications, to learn if the material being judged was natural and where it was derived from. Attempting to judge by analysis alone is useless, as the figures can be imitated by mixtures of other materials, and it is the peculiar properties of the various natural bitumens that enable them to be easily distinguished.

It is agreed, I think, by all authorities that bitumen is a natural product, but the exact line between bitumen and asphalt cannot be clearly drawn, as bitumen is found as an impregnation of limestone, sandstone and shale. Aspraltum and Manjak are, again, other forms of bitumen, used in the manufacture of varnish, and as they are in most cases hard, coal-like substances, a definition that describes them simply, and yet accurately, is "hard bitumen." They are practically free from mineral matter, and I cannot therefore agree with Mr. Hutchinson that the Trinidad material should be placed under the same heading as asphaltum, as the former is a totally different material, and contains a fair proportion of mineral matter.

In touching on only a few points, I am afraid

I have taken up a considerable amount of your space, but clear definitions of bitumen, asphalt, &c., should certainly be issued to engineers, and in my opinion this might be done by the Road Board, providing the views of authorities on the subject are taken; or, better still, if a committee of experts was appointed to deal with this and all other matters relating to bitumen. The same course might be adopted with regard to stone, sand, &c., and these committees could report to the main body. It occurred to me that the course I suggest might meet with the approval of all concerned, including those who at present do not appear to be in agreement with some of the steps that are being taken by or on behalf of the Road Board to discover the most suitable method of road construction for modern traffic requirements.—Yours, &c.,

A. E. H. DUSSEK.

Canal Bank,
Deptford, S.E.
November 27, 1912.

To the Editor of THE SURVEYOR

SIR,—I have read the letters of Mr. J. Hutchinson and Mr. C. Nathan on this subject; but some mistake is evidently being made, as the definitions given and some of the views your correspondents express do not agree with the known data of bitumen and asphalt, and Mr. Nathan and Mr. Hutchinson are, in my opinion, in error on several points.

I am at a loss to understand how "limestone impregnated with natural bitumen" can be said by Mr. Hutchinson to be the same as "calcareous rock impregnated naturally with bitumen"—one is impregnated naturally, but the other may be a manufactured composition.

I ask Mr. Nathan if he will kindly explain, without referring me to any of his other articles, &c.—

(1) Why "pure natural asphalt" is the same as "solid bitumen" and where "pure" natural asphalt is found?

(2) Why "asphalte" spelt with an "e" is different to asphalt without an "e," and what is the difference? Why "calcareous rock impregnated with bitumen" is the same as "natural rock asphalt"?—it should surely be "naturally" impregnated with bitumen.

(3) Why "asphaltum" is the same as "the residuum obtained from the distillation of asphaltic or semi-asphaltic base petroleums?"

Does Mr. Nathan say that "Gilsonite" and other similar asphaltums are residuums?

I join issue with Mr. Nathan on each of his three recommendations, and I am more than surprised at his reply to Mr. Hutchinson when he definitely asserts that asphaltum is "the residuum obtained from distillation of asphaltic or semi-asphaltic petroleums."

The meaning of the words asphalt and bitumen should certainly be defined for the use of engineers who may not be acquainted with them, but unless this is done correctly I do not think the definitions are likely to stand for very long without being disputed.—Yours, &c.,

JAS. BASTIAN.

39 Stanhope-gardens,
Highgate.
December 3, 1912.

To the Editor of THE SURVEYOR.

SIR,—The question of a proper nomenclature for road materials of a bituminous nature seems to crop up periodically in yours and other papers devoted more especially to the question of roads and road materials, and the nett result of these periodical discussions is for a new set of definitions to be propounded.

Surely it would be wiser for engineers, surveyors and others to be guided to a certain extent, if not entirely, by the enormous amount of work that has been done in America with this particular class of hydro-carbon.

I am aware that there is a certain amount of prejudice against following American ideas, but surely the results of research, whether performed in Germany, France, the United States, or other countries, should merit due consideration, and the question of the country of origin of any research be of no moment.

In order to systematise the definitions of asphalts, both natural and artificial, Prevost Hubbard, chemist to the Office of Public Roads in Washington, prepared a bulletin, entitled "Bitumens and their Essential Constituents for Road Construction and Maintenance," which defines clearly, from a chemical point of view, all the various types of binders.

As this bulletin is issued officially by the United States Department of Agriculture, it seems a pity, in the absence of any similar publication from a Government source in this country, that individuals should suggest further definitions for a group of materials already clearly defined.—Yours, &c.,

D. NORTHALL LAURIE, F.I.C.

32 Victoria-street,
Westminster, S.W.
November 29, 1912.

FIRE PROTECTION AND THE LONDON COUNTY COUNCIL.

To the Editor of THE SURVEYOR.

SIR,—Since drafting my letter of November 25th, which you did me the honour of printing in your last issue, the chairman of the Building Act Committee of the London County Council, Mr. Taylor, has been at pains to show that his Building Act Department has been more active during the past seven years in dealing with the London Building Act Amendment Act of 1905 than indicated in my communication, where I pointed out that only 527 buildings had on official showing been put in order up to June 12th last, and that some 50,000 cases were awaiting the council's attention.

Mr. Taylor, in the interests of the county council, emphasises the fact that 1,043 certificates were granted in respect to new buildings under sec. 7 since 1905, and he also put on record that 351 cases have been disposed of under sec. 11, and 4,430 applications for exemption have been granted under secs. 10 and 12.

I had no reason for complaining of inattention to new buildings, for I was fully aware that these new structures in respect to which the owners deposit plans are dealt with as a matter of routine. I was complaining of *existing* buildings, and my letter being due to the deaths resulting from the Kensington fire, I naturally referred to buildings coming within the same section of the Act as Messrs. Barker's premises—*i.e.*, sec. 9.

In putting forward the fact that 351 cases have been settled under sec. 11, and 4,430 cases under secs. 10 and 12, Mr. Taylor has raised an entirely new issue as to a further class of existing buildings, which I also consider to have been badly neglected by the London County Council, even if perhaps not as markedly neglected as those coming under sec. 9. This class of building includes the dangerous "projecting shop," and a large number of smaller buildings exceeding 30 ft. in height occupied "other than a dwelling-house by two or more families."

According to the evidence of the superintending architect before the House of Commons, no fewer than 48,566 such cases under secs. 10 to 12 have been notified to his department as requiring attention. Thus, in addition to there being some 50,000 cases awaiting attention under sec. 9, there are to-day as a matter of fact also some 44,000 cases still awaiting attention under secs. 10 and 12. To put it quite plainly, Mr. Taylor, being dissatisfied with my complaint in respect to the 50,000 cases, now compels me to point to a further 44,000 cases, making 94,000 cases in all, awaiting the council's pleasure since 1905.

It had not been my intention to bring two issues forward at the same time. The 50,000 cases were to my mind sufficient to go on with; but now that fresh issues have been raised, I consider it my duty to extend the scope of the matter complained of, and to say that while in the first instance the inattention is largely due to the council not giving the Building Act Department a sufficient staff and proper encouragement, in the fresh matter the inattention is largely due to what I consider the council's policy of not allowing the district surveyors to undertake certain duties which they are quite competent to carry out, and which should largely have been carried out by them under the Act.

Complaint has further been made that when I said the 50,000 cases could be dealt with in the course of the next five years, this would be impossible, and would be inflicting hardships. I wish emphatically to state that it is quite practicable and feasible to attend to the 50,000 cases with a suitable and well-staffed organisation in the course of five years, and, further, that the district surveyors of their fifty districts can easily attend to the majority of the 44,000 cases newly referred to without putting much, if any, strain upon the county council's Building Act Department. It is largely a matter of the earnest of the

council, of staffing and of organisation, and of further allowing the district surveyors to do their duty without undue interference.

Some other critics have suggested that if all these structural alterations were carried out within the next five years there would be a great disorganisation in the building world of the Metropolis. These critics are entirely mistaken. The amount of alteration in quantity and value is comparatively small, compared with the quantity and value of building work done during any active building period of similar length between 1880 and 1910.

I regret again to have to occupy such valuable space in putting forward these facts and making complaints regarding the sluggishness of the London County Council in respect to the administration of the Building Act Amendment Act of 1905, but this question of fire protection is one affecting such a large number of buildings and such a large number of lives that it is impossible to let the present state of affairs rest. The London County Council in its corporate capacity must be made to realise its duties and grave responsibilities as to safety of life in our Metropolis.—Yours, &c.,

EDWIN O. SACHS.

British Fire-Prevention Committee,
8 Waterloo-place, S.W.
December 3, 1912

CALL TO ARMS.

To the Editor of THE SURVEYOR.

SIR,—The Institution of Municipal and County Engineers have recently sounded the above, and with what effect time alone will show.

Much as this "call to arms" is needed, it sounds somewhat strange, as already there is, in the Institution of Municipal Engineers, a body with similar aims, already armed and ready to fight the cause of the municipal engineer. Would not the result have been better and more certain if only the institution had and still would throw out an invitation and get the younger institution to join forces with them? United these institutions could accomplish much, and offer more than each or both separately. They are both institutions of municipal engineers, and the members of each are municipal engineers, while some seventy members are in both institutions. Why, then, the separation and distinction, with each institution undermining the other? While we are content to quarrel and fall out over petty differences, it is no wonder that other institutions step in (see "Associate's" letter in last week's issue).

Will the seventy members belonging to both institutions support this appeal?—for they, being in both camps, should be best able to bring about a fusion of the two institutions; also will those who hold similar views also do their share? Both institutions have different strong points and strongholds, and reach into widely different quarters, so that a fusion would link up the whole municipal chain, without a weak link.

Up to the present qualifications have not been regarded as they are now and will be in the future. This question of qualifications is becoming impossible to all but a few. To-day one qualification is required, to-morrow another, and the next day another, and so on, until one's only chance is to belong to a number of institutions. This, although possible to many who are willing to work, is impossible to most by reason of the expense. I constantly hear the complaint of the expense of maintaining memberships and wonderings if it is worth while.

Only by amalgamations, absorptions, and consolidations of the institutions will the present-day municipal engineer and his assistant, with few exceptions, be enabled to gain the full advantage that these institutions should offer him. Let him then work to this end, and, if he cannot make things possible for himself, at least do something for those who are to come after him.—Yours, &c.,

MEMBER.

December 3, 1912.

INTERCEPTING TRAPS IN HOUSE DRAINS.

To the Editor of THE SURVEYOR.

SIR,—Much has been said, with but little value or effect, as to the facility of rats in obtaining ingress to the house drains through the water seal of the intercepting trap; nevertheless, while admittedly the water seal offers but a weak defence to the incursion of these vermin, if the trap were abandoned, as is advocated by its opponents, there would then be no obstacle or barrier whatever to the passage of rats from the public sewers to the private drains.

The gravest objection brought against the trap is that it is subject to possible chokage; but surely the same argument may be employed against chimneys. Moreover, the chokages that occur in the majority of cases may be traced to insufficient flushing—*i.e.*, to the disproportionate excess of solids to fluids passing through the drains—and it is therefore strong argument in favour of increasing the sparse 2-gallon flush to an effective 3 gallons. In the case of lavatories, baths and sinks the water authorities rightly exercise no restrictions in the quantity of water used for ablutions. Why, then, should such parsimonious stint be practised in regard to water-closets, in which, more than any other appliance in a house, abundant and efficient flushing is vitally essential, and of paramount importance? Cases of stoppage might also be largely decreased if waste waters from baths and lavatories (instead of as at present being allowed to trickle into the drains) were collected in automatic flushing tanks, and discharged in considerable bulk at periodic intervals.

The continued good health of a community depends largely on the perfect sanitary condition of the entire district, and consequently upon the condition of each individual system of house drainage, and to ensure perfection (as far as is attainable) every house drainage system should be periodically inspected and defects remedied. In olden days it was the duty of each householder to sweep and cleanse the footway abutting on his premises, but this obligation now rests with the municipal authority, whose duty it also is to collect all refuse, and as it is admitted that there is great laxity and indifference on the part of householders in attending to and examining their house drainage systems, why should not this work be taken over by the municipal authorities? It may be cited as an argument against inspection of private house drains by municipal authorities that they possess no powers to enter private premises for such purposes unless and until cases of infectious illness arise; but this could easily be arranged by legislation, and I venture to predict would be more warmly welcomed by property owners than are the visits of the surveyors deputed by the Government to survey private premises for the purposes of land tax, and the inspectors for "stamp-licking," "shop-closing," and other such-like Government fantasies, and at least there would be the satisfaction that the health of the public would be benefited.—Yours, &c.,

WALTER JENNINGS, Director,
George Jennings, Limited,
Sanitary Engineers.

63 to 67 Lambeth Palace-road, S.E.,
46 Dover-street, W.
December 2, 1912.

THE MANCHESTER APPOINTMENT.

To the Editor of THE SURVEYOR.

SIR,—I wish to express my admiration of your remarks in the footnote to "Associate's" letter regarding the above in last week's issue of your paper, also to compliment "Associate" upon his action in bringing this subject forward.

"Associate" is but one of several hundred others similarly situated, the only difference being that he is bold and honest enough to protest while the several hundred others are content to grumble and express dissatisfaction and discontent between themselves. I hope that the others will now arouse themselves and let the council of the institution in question know that "Associate" is not alone in his disappointment—that there are others.

"Associate's" letter will, as likely as not, go unsupported, the several hundred others being quite content to read his letter and agree with it when discussing this appointment among themselves. Instead of which, would cases such as these not be earlier remedied by taking the complaint straight to headquarters, and thus bringing the council more in touch with the urgent requirements of those who are rising but slowly from the base of the ladder?

Might I appeal to those who share "Associate's" views to lay their protest now, one and all, and this matter will be quickly set right? The council can be relied upon to do their utmost once they understand the situation, but they can best understand the requirements when, and only when, each associate, &c., goes to the trouble of "expressing the requirements" of the particular case. Thus the council are

enabled to view the case from their various aspects, & to compliment. Yours, &c.

MEMBER.

December 3, 1912.

To the Editor of THE SURVEYOR.

SIR,—The letter in your issue of the 29th, signed "Associate," respecting the above appointment is to be commended, and I think the council of the Institution of Municipal and County Engineers might well take up the question. If I am not mistaken, an assistant was advertised for some short time ago, when precisely the same conditions applied, precluding anyone holding only the diploma of the Institution of Municipal and County Engineers of any hope of success.—Yours, &c.,

ICONOCLAST.

November 29, 1912.

WHAT IS A GARDEN CITY?

To the Editor of THE SURVEYOR.

SIR,—I do not want in any way to intrude in the interesting correspondence now taking place in your journal, but I notice Mr. Price, in his letter of the 26th ult., evidently misses the main point of my letter of the 19th ult. Mr. Price is perfectly correct in quoting me as having said: "First Garden City, Limited, is a commercial company whose sole object is the development of an estate of 4,500 acres at Letchworth *as a garden city.*" The last four words are most important, as they mean that, although First Garden City, Limited, is a commercial company which conducts its affairs on business lines, it recognises the fundamental principles of garden city development—namely: (1) The adequate and scientific planning of the area on which the new town is built, and particularly the limitation of the number of houses per acre; (2) the provision of a wide belt of agricultural land surrounding the town, to be permanently kept free from town development or houses; and (3) the retention, for the new community itself, of the "unearned increment" of the land after a return of 5 per cent to the shareholders and all proper reserves.—Yours, &c.,

HAROLD CRASKE, Secretary,
First Garden City, Limited.

Letchworth, Herts.
December 2, 1912.

CONTINENTAL VISITS.

To the Editor of THE SURVEYOR.

SIR,—The Whitsuntide visit of the Institution of Municipal and County Engineers to Paris was such an excellent one, from every point of view, that I suggest the council of the institution should consider the advisability of arranging one to another city—for instance, Berlin.—Yours, &c.,

A MEMBER.

November 29, 1912.

Leeds Sewerage Scheme.—In a few weeks' time a commencement will be made with the first half of an important scheme of main-intercepting sewers in Leeds. The scheme will cost about £200,000, and it is hoped to complete it in four years.

New Method of Road Coating.—It was reported at the last meeting of the Kent County Council that the county surveyor, Mr. H. P. Maybury, was desirous of applying to some of the hard main roads of the county, where there is a good subsoil, a new method of coating composed of crushed shingle, sand and bitumen. In districts where shingle is obtainable cheaply the process may be largely resorted to. A 1-in. coat of the mixture would not cost more than 1s. per yard super., and the life of the material is estimated at three to four years. The Roads Committee, having inspected a section of road on which this coating has been laid, and finding that it makes a good surface, felt sufficient confidence in the scheme to recommend the council to authorise the acquisition of the plant required for its use on a larger scale. It would be necessary to buy a disintegrating machine and an engine to drive it, also to erect a temporary building to protect the machine from the weather, the whole cost being estimated at £700. The committee recommended that this expenditure should be sanctioned, and the council approved.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Birmingham T.C. (December 2nd. Mr. R. H. Bicknell).—£1,250 for works of street improvement and sewerage in Mason-lane, Erdington; £670 for the purchase of land for widening High-street (city); £1 500 for the extension of cottage baths in Coventry-street; and £5,000 for the provision of cottage baths in Lower Dartmouth-street.—Mr. Prideaux, who appeared to support the application, said Mason-lane formed a link between the main Sutton-road and the main Kingsbury-road. The lane was now 17 ft. wide, and it was proposed to make it into a 42-ft. road. With regard to the baths, the idea was to provide washing baths for the people in the poorer parts of the city, at a nominal cost of 1d. per bath. Further than that, arrangements had been made by which women could bring their children to have a bath at an equally reasonable cost. Up to the present these cottage baths had been a great success. It was proposed to extend the Coventry-street baths so as to give accommodation for twelve more men and six more women; and at Lower Dartmouth-street for eighteen more men and eleven women.

Blackburn R.D.C. (November 20th. Mr. F. O. Stanfield).—£200 and £321 for works of sewage disposal in the townships of Billington and Wilpshire respectively, including the execution of works in the township of Salesbury.—The clerk, Mr. John Birch, stated that in 1910 the Local Government Board sanctioned loans of £1,282 for Wilpshire and £248 for Billington, to enable the council to lay main outfall sewers for the property in the parish of Wilpshire in the neighbourhood of the Blackburn and District Orphanage, and for the treatment of that sewage and of the sewage coming from the Epileptic Colony at Langho. It was proposed to enlarge the works considerably, as they would have to deal with a much larger volume of sewage than they were thought capable of treating. During the progress of the work certain modifications were suggested. The alterations consisted in the main of the introduction of a sewage separator in place of additional septic tanks, which were part of the 1910 scheme, and the alteration of the old filters from contact beds to percolating beds.

Devonport T.C. (November 20th. Mr. W. W. E. Fletcher).—£4,500 for the extension of the infectious diseases hospital.—It was stated by the town clerk, Mr. R. J. Fittall, that, subject to the sanction of the board, a contract had been entered into with the manor authorities for the purchase of 3 acres of ground adjoining the present site. The price to be paid was £4,381, and extras would bring it up to £4 501, and so they were asking for a loan of £4,500 for the purchase, to be spread over a period of sixty years for repayment. The extension of the building would be dealt with in a subsequent application, after they had settled with the board as to the form the new buildings would take.

East Grinstead U.D.C. (November 19th. Mr. A. G. Drury).—£1,890 for the purchase of two plots of land adjoining the council's sewage farm; for fencing the new cemetery; and for drainage work in Matthews-hill, West-hill, Ship-street and Hermitage-lane, East Grinstead.—The surveyor, Mr. W. E. Woollam, stated that the population of the district was growing, and as the land adjoining the sewage farm was in the market he considered it was a good opportunity of acquiring it. He gave details as to the working of the sewage farm. The land was not ideal for sewage purposes, and it would be much better to have a larger area than if the land was of a more porous nature. The inspector: You think the acquisition of this land is necessary for future requirements? The surveyor: Yes. The inspector: I may take it that this land is required more or less to secure a zone? The clerk: Yes.—There was no opposition to the various schemes.

Nottingham T.C. (November 28th. Mr. Edgar Dudley). £860 for the purchase of 5,400 sq. yds. of land with a view to widening part of Hucknall-road to 0 ft. The city engineer, Mr. Arthur Brown, and the town clerk, Mr. W. J. Board, furnished the necessary particulars, and there was no opposition.

Pembroke (Co. Dublin) U.D.C. (November 20th. Mr. P. C. Cowan).—£9,000 for the purpose of carrying out works in connection with the electric light under-

taking in the township.—It was stated by the town clerk, Mr. J. C. Manly, that while the undertaking was run at a loss from 1901-9—a gradually decreasing loss—it started for the first time with a profit of 16 guineas, as appeared from the accounts. During the past three years the profit had increased, with the result that on March 31st last the undertaking showed a profit of £1,779. Mr. S. L. R. Price, electrical engineer, gave particulars of how the loan was to be applied—*viz.*, £2,927 for new generating plant; batteries, £2,475; buildings, £1,587; new condensing set and pump, £600; provisional sum, £525; purchase of free wiring installations, £279.

Somerset C.C., Axbridge R.D.C. and Weston-Super-Mare U.D.C. (November 27th. Mr. R. H. Bicknell).—This was an inquiry with respect to an agreement entered into by the Somerset County Council, the Axbridge Rural District Council, and the Weston-super-Mare Urban District Council, with a view to improving a narrow road leading from Brent Knoll to the Weston-super-Mare boundary, the ultimate intention being that the road should be taken over as a main road by the county council. The immediate matter for consideration consisted of applications made by the rural district council and the Weston Urban District Council, respectively, for power to borrow sums of £4,000 and £1,000 respectively, toward the cost of the improvement. The total estimated cost of the work is £7,500, toward which £2,000 represents a grant made by the Road Board, and £500 to be contributed by the county council. The length of road affected is 5¾ miles, and the area of land sought to be acquired is 3¾ acres. Numerous witnesses were called—the majority being officials of the authorities concerned. Figures were given as to a traffic census taken by the county council, and the evidence of several witnesses tended to show that, owing to the unsatisfactory means of approach and exit provided by the road, Weston was largely shunned by motorists, while it was explained that members of the Road Board who had inspected the locality had, in addition to recommending the grant, expressed themselves strongly in favour of the improvement scheme being carried out.

Southwick U.D.C. (November 20th. Mr. H. Shelford Bidwell). £450 for works of surface-water drainage.—Mr. J. E. Dell, clerk to the council, explained that it was really for the continuation of the main surface-water sewer to the north of the Green, and that by a supplementary resolution the council had decided to apply for an additional £100, in reference to the former application. The surveyor, Mr. G. B. Warr, explained the plans, and in dealing with the cause of the flooding said the water percolated through the Downs chalk and ran freely through the sandy subsoil until it came to marl, when it was retarded and rose to the surface.

Sutton-in-Ashfield U.D.C. (November 27th. Mr. Edgar Dudley).—£600 for an improvement in Low-street.—This street, it was explained, was the principal thoroughfare in Sutton, and was practically a dividing line between the old and new parts of the town. Property here realised higher prices than in any other part of the town. The area required was 49 sq. yds., which, at the purchase price of £600, worked out at about £12 5s. per yard. On the opposite side of the street land had been sold in large quantities at £9 per yard. In this case the vendors would set back the buildings at their own expense, and the land purchased would be thrown into the street.

York T.C. (November 27th. Major J. Stewart).—£2,350 for the completion of the new street from Pavement to Piccadilly.—The city surveyor, Mr. F. W. Spurr, stated that the new street would be a public highway, and would probably be a main road. The by-laws provided for 42-ft. streets, while the new street would be 50 ft. wide. The pavements would be 8 ft. wide, and the carriageway would be 34 ft. The work was not commenced, and no payments had been made. A certain amount of filling in of the roadway would be required. They did not expect to have to pay for the material for filling in the road. The facing of the road would be tar-macadam, while the pavements would be flagged with 2½-in. concrete flags. The inspector: You don't think the tar-macadam will last twenty years? Mr. Spurr: I think it will, with some repairs. The inspector seemed surprised at the statement, and asked Mr. Spurr if the tar-macadam would have to be renewed within five years. Mr. Spurr: Certainly not; certain repairs may have to be done.

APPLICATIONS FOR LOANS.

Cardigan T.C.—£1,800 for water supply extensions.

Chelmsford R.D.C.—£3,000 for the provision of cottages

Eastleigh and Bishopstoke U.D.C.—£450 for a public convenience.

Hartshorne R.D.C.—£2,200 for Fictonall water scheme.

Hebden Bridge U.D.C.—£220 for the provision of new stabling.

Margate T.C.—£5,500 for a bathing pavilion.

Newbury T.C.—£300 for gas suction plant at the sewage pumping station.

Norwich T.C.—£900 for school extensions.

Orsett R.D.C.—£2,500, excess loan for Stanford sewerage works.

Stoke-on-Trent T.C.—£12,000 for electricity services and plant.

Walton-upon-Thames U.D.C.—£500 for the provision of new stables.

LOANS SANCTIONED.

Bourne R.D.C.—£1,771 for the erection of industrial dwellings.

Brighouse T.C.—£3,000, to be repaid in thirty years, for renewing water mains.

Bromley T.C.—£715 for private street improvement works.

Harrogate T.C.—£2,700 for the erection of a glass and iron annexe to the royal pump room.

Nelson T.C.—£21,462 for private street improvement works.

Newbury T.C.—£3,210 for school extensions.

Preston T.C.—£4,500 for street improvements.

Stoke-on-Trent T.C.—£1,696 for a new wing to the Penkhull schools, and £550 for street improvement works.

Thakeham R.D.C.—£300 for experimental works in connection with the Starrington water supply.

Wem R.D.C.—£250 for a water supply scheme for Tilley.

West Suffolk C.C.—£3,256 for the erection of an infants' department at Brandon, and alterations to existing buildings.

York T.C.—£3,030 for the purchase of land for a recreation ground.

FORTHCOMING INQUIRIES.

DECEMBER.

		£
9	**Wembley.** For street and recreation ground purposes (Mr. R. H. Bicknell) ...	10,420
10	**Caterham.** For sewage disposal works (Mr. P. M. Crosthwaite)	2,200
10.—	**Edmonton.** For the provision of a public convenience (Major J. Stewart)	1,300
10.—	**North Bromsgrove.** For sewage disposal purposes (Mr. R. G. Hetherington) ...	10,019
10.—	**Rochdale.** For electricity purposes (Mr. T. C. Ekin)	15,000
10.—	**Stockport.** For the extension of the police buildings (Mr. F. H. Tulloch)	15,000
11.—	**Bishop's Stortford.** For the provision of a public convenience (Major J. Stewart)	390
11	**Colne.** For water supply and paving works (Mr. T. C. Ekin)	16,975
11.—	**Farnworth.** For private street works (Mr. Courtenay Clifton)	17,000
11.—	**Worcester.** For electricity purposes (Mr. H. R. Hooper)	7,900
12.—	**Denton.** For gasworks purposes (Mr. T. C. Ekin)	3,070
12.—	**East Ham.** For the provision of sanitary conveniences (Major J. Stewart) ...	1,991
12.—	**Littleborough.** For street improvement purposes (Mr. Courtenay Clifton) ...	2,350
12.—	**Lleyn.** For works of sewerage (Mr. A. G. Drury)	350
12.—	**Tamworth.** For street improvement purposes (Mr. F. H. Tulloch)	1,200
13.—	**Dewsbury.** For the purchase of property for street widening (Mr. Courtenay Clifton)	1,050
13.—	**West Ham.** For the provision of public convenience (Major J. Stewart)	2,400
14.—	**Portslade-by-the-Sea.** For the provision of council offices (Mr. Edgar Dudley) ...	1,000
17.	**Wimbledon.** For the extension of Wimbledon Common (Mr. Edgar Dudley)	10,500

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Building—Auckland £3,200, Bucks £2300, Edinburgh, Ilkeston, Middlesex £3,000, Wilts £12,000; housing and town planning—Aberystwyth, Acton, Carnarvon; refuse collection and disposal—Finsbury, Newport; roads and materials—Aberdeenshire, Surrey; sewerage and sewage disposal—Wrexham; water, gas and electricity—Egremont £22,307; miscellaneous—Huddersfield.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

BUILDINGS.

Auckland U.D.C. Municipal buildings are to be provided at an estimated cost of £3 200.

Blackpool T.C.—Plans have been approved for public conveniences in Middle-walk.

Braintree U.D.C.—The tender of Mr. W. Potter, of Braintree, at £336, has been accepted for the erection of offices and dressing sheds at the swimming bath.

Bucks C.C.—The Amersham Grammar School is to be enlarged, at an estimated cost of £2,300.

Cambridge T.C.—Messrs. E. H. Shorland & Brother, Limited, of Failsworth, Manchester, have just supplied their warm-air ventilating patent "Manchester" stoves with descending smoke flues to the Melbourne-road Schools, Cambridge.

Edinburgh T.C.—The Public Health Committee have expressed approval of the general principle of the establishment of a crematorium in the city and agreed to recommend that the council should approve of such a structure being erected in Warriston Cemetery. —The Plans and Works Committee have approved the provision of a sixty-stall public wash-house, at an estimated cost of £6,000, and the city superintendent has been instructed to obtain estimates.

Essex C.C.—The tender of Mr. J. Rayner, of East Hanningfield, at £1,115, has been accepted for the erection of a new school at Cold Norton.

Harrogate T.C.—The various tenders required in the erection of a glass and iron annexe to the Royal Pump-room, estimated to cost £2,700, have been allocated as follows: Excavator and mason, C. A. Nettleton, £320; carpenter and joiner, F. Harvey, £505; glazier, Braithwaite & Co., £177; painter, W. Norman, £52; fibrous plaster, W. H. Horn, Limited (Bradford), £153; ironfounder, Carron Company (Stirling), £925; copper roofing, Braby & Co., Limited (London), £382; wood block flooring, Burgess & Co. (Liverpool), 5s. 1d. per yard; marble top counter, Emley & Sons (Newcastle-on-Tyne), £18. The borough surveyor, Mr. C E. Rivers, expects the work to be completed about Whitsuntide.

Ilkeston T.C.—Mr. E. B. Hall, architect, has been instructed to prepare plans and estimates for extensions to the town hall.

Middlesex C.C.—On Thursday of last week, on the report of Mr. H T. Wakelam, the county surveyor, that Walton Bridge was in a dangerous condition, it was decided to substitute steel decking for the existing timber decking, which was described by a member as being "absolutely rotten," and the surveyor was authorised to obtain tenders for the work the cost of which was estimated not to exceed £3 000.

Montrose T.C.—A proposal for the extension of the burgh hall, at an estimated cost of £3,000, is under consideration.

Torquay T.C.—The borough surveyor, Mr. H. A. Garrett, has prepared an amended plan of the proposed fish market, the estimated cost of which is £295, and it has been decided to invite tenders for the work.

Wilts C.C.—A scheme has been approved for the extension of the county council offices at Trowbridge, at an estimated cost of £12000, exclusive of furnishing.

HOUSING AND TOWN PLANNING.

Aberystwyth T.C.—A tender has been accepted to build thirty workmen's dwellings at Trefechan, for £4,972.

Acton U.D.C.—Consideration is being given to a recommendation of the Works Committee for the provision of workmen's dwellings on city garden lines, the plans of which have been prepared by Mr. Yorath, deputy-surveyor.

Ampthill U.D.C.—The question of providing workmen's cottages is under the consideration of a special committee.

Birkenhead T.C.—The council have accepted the offer of Sir William Lever of the Storeton estate for £145,000. The reason prompting Sir William to make the offer was the interest he takes in town planning and to put into practice the strong opinion he holds that the land adjoining a large town should be acquired by the municipality to enable it to control future developments. The estate was recently purchased by Sir William, and he makes no profit by the sale. The land adjoins the borough, and is a beautiful residential district, 1,538 acres in extent.

Buckfastleigh U.D.C.—The surveyor, Mr. A. Warren, has been instructed to prepare plans and specifications of a scheme for workmen's dwellings, each house to contain not less than three bed-rooms.

Cambridge T.C.—The council have accepted the tender of Messrs. Kidman Brothers, at £1,724, for the erection of twelve workmen's dwellings.

Carnarvon T.C.—A scheme has been conditionally approved for the housing of the working classes. Under the first part of the scheme it is intended to acquire land for the erection of sixty-four houses at rentals ranging from 5s. to 6s. per week, while another part provides for twenty-five houses renting from 3s. to 4s. per week. The scheme in its entirety is estimated to cost about £20,000.

Edinburgh T.C.—A committee of the corporation recommend that a town planning scheme should be prepared for the area of the old slaughter-houses and the adjoining ground in Fountainbridge.

Harrow U.D.C.—A town planning scheme, to include all the area unbuilt upon on both sides of the Hill, has been prepared, and application for sanction will be shortly made to the Local Government Board.

Pembroke (Co. Dublin) U.D.C.—Eighty-eight cottages, erected at a cost of nearly £24,000, were formally opened last week. The rents vary from 4s. 4d. to 7s. per week.

St. Austell U.D.C.—Purchase prices and other particulars are to be obtained in respect of suitable sites for the erection of workmen's dwellings in various parts of the town.

PARKS AND OPEN SPACES.

Birmingham T.C.—The council agreed on Tuesday last to purchase a plot of land at the junction of Sheepcote-street and Grosvenor-street West, at the price of £3,540 (or 20s. 11d. per square yard), as a recreation ground. Another plot in Lawford-street is also to be acquired, at 10s. per square yard, as a recreation ground.

Lincoln T.C.—The council have agreed to a contribution of £500 being made from the funds of the Waterworks Committee towards laying out the pleasure grounds in Westgate, on condition that a portion of the disused reservoir be converted into a swimming bath.

Manchester T.C.—It has been agreed to purchase 10½ acres of land as an extension of Platt Fields Park, at a price of £750 an acre.

Paignton U.D.C.—It has been agreed to purchase, for £4,467, a stretch of sand known as Preston Beach, this sum to include the purchase of a vacant space of land adjoining the beach, which it is suggested should be utilised as an additional recreation ground, and as public tennis, croquet and bowling courts. The surveyor, Mr. C. O. Baines, has been instructed to prepare a plan for laying out the ground.

REFUSE COLLECTION AND DISPOSAL.

Finsbury B.C.—At a recent meeting of the council a discussion took place on the report of the Wharf and Cleansing Committee, recommending the purchase of two petrol motor wagons, at an estimated

cost of £700 each. Mr. Owen Richards opposed the recommendation. One, at least, of the metropolitan boroughs that had adopted motor traction had scrapped their wagons in a short time. Mr. E. H. Tripp did not think a case had been made out to justify the council embarking on so heavy an expenditure. Mr. G. Beard said that motor traction was more expeditious than the horse vehicle, and municipalities ought to be up to date. Mr. L. Phillips, chairman, said he sincerely believed that the work of the borough could be done more economically by motor traction than by horse vehicles. The report was rejected by a majority of thirty to eleven

Largs T.C.—The two-cell refuse destructor erected for the burgh of Largs by Messrs. Heenan & Froude, Limited, Manchester, was inaugurated last week. Mr. J. A. Robertson, electrical engineer of Greenock, was consulting engineer in connection with the installation.

Newport (Mon.) T.C.—It is proposed to establish a refuse destructor on the east side of the river, and in the neighbourhood of the corporation power station.

ROADS AND MATERIALS.

Aberdeenshire C.C.—The question of a road improvement scheme at Aboyne estimated to cost £3,900, is under the consideration of the Deeside District Committee.

Burton-on-Trent T.C.—Property of the value of £1,250 is to be purchased for the purpose of the further widening of Station-street.

Camberwell B.C.—The borough surveyor, Mr. William Oxtoby, has this week submitted a report on the tarring and gritting of the roads in 1912, in which he states that the number of roads treated is 252, of which more than half had been coated in previous years. It is, he said, generally understood that unfavourable weather conditions immediately adversely affect the work of tar-spraying. The past summer has an unfortunate record in that respect, consequent on which the operations were seriously interfered with and the programme curtailed. Inadequate supplies and delays in deliveries of materials, attributable to the transport workers' strike, also tended to retard progress. The prices of materials have been much higher this year, and an improved rate of pay has been given to the men employed on the work. Noting these facts, it is with great satisfaction he is able to report a much reduced average cost per super. yard in respect of both materials and labour, as compared with the corresponding figures for 1910 and 1911. New boilers and specially selected working plant (purchased in anticipation of this year's work) in place of improvised machinery that in previous years had been used, no doubt have contributed to this favourable result, while, of course, as is to be expected, the men employed are becoming more efficient through continued experience. The total average cost in the six districts was 1·361d. per square yard, compared with 1·65d. in 1911 and 1·68d. in 1910.

Crimsby R.D.C.—It has been decided to purchase a tar-spraying machine from the Lincoln Asbestos Company, at a cost of £20 10s. The sprayer is capable of spraying 3,500 yds. per day of ten hours when worked according to the firm's suggestions. The cost, it is stated, does not exceed ¼d. per square yard, inclusive of all material used.

Hexham R.D.C.—A grant of £250 has been made by the Road Board for the improvement of the road surface.

Nottingham T.C.—The Improvements Committee recommend the purchase of the necessary land for the widening of Derby-road, at an estimated cost of £285.

Penybont R.D.C.—The tender of Mr. Rees Jones, junr., of Coychurch at £1,086, has been accepted for street works at Aberkenfig.

Rawmarsh U.D.C.—A committee has been appointed to go into the question of widening a portion of High-street, and to confer with the West Riding County Council with a view to obtaining a grant for the work from the Road Board.

Stoke Newington B.C.—The estimate of £4,200 to cover the cost of strengthening the foundation and renewing the wood paving in Lordship Park has been agreed to, and the tender of Messrs. William Griffiths & Co., Limited, for carrying out the work, has been accepted.—Land to the value of £1,410 has been purchased for widenings in Park-street and Church-street.

Surrey C.C.—It has been resolved that in any new contract which might be entered into with the Godalming Town Council, the county council should contribute as part of such contract two-thirds of the costs of paving with sectional hard-wood blocks, 5,130 yds. super. of the main roads in the borough by way of annual payments not exceeding £276 per annum for a period of ten years, and a sum of £24 4s. per annum for a further period of ten years; also, that the county council should contribute a sum not exceeding £66 in respect of the wood-paving work not included in the above-mentioned loan.—The county surveyor, Mr. A. Dryland, has made a survey for a new road to form a loop on the Portsmouth-road between Bevensey Brook Bridge and the village of Esher. The main purpose has been to find an alternative route for an entirely new road between the two points, so as to afford better ingress and egress to London from the south-west. It has been decided to forward the scheme to the Road Board. The survey of the suggested improvement of the East and West road, between Shalford and Reigate, is, it is reported, nearly completed.

Torquay T.C.—The borough surveyor, Mr. H. A. Garrett, reports that he has tar sprayed about 9 miles of road during the past season, at a cost of £499.

Windermere U.D.C.—Consideration is being given by the Highways Committee to the plans and estimates of several important improvements on the Patterdale-road, connecting Windermere with Kirkstone Pass. A considerable portion of the expense will be borne by the Westmorland County Council, and the total cost is put at £1,693 the estimates being based on the assumption that the land necessary will be given by the adjacent owners.

SEWERAGE AND SEWAGE DISPOSAL.

Chelmsford T.C.—With respect to the question of the disposal of trade effluents, the council have adopted a resolution affirming the urgent necessity of amending the law as recommended by the Royal Commission on Sewage Disposal, so as to ensure effectual preliminary treatment of the refuse or the payment of a reasonable charge to the local authority, and requesting the President of the Local Government Board to introduce legislation on these lines in the next session of Parliament.

Rawmarsh U.D.C.—It has been decided that the construction of the storm-water drain in Dilks-road shall be carried out by the council's workmen.

Wrexham R.D.C.—A drainage scheme for Coedpoeth, estimated to cost £9,000, is under consideration.

WATER, GAS, AND ELECTRICITY.

Bewdley T.C.—The corporation have instructed Messrs. Berrington, Son & Watney, of Wolverhampton and Westminster, to report on the existing water supply works and the proposed extensions for the supply of water to Stourport.

Chirk R.D.C.—The council have adopted the scheme of Messrs. Berrington, Son & Watney, of Wolverhampton and Westminster, for the water supply of the district, and are applying to the Local Government Board for sanction to a loan to carry out the necessary works.

Droitwich R.D.C.—The council have instructed Messrs. Taylor & Wallin (Mr. Harry W. Taylor, ASSOC.M.INST.C.E.), of Newcastle-on-Tyne and Birmingham, to prepare a scheme of waterworks for the parish of Crowle.

Egremont U.D.C.—The tender of Messrs. Waring & Sons, of Huddersfield, at £22,307, has been accepted for the new water supply scheme.

Newry U.D.C.—The question of an improved water supply is to be considered at a special meeting of the council to be held at an early date.

Oswestry R.D.C.—The council have instructed Messrs. Berrington, Son & Watney, of Wolverhampton and Westminster, to prepare the detail plans and estimates of the proposed water supply scheme for submission to the Local Government Board.

St. Pancras B.C.—The tender of the Brush Electrical Company, Limited, at £14,050, has been accepted for a 5,000-kw. Ljungstrom turbine for the King's-road generating station.

Spalding R.D.C.—The Council have appointed Mr. Silcock, of Leeds, to advise them as to the completion of the water scheme taken over from the South Lincolnshire Water Company.

Thakeham R.D.C. Experimental works are to be carried out in connection with the proposed water supply for Storrington.

Tynemouth T.C.—The results of the working of the electricity undertaking last year were the most favourable yet obtained. The gross profit was £7,500—more than 10 per cent on the nett capital expenditure outstanding at the beginning of the year. The nett profit was £1,305, against £911 in the previous year.

MISCELLANEOUS.

Colne T.C.—It has been decided to apply for the necessary powers for the transfer of the Colne and Trawden Light Railways Company's undertaking. The council are proceeding by Bill instead of Provisional Order, as it holds out a probability of securing a longer term for the repayment of the necessary loan and permission to borrow money for working capital.

Huddersfield T.C.—A Parliamentary Bill is to be promoted for tramway schemes, waterworks extensions, a superannuation scheme, and a small extension of the borough. The tramway proposals include extensions to Brighouse (to join the Halifax Corporation system), to West Vale (viâ Elland), to Marsden, to tap the upper portion of the Colne Valley, and other extensions to Crosland Hill, Kirkheaton, and Dodlee, Longwood. Another proposal is to purchase the Deanhead reservoir from the Deanhead Commissioners for between £12,000 and £13,000.

Wandsworth B.C.—With respect to a representation from the Stepney Borough Council in opposition to the proposal of the London County Council to establish railless traction, this council have adopted a resolution affirming that they see no reason for any obstacle being put in the way of the London County Council in endeavouring to provide improved means of locomotion, provided proposals to erect overhead equipment are subject to the approval of the borough council concerned.

PERSONAL.

Mr. James Davies has been appointed surveyor for the Tenby district of the Pembroke Rural District Council.

Mr. C. Turton, surveyor to the East Grinstead Rural District Council, has had his salary increased by £165 for the year ending December 31st next, for his services in connection with the Ashurst Wood sewerage scheme.

Mr. George Sheppard, who has recently retired from the position of borough surveyor of Newark after thirty-seven years' service, and is now consulting engineer, has been presented by the officials of the corporation with a piece of plate and a framed illuminated address.

Mr. A. Dale was on Monday last appointed city architect of Nottingham, at a salary of £450 per annum, and Mr. F. B. Lewis, who has had to retire through ill-health, will continue in the service of the corporation as consulting city architect, at a retaining salary of £250.

Mr. E. Park, who was recently appointed surveyor to the Sedbergh Rural District Council, served his articles with Mr. W. F. Y. Molineux, surveyor and engineer to the Ulverston Rural District Council, from 1904 to 1908, and was assistant to Mr. John Banks, F.S.I., land agent and surveyor, Kendal, from 1908-9, afterwards filling the position of assistant under the Ulverston Rural District Council. Mr. Park is a member of the Institution of Municipal Engineers.

Mr. George Bell, borough surveyor of Swansea, took the chair at the first annual dinner of the Swansea Municipal Officers' Association held recently. In the course of his presidential address he said he was astonished lately by being told that within the next ten years the country would have eliminated public bodies from its system. This was contrary to his opinion. So far as he could see, the tendency would be for the State to relegate further powers and responsibilities to local authorities.

Messrs. G. A. Ballard, city engineer's office, York; E. H. Colcutt, Road Board offices, Westminster; J. R. Hill, town hall, Rochdale; L. W. Kershaw, engineer's office, Tyburn, Birmingham; F. P. Kindell, [illegible] offices, Bexhill-on-Sea; A. J. G. Maffin, Bernard and Sons' chemical works, E. J. T. Manchester, Brisbane Water and Sewerage Board; W. H. Newton, sewerage engineer's office, Leeds; G. D. Sweetman, town hall, Islington; A. E. Wheatley, town hall, Manchester; and S. Whitehead, borough engineer's office, Nelson, have been elected associate members of the Institution of Civil Engineers.

Mr. John A. Brodie, city engineer of Liverpool, is (says the *Liverpool Post and Mercury*) now on his way to Delhi to complete the commission he and others undertook at the request of the Indian Government in connection with the laying out of Delhi, the new capital of the Indian Empire. Mr. Brodie left Liverpool on Thursday last week, and on Friday he proceeded to the Continent, en route for his destination, viâ Brindisi, where he will join the steamer "Persia," of the P. and O. Line, for Bombay. The steamer is expected to arrive at that port on the 13th inst. Mr. Brodie will be away for about two months, and the experts with whom he is associated will, on completion of their engagement, present their report to the Indian Government.

Municipal Work in the East Indies.—A report by the Registrar of Imports and Exports at Singapore states that the Municipal Commissioners of Penang anticipate the expenditure of about £6,300 on water fittings and meters, motor vehicles, and a fire engine.

New Park for Wimbledon.—At the meeting of the Wimbledon Town Council on Wednesday it was decided to enter into an agreement for the purchase of Wimbledon Park estate, with its lake and lands adjoining, at a cost of £65,000. The property is to be converted into a public open space.

Street Lighting in Leeds.—The system of high pressure lighting installed in several Leeds thoroughfares by the Corporation Gas Committee for demonstration purposes has been considered by the Street Lighting Committee, who feel that the system is too costly. They have consequently requested the Gas Committee to remove the lamps within a month.

Dover Improvements.—Dover Corporation on Tuesday approved an amended scheme for the building of a viaduct road and the carrying out of improvements in the pier district, at a total cost of £103,981. The South-Eastern and Chatham Railway have agreed to pay £40,000 towards the cost of the viaduct road, which will form the approach to their new Marine station. The total cost to the town, after allowing for resales of land, is estimated at £54,381. Negotiations have now to be carried out with the Local Government Board concerning the rehousing of people displaced in the district.

FOR OTHER ADVERTISEMENTS

See End of Paper.

WANTED, by the Horsham Rural District Council, a number from two to six Movable Shelters for the Treatment of Consumptive Patients; must be strongly constructed, capable of being easily moved from place to place, and suitable for the accommodation of one patient in each shelter.—Reply, stating lowest price and full particulars, with earliest date of delivery, to the Chairman, Health Committee, care of A. C. Coole, Esq., Clerk to the Rural District Council, Carfax, Horsham. The Council do not bind themselves to accept the lowest or any offer.

WANTED—second-hand oil engine, 10 to 20 h.p., with or without plunger pumps, preferably three-throw.—Surveyor, Town Hall, Hants.

THEORY OF ENGINEERING CONSTRUCTION. A reference-book for Civil Engineers and Students. By Ernest H. Essex, A.M.I.C.E. 8¾ in. by 5¾ in. 216 pp. Cloth gilt, 5s. Post free, 5s. 3d. Comprising a selection of Notes and Formulæ on the Theory of Construction, arranged in the form of Answers to the Questions set at Examinations for the Election of Associate Members of the Institution of Civil Engineers.

"Students of engineering construction are indebted to Mr. Essex for his book. . . . The book will have its use for students who are preparing for examinations, and to go through it will be found an excellent exercise for all who have to follow construction as a business." *The Architect.*

"The examples chosen refer to problems of general professional interest, and the solutions are well reasoned and neatly expressed. As an adjunct to scientific text-books the volume ought to be useful, and it may also be serviceable as a guide to candidates for examination." *The Builder.*

London: St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, E.C.

THE PROTECTION OF VALVES.

AN EFFECTIVE METHOD OF BUSHING.

Air pumps and other valves, whether hard or flexible, have frequently, as is well known, to be discarded before the body of the valve is worn out, owing to the enlargement of the central hole resulting from the wear caused by the vertical movement on the stud. The effect of this is illustrated in Fig. 1, from which it will be seen that the valve is rendered useless, as portions of the holes in the valve grating become exposed and the vacuum is seriously impaired, if not altogether destroyed. In order to meet the difficulty, engineers have hitherto attempted to bush valves, but with very qualified success. So much is this the case that it has been found that even vulcanising the bushes into the valves has not been sufficient to secure them for any length of time, and that once the bushes become loose they wear the

FIG. 1.

holes so badly that they have to be cut, frequently ruining and even destroying the valve after very short service. This method of bushing the valves is illustrated in Fig. 2.

The Dermatine Company, Limited, 95 Neate-street, S.E., call the attention of practical engineers and pump makers to the new patent anchor gunmetal bushes for both flexible and hard valves (Hart and Fiegehen's patent), an invention which it is claimed has solved the problem. As will be seen from Figs. 3 and 4, the bush is embedded and vulcanised into the valve in such a way that, it is claimed, it cannot under any circumstances work loose, and, while preventing wear on the central hole, allows the valve

FIG. 2.

to seat itself readily on the grating. In the case of flexible valves the arms of the valve are hinged so as to allow the valve to "saucer" readily (Fig. 3). With hard valves, again, there is just sufficient flexibility with the wire loop (Fig. 4) to prevent the bush on the seating of guard irons cracking the valve, which is liable to occur with the old rigid metal bushing. The new bush has been adopted by a number of well-known engineering and textile firms and companies, by the Metropolitan Water Board, and by several municipal corporations, including Brighton, Bournemouth, and Aston Manor.

The foregoing remarks in regard to this method of bushing valves suggests a reference to the firm's own valves for air-pump and other purposes. These valves are made of the widely used material known as "Dermatine." Belts made of "Dermatine" are also extensively used in various parts of the world. They are of uniform width and thickness, and it is claimed for them that they stand heat and damp, or

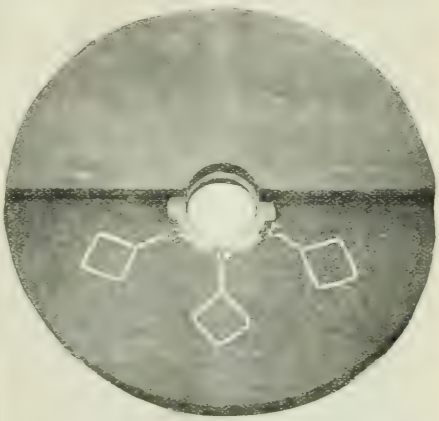


FIG. 3.

seams are as strong as the belt itself, and therefore do not slip on the pulleys, and are practically noiseless in use. The belting is made of the best long staple flax, 3-ply warp, and the very strongest cotton duck weft. The flax yarn is specially selected, and the whole woven to stand hard wear. The fabric, after a special preparation, is incorporated in "Der-

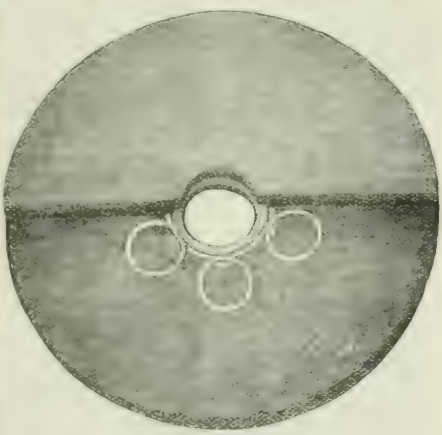


FIG. 4.

is sewn with several rows of special strong thread, [illegible] many belts, an impossibility. Other important applications of "Dermatine" are hose, and cup, ram, and pump rings. The hose is extensively used by local authorities for flushing, sewage pumping, fire brigade, and other purposes, though these are said by no

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Sewage Disposal in the United Kingdom (By Henry [illegible] Cousin, B.Sc. Pp. 78. 6d. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.) . . . gives a concise but comprehensive outline of the present position with regard to the question of sewage disposal. The main portions of the book are [illegible]

Sewage Pollution in New York Harbour.

METROPOLITAN SEWERAGE COMMISSION'S REPORT.

[The following is an extract from the report of the above commission, issued August 1st last, giving the opinion of the commission as to the degree of cleanness which is necessary and sufficient for the water of New York Harbour.

To arrive at a decision as to the degree of cleanness suitable for the waters of New York Harbour, it is necessary to consider what is required on the score of public health and decency. Risk of disease is of paramount importance, but it is not the only consideration.

At the outset it must be understood that, in order to improve the present polluted condition of the harbour, public works will be required. Were it not for the expense involved, practically all the sewage which is produced in the cities bordering on the harbour could be carried to some distant point and there be purified or applied to agriculture or discharged into the sea. Were the harbour as clean as it could be made, it is doubtful if the water would be employed otherwise that as at present. The danger of accidental and direct pollution would make the taking of shellfish for food unsafe within the harbour limits. The benefit of bathing without danger of contracting disease can be obtained by the establishment of bathing pools supplied with clean water and by suitably protecting the sea beaches.

The harm done by excessive pollution of the harbour water is indisputable. Although experts differ with respect to the amount of sickness which is produced by sewage contaminated water, the commission considers that there is considerable danger in coming in contact with it, whether through bathing, fishing, the eating of shellfish, or otherwise. Water which is black, greasy and effervescing with sewage, and in which plainly recognisable ingredients of sewage exist, should not be tolerated in any part of the harbour.

SEWAGE WORKS RECOMMENDED.

It is evident from the studies made by the commission that large quantities of sewage can be assimilated by the waters of the harbour without risk of creating offensive conditions, and if the dangers which lie in bacterial impurities be disregarded, it will be possible to discharge into these waters, without injury and without excessive cost for public works, large quantities of sewage from which the most objectionable matters have been removed. The commission considers that in many parts of the city the construction of disposal works which make use of the principles of screening and sedimentation in combination with outlets which will secure a prompt diffusion of the treated sewage in the water is the remedy now required, and that these works should be so built as to form part of a more extensive and composite plan for the exclusion of sewage from the harbour if greater protection should be needed in the future.

Upon the matter of the jurisdiction which should be exercised over the harbour, the commission, in its report of April 30, 1910, expressed the opinion, which it now reiterates, that it would be desirable to establish by Acts of the Legislatures of the States of New York and New Jersey an inter-State sewerage commission to protect the harbour waters. If this inter-State action cannot be brought about, then the conservation of the harbour waters of the Metropolitan District of New York should be undertaken by a New York Commission.

DEGREE OF CLEANNESS.

With regard to the degree of cleanness that should be maintained in the harbour waters, the commission is of opinion that no single standard, such as the amount of dissolved oxygen present, would be practicable. As a result of much thought, many investigations and the best expert advice procurable, the commission has adopted for its guidance the general standards of requirements stated below:

(1) Garbage, offal, or solid matter recognisable as of sewage origin, shall not be visible in any of the harbour waters.

(2) Marked discoloration or turbidity due to sewage or trade wastes, effervescence, oily sleek, odour or deposits shall not be caused, perhaps in the immediate vicinity of sewer outfalls, and then only to such an extent and in such places as may be permitted by the authority having jurisdiction over the sanitary condition of the harbour.

(3) The discharge of sewage shall not materially contribute to the formation of deposits injurious to navigation.

(4) Except in the immediate vicinity of docks and piers and sewer outfalls, the dissolved oxygen in the water shall not fall below 3·0 cubic centimetres per litre of water.* Near docks and piers there should always be sufficient oxygen in the water to prevent nuisance from odours.

(5) The quality of the water at points suitable for bathing and oyster culture should conform substantially as to bacterial purity to a drinking water standard. It is not practicable to maintain so high a standard in any part of the harbour north of the Narrows, or in the Arthur Kill. In the lower bay and elsewhere bathing and the taking of shellfish cannot be considered free from danger of disease within a mile of a sewer outfall.

The report from which the above extracts are made was issued on August 1st last, and, like its predecessor, issued April 30, 1910, is in three parts. Part I. describes the sanitary condition of the harbour and discusses the question of its pollution in easily understood terms. Part II. gives the commission's opinion, and the opinions of various persons consulted by the commission, as to the degree of cleanness which should be considered necessary and sufficient for the water. Part III. contains tables and plottings of analytical data relating to the condition of the harbour. An extensive table of contents and numerous page and sectional headings facilitate reference to the various subjects contained in the report. Details of this report have appeared from time to time, and have been dealt with in these pages. We may add, however, that the present volume is presented in a highly attractive form, and contains a mass of information, particularly in the results of microscopic examinations, numbers of bacteria and dissolved oxygen, with many tables and diagrams and several maps, rendering it valuable for reference.

Collection of House and Trade Refuse.—A paper on this subject will be read by Mr. J. O. Neumann at a meeting of the Institute of Sanitary Engineers to be held at Caxton Hall, Westminster, on Monday, the 16th inst. The chair will be taken at 8 o'clock by Sir John A. Cockburn, M.D., K.C.M.G.

Producer Gas.—A paper on "The Generation and Distribution of Producer Gas in South Staffordshire" will be read by Mr. H. A. Humphrey, M.INST.C.E., at a meeting of the Institution of Civil Engineers to be held at the Institution of Mechanical Engineers on Tuesday evening next. The chair will be taken at 8 o'clock.

Preliminary Studies in Bridge Design.—This little book,† a reprint of articles which appeared in THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, is intended as the first of a series of similar volumes which, taken together, will form a treatise on the design of ordinary highway bridges of moderate spans. This first volume goes further back in the evolution of the bridge than do most treatises, and considers the bridge in its essential elements, that is as the means of providing a crossing for man and beast across a watercourse. The bridge engineer is apt to forget this primary purpose and to consider his bridge merely as a framework or a carrier of stresses. Mr. Ryves, in a refreshingly original manner, has emphasised the necessity for studying natural and economic predispositions, one might say, of the bridge site, with a view toward producing, not the best type of bridge, but the best method of getting the river and the traffic across one another. . . . —*Engineering News*, New York.

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* With 60 per cent of sea water and 40 per cent of land water, and at the extreme summer temperature of 86 deg. Fahr., 3 cubic centimetres of oxygen per litre corresponds to 68 per cent of saturation.

† By Reginald Ryves, Assoc.M.INST.C.E. London: St. Bride's Press, Limited, 24 Bride lane, E.C. Price 2s. net.

TESTS OF ROAD STONES IN THE UNITED STATES.

GENERALISATION AS TO SERVICE RESULTS.

A bulletin recently issued by the United States Office of Public Roads contains a description of the tests carried out to determine the physical properties of rocks used for road making, and an interpretation of the results of these tests. In addition, there is a "discussion" of the behaviour of similar materials in service. The tests made are those for: (1) Hardness, (2) toughness, (3) wear-resistance, (4) cementing value, (5) specific gravity, and (6) absorption of water. The following summaries, from a table included in the report, relate to the more important of the rocks tested, and have been prepared for the purposes of the present article.

The rocks tested included the following, the number of samples tested in each case following the name:—

Amphibolite, 16; andesite, 63; basalt, 183; chert, 52; conglomerate, 9; diabase, 217; diorite, 72; dolomite, 183; felsite, 11; gabbro, 42; gneiss, 152; granite, 219; limestone, 718; marble, 37; peridotite, 5; quartzite, 90; rhyolite, 42; sandstone, 340; schist, 136; shale, 9; slag, 55; syenite, 27.

SUMMARIES OF MAXIMUM AND MINIMUM VALUES.

Extent of the variation in specific gravity in each case.—

More than 1·0. Sandstone, slag, 0·8 to 1·0; chert, gabbro, granite, limestone, peridotite, rhyolite, syenite.

0·6 to 0·8: Conglomerate, diabase, dolomite, gneiss, quartzite.

0·4 to 0·6: Amphibolite, schist.

0·2 to 0·3: Felsite, basalt, diorite, marble, shale.

Average specific gravities:—

Above 2·9: Amphibolite, diabase, gabbro, peridotite, schist, slag.

2·7 to 2·9: Basalt, diorite (2·86), dolomite, gneiss, marble.

2·6 to 2·7: Andesite, conglomerate, felsite, granite, limestone, quartzite, sandstone, shale, syenite.

Below 2·6: Rhyolite (2·56), chert (2·55).

Maximum water absorption, lb. per cubic foot:—

Over 10 lb.: Andesite, chert, limestone, sandstone.

6 lb. to 10 lb.: Dolomite (9·4), rhyolite (7·15), basalt (6·4).

4 lb. to 5 lb.: Shale, slag, syenite.

3 lb. to 4 lb.: Conglomerate, felsite.

2 lb. to 3 lb.: Diabase, 2·73 (217 samples); granite, 2·77 (136 samples); marble; quartzite, 2·95 (90 samples).

Below 2 lb.: Amphibolite, 1·65 (16 samples); diorite, 1·63 (72 samples); gabbro, ·97 (42 samples); gneiss, 1·24 (152 samples); schist, 1·35 (136 samples)

NOTE.—That for maximum absorption a small number of samples counts against the merit of a low figure.

Minimum water absorption, lb. per cubic foot.—

All were below 0·51 lb.

0·2 lb. to 0·3 lb.: Conglomerate, chert, peridotite (5 samples).

0·1 lb.: Marble.

0·05 lb. to 0·10 lb.: Dolomite, schist, syenite.

0·05 lb.: Andesite, diorite, quartzite.

0·04 lb.: Amphibolite (16 samples), gabbro, granite (219 samples), slag.

0·03 lb.: Diabase (217 samples), rhyolite (42 samples).

0·02 lb.: Gneiss, felsite (11 samples), limestone (718 samples), sandstone (340 samples).

NOTE.—That for maximum absorption a large number of samples counts against the merit of a low figure.

Maximum French coefficients of wear-resistance:—

Above 40: Amphibolite, sandstone.

30 to 40: Basalt (30·4), diabase, gabbro (30·8), granite, schist (31·7).

25 to 30: Andesite, diorite (25), syenite.

20 to 24: Felsite, gneiss, limestone, quartzite, rhyolite.

15 to 20: Marble, slag.

10 to 15: Chert, conglomerate, peridotite.

NOTE.—A large number of samples counts against the merit of a high figure for maximum wear-resistance.

Minimum French coefficients of wear-resistance:—

Above 10: Felsite (only 11 samples).

Above 5: Diabase, gabbro, quartzite.

3 to 4·1: Amphibolite (16 samples), diorite, rhyolite (4·1), slag (3).

2 to 3: Syenite (2·8), andesite, basalt, dolomite, gneiss.

Below 2: Chert, granite (but with 219 samples), limestone (718 samples), sandstone (340 samples), schist (136 samples).

NOTE.—A large number of samples reduces the demerit of a low minimum figure for wear-resistance.

LABORATORY TESTS AND SERVICE RESULTS.

It is pointed out in the bulletin that it would "be impossible to judge accurately the qualities of a road material from laboratory tests alone, unless supplemented by the experience obtained by observation of similar material in service." The discussion of results applies "only to materials which are to be subjected principally to horse-drawn traffic, as ordinary macadam roads have been found impracticable when much automobile traffic exists."

Trap Rocks.—It is concluded that, excepting the cementing test, which sometimes gives values lower than those corresponding to the results of experience, the laboratory tests of trap rocks tally with the results of service tests.

Limestone and Dolomite.—It is concluded that the results of laboratory tests furnish a very fair indication of the probable behaviour of the material in service.

Chert.—Usually shows good wear resistance, and better binding qualities in service than those indicated by cementing tests. The following are quoted in full:—

Granites. Lack of toughness and binding power renders the granites, as a class, unfit for use in any but the foundation courses of macadam roads. The laboratory test will usually show these defects, except in the case of highly altered material, which will invariably show a good cementing value in the laboratory. Experience has shown, however, that even such material should not be used for surfacing on account of the ease with which it disintegrates under traffic.

Sandstones.—The laboratory tests do not agree concerning sandstones as closely as they should with the results in practice. This is especially true in their wearing and binding qualities, for, although these tests quite frequently run high in the laboratory, it is undoubtedly true that, except in some instances, material of this nature is unsuitable for use except in the foundation courses. As a rule, therefore, it is necessary in judging this material only to determine whether it has sufficient strength to stand up under the roller.

Chert.—Chert is a very hard material, and usually shows good resistance to wear and rather low cementing value in the laboratory. It has been found, however, that it in general develops good binding qualities on the road.

Gneiss, Schist and Slate.—Owing to their foliated structure, gneiss, schist, or slate should never be used in road construction when a better material is available.

Marble and Quartzite.—Neither marble nor quartzite is of much value to the road builder for the wearing courses of macadam roads, the first on account of the crystalline structure, and the second on account of its extreme hardness and lack of binding power.

"Fluate."—The manufacturers of this material—in regard to which an inquiry appeared in last week's issue—are, a correspondent informs us, the Bath Stone Firms. "Fluate" is a waterproofing composition for brick and stone walls.

Northampton Polytechnic Institute.—The annual prize distribution and students' conversazione will take place this (Friday) evening. The distribution of prizes and certificates will be performed by the Marquess of Northampton, K.G. The conversazione for members and students will be continued to-morrow, when the institute's building in St. John-street, Clerkenwell, will be thrown open to the whole of the members and students and their friends.

Municipal Engineering (Edited by Sydney G. Turner, ASSOC.M.INST.C.E. Price 3s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.).—This volume consists of model answers to questions set at recent examinations of the Institution of Municipal and County Engineers, and is the second edition. It is practically identical with the first issued. It is not suggested that it should take the place of recognised text-books, but it provides useful summaries of various subjects, as well as indications as to how different types of questions may be answered. Every effort has been made to render the answers as accurate and comprehensive as possible, though they contain more than a candidate would be expected to supply. The answers are founded upon examinations held in Birmingham, London and Manchester. The appendix contains examples of questions on sewerage, sewage disposal, tramway construction, bridges, water supply, road construction, buildings, sanitary science as applied to towns and buildings, drainage, and other matters.—*Local Government Journal.*

Some Recent Publications.*

The Law Relating to Electric Lighting, Power and Traction. By the late John Shiress Will, K.C. Fourth edition, by W. E. Tyldesley Jones, of Lincoln's Inn, Barrister-at-Law. Price 27s. 6d. London: Butterworth & Co.

This is the fourth edition of the late Mr. Shiress Will's well-known work and as it is about ten years since the third edition appeared, it will be readily seen that there was a good deal of work to be done by the reviser and editor. During the last decade the law relating to electrical undertakings has much increased in importance owing to the vast amount of capital which has been sunk in these enterprises. The same period has also witnessed many important changes and developments in the law. In this connection it is sufficient to refer to the passing of the Electric Lighting Act of 1909, the considerable body of new law which has been established by judicial decisions, and the advent of the railless trolley car, with the consequent necessity of devising new appropriate clauses for the Acts authorising this system.

In the light of these and other changes, it is only to be expected that the revision effected in this fourth edition is of a very substantial character. The introduction, which comprises a concise, yet comprehensive, survey of the law, has been entirely rewritten. The main body of the work is divided into two parts, dealing respectively with the law relating to electric lighting and power, and that relating to electric traction. The method of arrangement adopted in regard to Part I. is to print the full text of the various statutes, an exhaustive note being appended to each section. It will be generally conceded by those accustomed to the practice of the law that this is the best way of arranging a book of this kind if accuracy is to be secured, as there are innumerable pitfalls in the path of anyone who attempts to paraphrase an Act of Parliament. Inasmuch as all cross references are duly set out in their proper places in the note to each section, and the volume is provided with a very full index, it is not a difficult matter to find *all* the provisions which apply to any given subject, if the reader desires to do so. Appended to the statutes are forms of provisional order, power act, &c., and the rules, regulations and forms of account prescribed by the Board of Trade, the London County Council, and other authorities.

Part II. of the work consists of an introduction devoted specially to electric traction, the text of the Railways (Electrical Power) Act, 1903, a series of model clauses, and the Board of Trade regulations, &c. In the case of a book of this kind which has a long-established reputation, the task of the reviser and editor is not an easy one, inasmuch as his work naturally suggests comparison with that of the original author. It is sufficient to say that, judged by this high standard, the new edition for which Mr. Tyldesley Jones is responsible does not fall behind its predecessors, and we are confident that "Will on Electric Lighting" will continue to be regarded as an indispensable part of the equipment of those legal practitioners who are concerned with this branch of the law, and of those engineers who are charged with the administration of electrical undertakings, and who consequently require an authoritative and readily accessible legal guide.

Street Pavements and Paving Materials. A Manual of City Pavements: Their Methods and Materials of Construction. By Geo. W. Tillson. Second edition. Price $4 net. New York: John Wiley & Sons.

The first edition of this standard work was published twelve years ago. Since then a number of new pavements have been introduced, and modifications of methods of constructing the old pavements have been made. This has necessitated a thorough revision of much of the book. New chapters on concrete pavements and the protection of pavements have been added. The book's chapters now reads as follows: (1) History and Development of Pavements, (2) Stone, (3) Asphalt, (4) Brick Clays and the Manufacture of Paving Brick, (5) Cement, Cement Mortar, and Concrete, (6) Theory of Pavements, (7) Cobble and Stone-block Pavements, (8) Asphalt Pavements, (9) Brick Pavements, (10) Wood Pavements, (11) Broken-stone Pavements, (12) Concrete Pavements, (13) Plans and Specifications, (14) Construction of Street Car Tracks in Paved Streets, (15) Width of Streets, Kerbs, Sidewalks, &c., (16) Asphalt Plants, (17) The Protection of Pavements.

One of the most interesting chapters in the book is that on the theory of pavements in which such matters as cheapness, durability, resistance to traffic, non-slipperiness, ease of maintenance, favourableness to travel, and sanitariness are discussed. The following formula is given for determining the annual expense of a new pavement: $A + CI + \frac{R}{N}$, where N is the life of the proposed pavement, C the cost per square yard, I the rate of interest, R the estimated total cost of repairs if distributed over the entire life, A the sinking fund to be paid each year to equal C at the end of N years. When the annual cost for the repairs of a pavement exceeds the sum given by the above formula a new pavement should be laid.

The book is practical as well as theoretical, and must be regarded as one of our best standard works on the subject.

A Text-book on Roads and Pavements. By Fredk. P. Spalding. Fourth edition, revised and enlarged. Price $2 net. New York: John Wiley & Sons.

The motor car has given rise to many new problems in road building, both in the city and country, and has led to extensive scientific study of the materials used for road building. This has necessitated a re-writing of the present book and its issue in a fourth edition, materially enlarged.

The book is an elementary treatise on the general subject, and covers country roads as well as city pavements. The following are the chapter headings: (1) Road Economics and Management, (2) Drainage of Streets and Roads, (3) Location of Country Roads, (4) Improvement and Maintenance of Country Roads, (5) Broken-stone Roads, (6) Bituminous Macadam Roads, (7) Foundations for Pavements, (8) Brick Pavements, (9) Asphalt Pavements, (10) Wood-block Pavements, (11) Stone-block Pavements, (12) Concrete Pavements, (13) City Streets. The work is well arranged and well printed, but lacks one essential feature of a scientific book—there is no index.

Vol. clxxxviii. of the "Proceedings" of the Institution of Civil Engineers contains four papers, or groups of papers, selected for discussion. The first, "Experiments on the Strength and Fatigue Properties of Welded Joints in Iron and Steel," by T. E. Stanton and J. R. Pannell, is somewhat beyond the range of practical interest of Surveyor readers. The three next, taken together for discussion, were: "Reinforced-Concrete Wharves and Warehouses at Lower Pootung, Shanghai," by S. H. Ellis; "The Direct Experimental Determination of the Stresses in the Steel and in the Concrete of Reinforced-Concrete Columns," by W. C. Popplewell; and "Composite Columns of Concrete and Steel." These papers have a direct bearing on reinforced-concrete structural work, including bridges, in which columns of reinforced concrete often play an important part. A paper on "The Central Heating and Power Plant of McGill University, Montreal," by R. J. Durley, provoked an interesting discussion, in which, among others, Prof. Coker, Mr. F. W. Jennings and Sir Charles Parsons took part. The last group consisted of two papers: "The Water Supply of the Witwatersrand," by D. C. Leitch, and "Investigations Relating to the Yield of a Catchment Area in Cape Colony," by E. C. Bartlett. The discussion and correspondence following these papers occupy seventy-two pages of the book, and the considerations brought forward were, in several cases, of much interest. Among the names of those taking part in the discussion or contributing to the correspondence the following are prominent: Mr. Baldwin Latham drew attention to important facts and figures, especially in connection with gaugings of streams in various parts of England. Mr. E. P. Hill criticised the methods of water engineers in dealing with rainfall and run-off data. Mr. M. B. Duff discussed rainfall data, and compared figures for maximum run-off with the maximum run-off as computed by Dickens' formula. Mr. W. J. Olive criticised Mr. Bartlett's paper with respect to rainfall and run-off, and referred to the

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

elaborate Burkli-Ziegler formula. Mr. R. Ryves also discussed this part of the subject, and suggested that the Ryves and Chamier formulas should be compared with results obtained by gaugings in South Africa. A number of engineers discussed the conditions in the areas under consideration, and the works described in Mr. Leitch's paper. These papers, with the discussion and correspondence, form an important contribution to the literature of water engineering.

TEST DEFLECTIONS IN REINFORCED CONCRETE.

At a meeting of the Society of Engineers (Incorporated) held on Monday evening, Mr. Percy J. Waldram, F.S.I., M.C.I., read a paper on "Test Deflections in Reinforced Concrete," a subject which, he stated, was one requiring the closer attention of engineers before a standard of deflection was fixed by the proposed London County Council regulations, a standard which might or might not be correct or even safe.

The stiffness of a beam was no criterion of its strength unless due regard were paid to the factors of depth and fibre stiffness. The small deflections of reinforced concrete beams were sometimes quoted as evidence of the strength of the material, but it was seldom noted that the deflections were small because the greatest loads placed on reinforced concrete were very much less than those commonly used upon wood or steel. Reinforced concrete was a much weaker material than steel or ordinary fir for beams of equal size.

The draft regulations for reinforced concrete compiled and approved by the London County Council were submitted to the principal architectural and engineering institutions for criticism, and published in the "Minutes" of the council. The author had been consulted in a case where the parties had agreed to work to the regulations as published, when the opportunity of applying them to the problem of a somewhat difficult design gave disquieting results. For instance, the clauses determining the strength of columns were quite unworkable, and those relating to deflection proved positively dangerous, as was shown by examples.

A standard of deflection suggested by the author was referred to, but he pointed out that the effect of end fixing was not yet fully determined, and that it was impossible to legislate on an uncertain basis. The minute range of the deflections made it all the more necessary to use the greatest care in fixing a standard.

Reference was then made to the calculations necessary to determine the strength of reinforced concrete beams, and a number of formulæ were given, with explanatory notes. The application of these to well-known tests was shown by a series of graphs, and particular attention was directed to one in which the conditions were such as were general, supposed to make the calculations almost impossible, on account of their intricacy. By the author's method, however, the problem was shown to be very much facilitated.

Problems in Engineering with Solutions.* —The English journal THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER carries on a section devoted to various questions which might be put in an examination for the position of municipal engineer in an English town or city. The questions are given one week and answers provided by various correspondents given in subsequent issues. The volume noted above is the first one to be made up from the questions and answers. As is well known, the position of municipal engineer in England is one of most varied activity, so that the subject covered by the questions and answers extends through the whole field of engineering. For example, the chapter headings are as follows: Mechanics and Hydrostatics; Strength and Elasticity of Materials; Theory of Structures; Surveying and Levelling; Water Supply and Hydraulics; Sewerage; Sewage Disposal; Road Making and Tramways; Building Construction and Materials; Law and Miscellaneous. While the questions and most of their solutions are distinctly British in character, the wide range of subjects and the method of treatment make the book of some value to American engineers. There is a good deal to be said in favour of the question and answer method of instruction.—*Engineering News.*

* Being Questions and Answers reprinted from the Assistants' and Students' Sections of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER. First Series, 1909-10. Edited by Sydney G. Turner, A.C.G.I., M.INST.C.E. London: St. Bride's Press, Limited. Price 6s. nett.

HEAVY MOTOR TRAFFIC.

THE HORNSEY TEST CASE.

At the last monthly meeting of the Middlesex County Council the Highway Committee reported that they had been in communication with the Hornsey Borough Council on the subject of a certain road in the borough, the carriageway of which was of macadam and unsuited to such traffic. The effect of the traffic on the road had been disastrous, and rendered necessary very heavy expenditure. They had taken counsel's opinion, and were advised by Mr. Macmorran, K.C., that they had a good case against the motor omnibus companies under sec. 23 of the Highways and Locomotives Amendment Act, 1878, amended by sec. 12 (1) of the Locomotives Act, 1898. The borough council proposed to bring a test case in the High Court, and they asked the Highway Committee to contribute a share of the costs of the action. The committee were of opinion that the county council could not reasonably be expected to contribute to the costs incurred by the Hornsey Council. It was stated by a member that the road in question was not a main road, and that any decision obtained would not govern main roads. It was resolved, however, to send the matter back to the committee for further consideration.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. THOMAS, M.INST.C.E., County Surveyor, Buckinghamshire.

A meeting of the Institution of Municipal and County Engineers will be held at Caxton Hall, Westminster, this (Friday) evening.

PROGRAMME.

7 for 7.30 p.m. Assemble in Room 13 at Caxton Hall, which adjoins S. James's Park (District Railway) Station.

8 p.m. Discussion on paper entitled "Rail Corrugation," by Mr. H. T. Wakelam, M.INST.C.E., county engineer, Middlesex.

10 p.m. Light refreshment.

CHAS. JONES, M.INST.C.E.,
Hon. Secretary,
Borough Engineer,
Ealing, W.

EASTERN DISTRICT.

Chairman—Mr. ALFRED FIDLER, M.INST.C.E., Northampton.

An Eastern District meeting is to be held at Lyons' Victoria Mansions Restaurant, Victoria-street, Westminster, to-morrow (Saturday).

PROGRAMME.

4 p.m. Meeting of the Eastern District Executive Committee at the offices of the institution, 11 Victoria-street, Westminster, S.W. Note.—The members of this committee were elected at the Grays meeting, and have been circularised.

6 p.m. Dinner at Lyons' Victoria Mansions Restaurant (Victoria-street, Westminster). Tickets 2s. 6d. each.

7 p.m. Discussion on the report of the Departmental Committee of the Local Government Board in reference to Intercepting Traps on House Drains, to be opened by Mr. H. P. Boulnois, M.INST.C.E.

8 p.m. Music and conversation.

8.30 p.m. Suggestions and discussion in regard to the work of the institution, with special reference to the Eastern District.

A cordial invitation is given to members of the district to attend the Eastern District meeting and the dinner and discussion.

ERNEST J. LITCHFIELD, M.INST.C.E.,
Hon. District Secretary,
Borough Engineer,
Southend-on-Sea.

SOUTH-EASTERN DISTRICT.

A meeting of members of the above district will take place at Sidcup at 2.30 p.m. on Wednesday, January 8th, when the road sections will be inspected.

Mr. Maybury has kindly consented to supply the re-

vised cost of the trial lengths up to December 31st; the meeting will be followed by a dinner at Frascati's Restaurant, Oxford-street, at 6.30 p.m.

MEETING AT SWANSEA.

A meeting of the institution will be held at Swansea on Saturday, January 11, 1913.

Thomas Cole,
Secretary.

11 Victoria-street, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. Frank Latham, M.Inst.C.E.I., F.S.E., Borough Engineer and Surveyor, Penzance.

COUNCIL MEETING.

At a meeting of the council held on November 27th the following applicants were recommended for admission:—

To Membership: Messrs. B. H. Noble, surveyor, Alford Urban District Council; R. G. Whitley, engineer and surveyor, Bentley-with-Arksey Urban District Council; and H. J. Godfrey, surveyor, Cricklade and Wootton Bassett Rural District Council.

To Associate-Membership: Mr. W. J. Thorp, road surveyor, Harrogate Corporation.

Transfer to Membership: Messrs. G. F. Andrassey, architect and assistant engineer and surveyor, Chelmsford Rural District Council; and C. T. Fulcher, deputy surveyor, Shoreditch Borough Council.

(Under the new by-laws these elections will be ratified at the next council meeting if no written objections are lodged within fourteen days.)

New Members, &c.—From the applicants recommended for admission at the last meeting, seven members and two associate members were elected, and one transfer was made to the membership class.

Royal Sanitary Institute Congress.—The president was deputed to represent the institution at the congress to be held at Exeter in July.

Provincial Council Meetings.—It was decided that two provincial council meetings should be held during the present financial year, one in the Northern and one in the North-Western District.

Next Council Meeting.—It was decided that, owing to the Christmas holidays, the next meeting of the council be held on Saturday, December 21st.

B. Wyand,
Secretary.

39 Victoria-street, S.W.
November 30, 1912.

INSTITUTION OF WATER ENGINEERS.

President—Mr. J. S. Pickering, M.Inst.C.E., borough surveyor and water engineer, Cheltenham.

WINTER GENERAL MEETING.

The seventeenth Winter General Meeting of the Institution of Water Engineers will be held at the apartments of the Geological Society, Burlington House, W., on Saturday, December 14th. The proceedings will commence at 10.30 a.m., or as soon as the business of the special general meeting called for 10 o'clock is completed. The usual informal dinner will be held on Friday evening.

The following papers have been promised for reading and discussion:—

(1) "Some Recent Examples of Pollution of Public Water Supplies," by J. C. Thresh, D.Sc., M.D., &c.

(2) "The Valuation of Water Undertakings on Transfer to Local Authorities," by E. J. Silcock, M.Inst.C.E., F.S.I.

(3) "Recent Advances in the Science of Water Purification" by Adolph Kemna, D.Sc.

Advance copies of these papers will, it is hoped, be available for the use of those wishing to take part in the discussions, but as only a limited number will be printed early application should be made.

Programme.

10.30 a.m.—The minutes of the seventeenth ordinary general meeting and of the special general meeting will be read and submitted for confirmation; ballots will be taken for council for the year 1913-14, and for new members; reading of papers and discussions thereon.

The meeting will be adjourned for luncheon or otherwise as circumstances may require.

Percy Griffith,
Secretary.

20 Victoria-street, S.W.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

President—Mr. John D. Watson, M.Inst.C.E., F.R.San.I.

ANNUAL GENERAL MEETING AND DINNER.

The eleventh annual general meeting and dinner of the Association of Managers of Sewage Disposal Works will take place on Thursday next the 12th inst., at the Holborn Restaurant, London.

Programme.

11 a.m.—Council meeting.

2 p.m.—Annual general meeting, York Room; chairman's annual report; balance-sheet; general business.

2.45 p.m.—Lieut.-Colonel Alfred A. S. Jones, V.C., M.Inst.C.E., past-president, will present a paper, "Eighth Report of the Royal Commission"; Mr. Arthur J. Martin, M.Inst.C.E., presents a paper, "Tanks — and other Matters"; Mr. Wm. Makepeace presents a paper, "Fine Grade Filters"; discussion.

At the annual dinner, which will take place in the Gordon Salon at 7 p.m., presentations will be made to Colonel Jones and to Mr. Daniel Ledson, hon. secretary of the Manchester District branch of the association.

LOWER THAMES VALLEY DISTRICT SURVEYORS' ASSOCIATION.

President—Mr. Harold F. Coales, Assoc.M.Inst.C.E., Engineer and Surveyor, Sunbury-on-Thames.

The ordinary monthly meeting of the above association will be held at the Town Hall, Twickenham, to-morrow (Saturday), at 6.30 p.m. under the presidency of Mr. Harold F. Coales, Assoc.M.Inst.C.E. After the general business of the association has been dealt with, a paper, entitled "Notes upon the Effect of Intercepting Traps in House Drainage," by Mr. E. Willis, Assoc.M.Inst.C.E., F.S.I., will be considered. A matter dealing with fire hydrants will also be taken, and it is hoped that members will endeavour to be present to take part in the discussion of these subjects.

James W. Croxford,
Hon. Secretary.

Clifden House,
Brentford.

FOUR BOOKS FOR MUNICIPAL ENGINEERS.—There is a field for enterprising local authorities to lead the way by providing municipal crematoria. Mr Albert C. Freeman's book—"Crematoria in Great Britain and Abroad," with 70 illustrative plans and designs, price 5s. (post-free 5s. 4d.)—is the standard work on the subject. Mr. Freeman is also the author of "The Planning of Poor-Law Buildings and Mortuaries," price 7s. 6d. (post-free 7s. 10d.), a companion work in which the illustrations are again a valuable feature. "Roofs and Floors of New Buildings: their Structure and Stability," by Ernest H. Essex, Assoc.M.Inst.C.E., price 2s. 6d. (post-free 2s. 8d.), embodies in a most concise manner the calculations necessary for the strengths of timbers in floors and roofs. "The Housing of the Labouring Classes and Back-to-Back Houses," by H. Percy Boulnois, M.Inst.C.E., price 1s. (post-free 1s. 1d.), contains 41 diagrams, and comprises, says "The Architect," "valuable information on one of the most embarrassing of social problems." The above four works are all published by the St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, London, E.C.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

TEMPORARY SURVEYING ASSISTANT.—December 7th.—Hazel Grove and Bramhall Urban District Council. £2 2s. per week.—Mr. Frederick Pidgeon, clerk.

HIGHWAYS SURVEYOR.—December 7th.—Keynsham Rural District Council. £175 per annum.—Mr. Frank G. Whittuck, clerk.

ROAD FOREMAN.—December 11th.—Tonbridge Urban District Council. 35s. per week.—Mr. W. L. Bradley, engineer and surveyor, The Castle, Tonbridge.

CLERK OF WORKS.—December 11th.—Corporation of Ramsgate. £4 4s. per week.—Mr. A. B. Clarke, town clerk.

OUTDOOR ENGINEERING ASSISTANT.—December 14th.—Rivers Committee of the Manchester Corporation. £200 per annum.—Mr. Thomas Hudson, town clerk.

INSPECTOR OF NUISANCES AND SURVEYOR.—December 16th.—Thurnscoe Urban District Council. £140.—Mr. J. Ledger Hawksworth, clerk.

SURVEYOR'S ASSISTANT.—December 17th.—Bridgwater Rural District Council. £50—£60.—Mr. W. Alexr. Collins, engineer and surveyor. Applications to be endorsed "Assistant."

BOROUGH SURVEYOR AND INSPECTOR OF NUISANCES.—December 21st.—Corporation of Ludlow. £200 per annum.—Mr. John H. Williams, town clerk.

SURVEYOR.—December 21st.—St. Bartholomew's Hospital.—Mr. Thomas Hayes, clerk to the governors.

CLERK OF WORKS.—December 21st.—East Suffolk County Council.—Mr. W. Jervis, chief surveyor of main roads, County Hall, Ipswich.

DEPUTY BOROUGH ENGINEER AND SURVEYOR.—December 23rd.—Corporation of Warrington. £200 per annum.—Mr. Andrew M. Ker, borough engineer and surveyor.

ENGINEER-IN-CHIEF.—December 31st.—Mersey Docks and Harbour Board.—Mr. Alfred Chandler, general manager and secretary.

SECOND ARCHITECTURAL ASSISTANT.—Public Works Department of the Government of Ceylon. Age between twenty-five and thirty. £300—£350.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W. Quote M 5,711 on left-hand top corner of application.

MUNICIPAL COMPETITIONS OPEN.

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BELFAST.—January 1st.—Designs for 126 houses of two apartments each, and 126 houses of three apartments each, for the corporation. Premiums are offered of £25, £15, and £10.—Mr. R. Meyer, town clerk.

ORSETT (Essex).—January 1st.—For the construction of a sewerage and sewage disposal scheme in the parish of South Ockendon, for the Orsett Rural District Council. Premiums of £50 and £25 are offered.—Mr. James Beck, clerk, 2 Orsett-road, Grays.

HARROGATE.—February 3rd.—Designs for a council school, for 675 children.—Mr. C. E. Rivers, ASSOC.M. INST.C.E., borough engineer.

DUBLIN.—February 6th.—Designs for municipal buildings for the corporation. The proposed expenditure is £50,000, and the author of the design placed first will be appointed to carry out the scheme on a 5 per cent basis. Premiums of £150 and £100 are offered. The assessor is Mr. Albert E. Murray, F.R.I.B.A.—The Town Clerk.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

Buildings.

MANCHESTER.—December 7th.—For the erection of a school, for the Education Committee.—Accountant, Education Offices, Deansgate.

NEWPORT (Mon.).—December 9th.—For the construction of an underground convenience, for the corporation.—Mr. A. A. Newman, town clerk.

DURHAM.—December 10th.—For alterations at a school, for the Education Committee.—Mr. J. Dawson, clerk, Shire Hall, Durham.

ASHTON-UPON-MERSEY.—December 10th.—For the erection of shelter and conveniences, for the urban district council.—Mr. J. W. L. Foulkes, clerk.

WEST HAM.—December 10th.—For the erection of fire brigade station and firemen's dwellings at Silvertown, for the corporation.—Mr. Fred. E. Hilleary, town clerk.

LEEDS.—December 11th.—For alterations to a council school, for the Education Committee.—Mr. J. Graham, secretary.

DUNGANNON.—December 12th.—For erecting twenty-two single and eighteen double cottages, for the rural district council.—The Clerk.

WIMBLEDON.—December 13th.—For alterations and additions to slipper baths, for the corporation.—Borough Engineer and Surveyor.

DOVER.—December 14th.—For additions and alterations to a school, for the corporation.—Mr. R. E. Knocker, town clerk.

ABERAVON.—December 14th.—For the construction of offices and boundary wall, for the corporation.—Mr. James Roderick, borough surveyor.

CHELMSFORD.—December 16th.—For sinking a borehole, for the corporation.—Mr. George Melvin, town clerk.

ABERDARE.—December 16th.—For the erection of twenty-three playsheds at council schools, for the Education Committee.—Mr. T. Botting, Education Offices, Aberdare.

STOCKPORT.—December 16th.—For extensions to technical school, for the Education Committee.—Mr. A. Lawton, secretary, Town Hall.

MONMOUTHSHIRE.—December 16th.—For the erection of a higher elementary school, for the Education Committee.—Mr. C. Dauncey, secretary, County Council Offices, Newport.

ABERTILLERY.—December 16th.—For extensions to the generating station, for the urban district council.—Mr. W. Gait, clerk.

FELIXSTOWE.—December 16th.—For the enlargement of a public convenience, for the urban district council.—Mr. H. Clegg, surveyor.

KENT.—December 19th.—For the erection of a school at Tonbridge, for the Education Committee.—Mr. F. W. Crook, secretary, Caxton House, Westminster.

EXETER.—December 23rd.—For the extension of the isolation hospital, for the corporation.—Mr. H. Lloyd Parry, town clerk.

TWICKENHAM.—December 27th.—For the construction of a stone-pitched inclined embankment along the river frontage, for the urban district council. Mr. H. Jason Saul[illegible]s, clerk.

Iron and Steel.

HAMPTON.—December 10th.—For the supply and erection of a duplicate set of condensing steam engine air compressors and other subsidiary works, for the urban district council.—Mr. Sidney H. Chambers, surveyor.

LARNE.—December 11th.—For the construction of 2,060 lin. yds. of 3-in. cast-iron pipe and collecting tank, for the rural district council.—Mr. S. M. Wallace, clerk.

MANCHESTER.—December 12th.—For the supply of reversible water-tube condensers at gas station, for the corporation.—Mr. Thomas Hudson, town clerk.

GUILDFORD.—December 18th.—For the construction of surface-water drain, manholes, gullies and connections, for the corporation.—Mr. A. D. Jenkins, town clerk.

BRADFIELD.—December 21st.—For the supply of engines and pumps for waterworks at Stratfield Mortimer, near Reading, for the rural district council.—Mr. R. E. Rawstorne, clerk, 4 Bridge-street, Caversham, Reading.

HARROGATE.—For the supply of 85 tons of 3-in. diameter cast-iron pipes and special castings, for the corporation.—Mr. Arthur W. West, waterworks manager and engineer.

Roads.

DORKING.—December 7th.—For the supply of broken granite, granite chippings, and coal-tar, for the urban district council.—Mr. W. A. Clegg, surveyor.

SOUTHAMPTON.—December 9th.—For the supply of refined tar for surface treatment of the main roads, for the county council.—Mr. H. Barber, clerk.

BECKENHAM.—December 9th.—For making up Overbury-avenue and Hampden-road, for the urban district council.—Mr. F. Stevens, clerk.

SOUTHAMPTON.—December 9th.—For the supply of columnar basalt, Clee Hill basalt, Welsh granite, coverack, or similar syenite, quartzite, and tarred-macadam, for the county council.—Mr. H. Barber, clerk, The Castle, Winchester.

SOUTHAMPTON.—December 9th.—For the hire of steam rollers, for the county council.—Mr. H. Barber, clerk.

STRETFORD.—December 9th.—For paving certain passages, for the urban district council.—Mr. Geo. H. Abrahams, clerk.

WAKEFIELD.—December 9th.—For the execution of private street works, for the corporation.—Mr. J. P. Wakeford, city surveyor.

BERWICK.—December 9th.—For loading and breaking 2,000 yds. of road metal, for the sanitary authority.—Mr. W. Weatherhead, clerk.

BLACKBURN.—December 9th.—For making up certain streets, for the corporation.—Mr. William Smith, borough engineer.

MANSFIELD.—December 9th.—For making up certain streets, for the corporation.—Mr. J. H. White, town clerk.

WILTS.—December 10th.—For the supply of granites, basalts, flints, limestones and gravel, for the county council.—Mr. J. George Powell, county surveyor.

WILTS.—December 10th.—For steam rolling main roads, for the county council.—Mr. J. George Powell, county surveyor.

WILTS.—December 10th.—For the supply of tools for road work, for the county council.—Mr. J. George Powell, county surveyor.

BEDLINGTON.—December 10th.—For making up part of a street, for the urban district council.—Mr. Charles D. Forster, joint clerk, 24 Grainger-street, Newcastle-on-Tyne.

SALFORD.—December 10th.—For excavating, paving, flagging and Limmer rock asphalte works, for the corporation.—Borough Engineer.

WORTHING.—December 10th.—For the supply of broken granite, granite chippings and granite dust, for the corporation.—Mr. W. Verrall, town clerk.

KENT.—December 11th.—For the supply of 60,000 tons of broken road stone, such as Rhenish basalt, Guernsey, Jersey or Alderney granites, Clee Hill basalt, Leicester granite, Penlee, St. Keverne or other Cornish granite, Northumbrian whinstone, Penmaenmawr or other North Wales granites, quartzite, Norway granite, or Quenast or Leuze to the county council.—Mr. W. B. Prosser, clerk.

CHEADLE.—December 11th.—For making up certain roads, for the urban district council.—Mr. Arthur Briggs, clerk.

WEST RIDING.—December 11th.—For paving with granite and grit setts, for the county council.—Mr. F. G. Carpenter, County Hall, Wakefield.

DEWSBURY.—December 11th.—For [illegible] clerk.

INVERNESS.—December 11th.—For the supply of 200 tons of [illegible] Burgh Surveyor.

EDGWARE.—December 11th.—For making up a road, for the [illegible]

WESTBOURNE.—December 12th.—For the supply of hand-picked field stones, and Portfield or Lavant gravel and shingle, for the rural district council.—Mr. J. W. Loader Cooper, clerk, Queen-street, Emsworth.

BERKS.—December 12th.—For the supply of broken road materials, gravel and sand, for the county council.—Mr. J. Fred. Hawkins, county surveyor, Shire Hall, Reading.

HAMPSTEAD.—December 12th.—For the removal of slops, for the borough council.—Mr. A. P. Johnson, town clerk.

GODSTONE.—December 14th.—For tar-washing the surface of certain highways, for the rural district council.—Mr. Geo. E. Crowter, surveyor of highways.

FINCHLEY.—December 14th.—For the coating of 2,000 super. yds. of carriageway with bitumen-treated macadam, asphalt on concrete, and creosoted deal blocks on concrete, for the urban district council.—Mr. E. H. Lister, clerk.

LUTON.—December 19th.—For private street improvement works, for the corporation.—Mr. W. Smith, town clerk.

SOUTHAMPTON.—December 20th.—For the supply of tools for use on the main roads, for the county council.—Mr. H. Barber, clerk.

SOUTHAMPTON.—December 20th.—For the supply of surface-tarring machines, for the county council.—Mr. H. Barber, clerk.

SOUTHALL-NORWOOD.—December 24th.—For making up and channelling work, for the urban district council.—Mr. R. Brown, engineer and surveyor.

MERTON.—December 27th.—For the supply of tar for road surfacing, for the urban district council.—Mr G. Jerram, clerk.

LLANTRISANT AND LLANTWIT FARDRE.—January 1st.—For the completion of the new Ely Valley-road, and branch roads, about 3 miles in length, for the rural district council.—Messrs. Gomer S. Morgan & Thomas Saunders, engineers, School-street, Pontyclun, Glam.

DORSET.—January 4th.—For steam rolling on 458 miles of main roads for three years, for the county council.—Mr. W. Townshend Fletcher, county surveyor, Dorchester.

DORSET.—January 4th.—For the supply of granites, basalts, quartzites, limestones and tar-macadam, for the county council.—Mr. W. Townshend Fletcher, county surveyor, Dorchester.

EASTHAMPSTEAD.—January 7th.—For the supply of broken or unbroken granite, slag, limestone and flints, for the rural district council.—Mr. C. B. Wilson, clerk.

Sanitary.

BIRMINGHAM.—December 7th.—For the construction of stoneware pipe sewer and other works, for the corporation.—Mr. H. E. Stilgoe, city engineer and surveyor.

SWANSEA.—December 7th.—For the extension of sewers, and construction of manholes and flushing chamber, for the rural district council.—Mr. Edward Harris, clerk.

LEEDS.—December 9th.—For the construction of main intercepting sewers, consisting of a new intercepting outfall sewer 4¼ miles in length, two new branch sewers, conduits and other works incidental thereto, for the corporation.—Mr Geo. A. Hart, sewerage manager.

AMBLE.—December 9th.—For providing, cutting, laying, filling in and reinstating 50 chains length of field pipe drain, for the Burial Joint Committee.—The Clerk.

PONTARDAWE.—December 9th.—For laying sewer and water mains, for the rural district council.—Mr. W. Lewis, clerk.

SOUTHAMPTON.—December 10th.—For the construction of soil sewer and manholes, for the corporation.—Mr. R. R. Linthorne, town clerk.

CROSSNESS.—December 10th.—For the removal of refuse from the main drainage outfall works, for the [illegible] The Chief Engineer.

COOKHAM.—December 10th.—For laying socket pipe, manholes and gullies, for the rural district council.—Mr. P. R. Gibbs, district surveyor.

HAMBLEDON.—December 11th.—For laying stoneware pipe sewer and manholes, for the rural district council.—Mr. Ferdinand Smallpiece, clerk.

MANCHESTER.—December 13th.—For the execution of [illegible] summary alterations, for the corporation.—Mr. Thomas Hudson, town clerk.

NANTWICH.—December 14th.—For the construction of sewage disposal works, comprising detritus, settling, storm-water and stand-by tanks, filter-beds, humus tanks, and laying sewers and manholes, for the rural district council.—Mr. Charles E. Davenport, engineer.

YEOVIL.—December 14th.—For laying stoneware pipe sewer, and constructing manholes, tanks, and sludge well, and digging irrigation channels, for the rural district council.—Mr. J. E. Rodber, clerk.

RUNCORN.—December 14th.—For the conversion of privies into water-closets, for the urban district council.—Mr. James Willing, surveyor.

MANCHESTER.—December 16th.—For the construction of new intercepting sewer from Winslow-road to Chorlton Park, for the corporation.—Mr. Thomas Hudson, town clerk.

DENTON.—December 17th.—For alterations to existing tanks, construction of new sludge tanks, and erection of engine and sludge-pressing house, for the urban district council.—Mr. W. Richards, clerk, Town Hall, Denton, near Manchester.

GUILDFORD.—December 18th.—For the construction of 972 yds. of 18-in. and 12-in. surface-water drain, manholes, gullies, and connections, for the corporation.—Mr. A. D. Jenkins, town clerk.

SOYLAND.—December 18th.—For the construction of stoneware pipe sewers, manholes and ventilators, for the urban district council.—Mr. L. H. Longbotham, clerk, Carlton-street, Halifax.

RADCLIFFE.—December 19th.—For the construction of sewerage works, for the urban district council.—Mr. S. Mills, clerk.

MIDHURST.—December 23rd.—For the removal of house refuse and street scavenging, for the rural district council.—The Clerk.

BOSMERE AND CLAYDON.—December 26th.—For scavenging work, for the rural district council.—Mr. R. M. Cook, clerk, 6 Providence-street, Ipswich.

WOKING.—December 30th.—For the construction of sewers and tanks, for the urban district council.—The Clerk.

STIRLING.—For the supply of [illegible]ment and soap, for the corporation.—T. Lang, Clerk

Stores.

RHONDDA.—December 16th.—For the supply of [illegible]ks, stoneware-pipe sewers, bass brooms, ironmongery, wrought-iron tubes, iron castings, paving, kerb, channel, Portland cement, and hauling to macadam, for the urban district council.—Mr. W. J. Jones, engineer and surveyor.

HARTLEPOOL.—December 16th.—For the supply of bass brooms, ironmongery, iron castings, oils, disinfectants, Portland cement, stoneware or fireclay pipes, and broken or unbroken whinstone or slag, for the corporation.—Mr. Percy Horsley, borough engineer.

WILLESDEN.—December 17th.—For the supply of jobbing works in sewer construction, mason's and pavior's work, artificial slab paving, tar paving and execution of tar-paving works, gravel, flints, burnt ballast, broken granite, lime, cement, stoneware pipes, lamp columns and fittings, oils, chandlery, coal, coke, barging of road slop, horse provender, ironmongery, tools, timber, maintenance of telephones and wires, and wood-paving works, for the urban district council.—Mr. Stanley W. Ball, clerk.

MANCHESTER.—December 17th.—For the supply of Portland cement, steel bolts, and nuts for fish-plates, self-acting sliding lathe, and cleaning and dyeing of car curtains, for the Tramways Committee.—Mr. Thomas Hudson, town clerk.

GILLINGHAM.—December 19th.—For the supply of road materials, Portland cement and lime, requisites for precipitation works, stoneware pipes, timber, sewer ironwork, coal and coke, bricks, paints, oils, varnish, general stores, ironmongery and disinfectants, for the corporation.—Mr. F. C. Boucher, town clerk

Miscellaneous.

LAMBETH.—December 16th.—For the supply and installation of three electric lifts, and dismantling and removal of existing lifts, for the Board of Guardians. Mr. James L. Goldspink, clerk, Brook-street, Kennington-road. Tenders to be endorsed "Tender for lifts."

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

CHELMSFORD.—For laying sewer and surface water sewers, for the corporation.—Mr. P. T. Harrison, borough surveyor:—

T. Adams, Wood Green	£927
Impey & Co., Wanstead	699
Johnson & Hawkes, Chelmsford	606
R. A. Bonnett, Chelmsford	591
F. J. Bailey, Chelmsford *	585
J. Jackson, Forest Gate	549

MIDDLESBROUGH.—For making up a certain street, for the corporation.—Mr. S. E. Burgess, borough engineer:—

H. Ellison, Limited, Cleckheaton	£547
G. E. Simpson, Newcastle-on-Tyne	580
J. Pearson, Limited, Stainton-in-Cleveland	521
M. O'Doherty & Son, Stockton-on-Tees	488
Goodhart Brothers, Middlesbrough	461
E. Newhouse, Middlesbrough	445
J. Crombie & Sons, Limited, Middlesbrough *	440

MIRFIELD.—Accepted for laying pipe sewer and manholes, for the urban district council:—

S. Johnson & Son, Mirfield, £251.

ROMFORD.—For the supply of best blue Guernsey granite, for the rural district council.—Mr. G. Lawwood, highway surveyor:—

Granite.—W. Griffiths & Co., Limited, Bishopsgate-street, £1 14s.

Flints.—Daldy & Co., Romford, £95.

TREFECHAN.—For the erection of thirty workmen's dwellings, for the corporation.—Mr. R. Jones, borough surveyor:—

E. M. Evans & Sons, Aberystwyth	£6,656
J. J. Edwards, Aberystwyth	6,211
D. & M. Davies, Aberystwyth	5,673
E. Evans & Son, Aberystwyth	5,284
Jenkins Brothers, Aberystwyth	5,227
E. E. Jenkins, Aberystwyth	5,189
Edwards Brothers, Aberystwyth *	4,972
J. Humphreys, Aberystwyth	4,970

Surveyor's estimate, £5,413.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

DECEMBER.

6.—Institution of Municipal and County Engineers: Meeting in London. Mr. H. T. Wakelam on "Tramway Rail Corrugation." Caxton Hall, 8 p.m.

7.—Junior Institution of Engineers: Visit to Works of Messrs. Thos. Glover & Co., Limited, Gas-meter Manufacturers and Engineers, Edmonton. 3 p.m.

7.—Institution of Municipal and County Engineers: Eastern District Meeting, Lyons' Victoria Mansions Restaurant, Victoria-st., S.W.

7.—Institution of Municipal Engineers: North Western District, Social Evening, Mitre Hotel, Manchester. 6 p.m.

7.—Institution of Municipal and County Engineers: South-Eastern District Meeting, 11 Victoria-street, S.W.

7.—Lower Thames Valley District Surveyors' Association: Meeting at Twickenham Town Hall. 6.30 p.m.

10.—Institution of Civil Engineers: Mr. H. A. Humphrey on "The Generation and Distribution of Producer Gas in South Staffordshire." Institution of Mechanical Engineers. 8 p.m.

11.—Junior Institution of Engineers: Sir A. Traver Dawson, K.B., M.Inst.C.E., delivers his Presidential Address. 8 p.m.

12.—Association of Managers of Sewage Disposal Works: Annual General Meeting and Dinner, Holborn Restaurant.

12.—Concrete Institute: Messrs. R. Sankey and Laurence Gould, F.C.S., on "The Effects on Concrete of Acids, Oils and Fats." 7.30 p.m.

14.—Institution of Water Engineers: Seventeenth Winter General Meeting, Burlington House, W. 1.30 p.m.

16.—Institute of Sanitary Engineers: Mr. J. O. Neumann on "The Collection of House and Trade Refuse." Caxton Hall, Westminster. 8 p.m.

18.—Institution of Municipal and County Engineers: Metropolitan District Meeting, 11 Victoria-street, S.W.

19.—Quantity Surveyors' Association: Conversazione, Connaught Rooms, Great Queen-street, Kingsway, W.C. 8 p.m.

21.—Institution of Municipal Engineers: Council Meeting.

JANUARY.

8.—Institution of Municipal and County Engineers: South-Eastern District Meeting at Sidcup.

9.—Concrete Institute: Mr. W. Valentine Ball, Barrister-at-Law, on "Concrete in its Legal Aspect." 7.30 p.m.

11.—Institution of Municipal and County Engineers: Meeting at Swansea.

APPOINTMENTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those readers who pay their deposit are recommended to arrange that they are received* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their insertion in the issue of the following day. Such advertisements may, in cases of emergency, be telephoned (No. 3359 Holborn), would be subject confirmation by letter.*

SURVEYORSHIP.

ST BARTHOLOMEW'S HOSPITAL.

Notice is hereby given that a meeting of the Electors Committee will be held on Monday, the 6th January, 1913, at 3.15 o'clock in the afternoon, to elect a Surveyor to this Hospital.

Candidates, who must be members of the Royal Institute of British Architects, or of the Society of Architects, or of the Surveyors' Institute, are required to lodge 36 copies of their applications and testimonials with the undersigned on or before Saturday, the 21st December, 1912.

Further particulars will be forwarded on request.

THOMAS HAYES,
Clerk to the Governors.

November 28, 1912

BOROUGH OF LUDLOW.

APPOINTMENT OF BOROUGH SURVEYOR AND INSPECTOR OF NUISANCES FOR THE BOROUGH OF LUDLOW.

Notice is hereby given that the Town Council will, on Thursday, the 16th day of January, 1913, appoint a competent and fully qualified person to perform the duties of the above joint offices.

The salary for the joint offices is £200 allocated as follows: £80 for the Borough Surveyor and £120 for the inspector of nuisances), with office accommodation, including stationery.

The duties will be:—

(a) The ordinary duties of a Borough Surveyor.

(b) The ordinary duties of an Inspector of Nuisances, as defined by the Sanitary Officers (Outside London) Order, 1910.

(c) The duties imposed by the Housing and Town Planning, &c., Act, 1909 and the Orders of the Local Government Board thereunder on an Inspector.

(d) The duties of an Inspector under the Petroleum Acts.

The appointment (as to the Inspectorship of Nuisances) is under the terms of Article IX. of the foregoing Order of the Local Government Board, and is subject to the approval of the Board.

The person appointed will (to comply with the Public Health Acts) be required to give security for the due performance of his duties, which security is fixed at £25. And will be required to give an undertaking not to be concerned in any work that may interfere with his official duties.

And I also will be required to agree to give at least one month's notice previous to resigning the office or to forfeit the sum of £5 as liquidated damages.

Applications, with copies of testimonials, endorsed "Borough Surveyor," to be delivered at my office not later than 5 o'clock in the afternoon of Saturday, the 21st day of December next.

The Council does not bind itself to make any appointment.

Personal canvassing of the members of the Council will be considered a disqualification.

JOHN H. WILLIAMS,
Town Clerk.

Town Clerk's Office, Ludlow.
November 23, 1912.

CITY OF MANCHESTER.

The Rivers Committee invite applications for the position of Cost Clerk and Engineering Assistant in the Main Drainage Works. Salary £200 per annum.

Applications, in writing, stating experience, with copies of three recent testimonials, to be sent to the Chairman of the Rivers Committee, Town Hall, Manchester, not later than 10 a.m. on Saturday, the 14th December, 1912. Canvassing, directly or indirectly, will be a disqualification.

THOMAS HUDSON,
Town Clerk.

Rivers Department,
December 3, 1912.

COUNTY BOROUGH OF WARRINGTON.

APPOINTMENT OF DEPUTY BOROUGH ENGINEER AND SURVEYOR.

The Corporation of Warrington invite applications for the position of Deputy Borough Engineer and Surveyor.

Candidates must be under 35 years of age, but over 40, and must have had Municipal experience, and possess a thorough knowledge of the duties of a Borough Engineer and Surveyor's Office. Preference will be given to candidates who have passed the examination for Associate Membership of the Institution of Municipal and County Engineers.

Salary £200 per annum.

Applications, stating age, experience, qualifications and present [illegible] accompanied by copies of not more than [illegible] testimonials, to be delivered at my Office not later than 12 noon on Monday, the 23rd day of December next, endorsed "Deputy Borough Engineer and Surveyor."

Canvassing the Members of the Council, personally or by letter, will be deemed a disqualification.

ANDREW M. KER,
Borough Engineer and Surveyor.

Town Hall,
Warrington.
December 3, 1912.

EAST SUFFOLK COUNTY COUNCIL.

MAIN ROAD RECONSTRUCTION SCHEME.

APPOINTMENT OF CLERK OF WORKS.

Applications are invited for the appointment of Clerk of Works to take charge (under the County Road Surveyor) of Works of Reconstruction of Main Roads in the County, for the three years ending 31st March, 1916.

Applicants must possess a sound practical knowledge of latest methods of road construction, and must not be more than 35 years of age. Candidates must be prepared to devote their whole time to the duties of the office, and commence work as early as possible.

Applications, endorsed "Clerk of Works," to be made in candidate's own handwriting, stating wages required (which must include all travelling and other expenses, except postages, telegrams and stationery), and accompanied by copies of not more than three recent testimonials, to be sent to the undersigned not later than 21st December, 1912.

Personal canvassing will disqualify.

Forms of application and particulars of the duties may be had on application to—

W. JERVIS,
Chief Surveyor of Main Roads.

County Hall,
Ipswich.
December 3, 1912.

BRIDGWATER RURAL DISTRICT COUNCIL.

SURVEYOR'S ASSISTANT.

Applications are invited for the post of Junior Assistant in the Engineer and Surveyor's Office. Salary £50 per annum, rising by annual increments of £5 to £60 per annum.

Applications, in candidate's own handwriting, stating age and experience, together with copies of three testimonials, to be delivered to the undersigned by December 17th, endorsed "Assistant."

No application will be considered unless candidate has had practical experience, and preference will be given to a Student of the Institution of Municipal and County Engineers.

Canvassing in any form will be considered a disqualification.

W. ALEXR. COLLINS,
Engineer and Surveyor.

36A Eastover,
Bridgwater.
November 27, 1912.

THURNSCOE URBAN DISTRICT COUNCIL.

APPOINTMENT OF INSPECTOR OF NUISANCES AND SURVEYOR.

The above Council invite applications for the position of Inspector of Nuisances and Surveyor, at a salary of £140 per annum.

The district comprises 1,200 acres, and has a population of 4,500, with a road mileage of 6 miles.

The person appointed must devote the whole of his time to the office, and will also be required to carry out the duties of Inspector under the Housing Acts. Inspector of Dairies and Cowsheds, and must possess a thorough practical knowledge of the duties appertaining to the various offices.

The appointment will be subject to the approval of the Local Government Board.

Applications, in the handwriting of the candidates, stating age, qualifications, and other particulars, together with copies of two recent testimonials, to be sent to Mr. M. Nokes, Chairman of the Council, not later than Monday, December 16th, 1912, endorsed "Surveyor."

Canvassing in any form will be deemed a disqualification.

J. LEDGER HAWKSWORTH,
Clerk to the Council.

Council Offices,
Bolton-upon-Dearne,
Rotherham.

PUPIL.—The Borough and Waterworks Engineer of Leamington (A.M.I.C.E.) has a vacancy in his office for a Pupil. Address, Town Hall.

TENDERS WANTED.

URBAN DISTRICT COUNCIL OF DENTON.

EXTENSIONS OF SEWAGE DISPOSAL WORKS.

The above Council are prepared to receive Tenders for Alterations to existing Tanks, Construction of New Sludge Tanks, and Erection of Engine and Sludge Pressing House, and other Works in connection therewith.

Plans may be seen, and General Conditions, Specifications, and Forms of Tender may be obtained, on or after the 6th December, 1912, at the Office of Mr. John B. Cooke, Engineer of the Council, Town Hall, Denton, near Manchester, upon payment of Three Guineas, which sum will be returned on receipt of a *bonâ-fide* Tender.

Tenders, sealed and endorsed "Sewage Works Extensions, Contract No. 1," or "Sewage Works Extensions, Contract No. 2," as the case may be, must be sent in to me so as to be received by me not later than the 17th December, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

WM. RICHARDS.
Clerk to the Council.

Town Hall
Denton.
Near Manchester.
November 27, 1912.

PUBLIC HEALTH ACT, &c.

BRADFIELD RURAL DISTRICT, IN THE COUNTY OF BERKSHIRE.

PARISH OF STRATFIELD MORTIMER.

TO MANUFACTURERS OF OIL ENGINES AND PUMPS, &c.

The Rural District Council of Bradfield are prepared to receive Tenders for Engines, Pumps, &c., for Waterworks at Stratfield Mortimer, near Reading.

Particulars and Forms of Tender may be obtained from the Council's Consulting Engineer, Mr. H. Howard Humphreys, of 28 Victoria-street, Westminster, on Wednesday and Thursday, the eleventh and twelfth (11th and 12th) of December *only*.

Intending Contractors will be required to deposit a sum of Three Guineas part to particulars being furnished, such sum being returned on receipt of a *bonâ-fide* Tender.

Tenders, endorsed "Mortimer Machinery," must reach the undersigned not later than 4 o'clock on Saturday, the 21st day of December, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

Given under my hand this second day of December, 1912.

R. E. RAWSTORNE.
Clerk to the Council.

4 Bridges-street,
Caversham, Reading.

DORSET COUNTY COUNCIL.

MAIN ROADS.

ROAD METAL.

The Roads and Bridges Committee of the County Council invite Tenders from the Quarry Proprietors, Stone Merchants and others for the Supply of Road Material for a period of one year, commencing 1st day of April next.

The Material required will consist of Granites, Basalts, Quartzites, Limestones, Tar-macadam, &c., particulars of which are set out in Specifications.

Forms of Tender to be obtained of the County Surveyor, County Offices, Dorchester. The whole of the Material will be required to be delivered at Railway Stations or Wharves.

Sealed Tenders, to be addressed to the Clerk of the County Council, County Offices, Dorchester, must be delivered on or before the 4th January, 1913. All Tenders to be endorsed "Tenders for Road Metal."

No pledge is given that the lowest or any Tender will be accepted.

(By order)
W. TOWNSHEND FLETCHER.
County Surveyor.

County Surveyor's Office,
Dorchester.
December 3, 1912.

DORSET COUNTY COUNCIL.

MAIN ROADS.

STEAM ROLLING.

The Roads and Bridges Committee of the County Council invite Tenders for Steam Rolling on 458 miles of Main Road for a period of one or three years, commencing on the 1st day of April next.

Specifications and Forms of Tender can, on application, be obtained from the County Surveyor.

Sealed Tenders, addressed to the Clerk of the County Council, and endorsed "Tenders for Steam Rolling," must be delivered on or before the 4th January, 1913.

No pledge is given that the lowest or any Tender will necessarily be accepted.

(By order)
W. TOWNSHEND FLETCHER.
County Surveyor.

County Surveyor's Office,
Dorchester.
December 3, 1912.

LLANTRISANT AND LLANTWIT FARDRE RURAL DISTRICT COUNCIL.

ELY VALLEY-ROAD.

The above-named Council is prepared to receive Tenders for the Completion of the New Ely Valley-road and Branch Roads, all 36 ft. in width.

The Contract will consist of a Road about 3 miles in length, between Mill-street, Tonyrefail and Talbot Village, Llantrisant; a Branch Road, half a mile in length, between Ynysallan and Glanmychydd Fawr; and a Branch Road, about one mile in length, between Coed Ely and the existing road leading from Tonyrefail to Gilfach Goch.

The Contract will include all Excavations, Filling and Forming, Ballasting and Metalling, Banks and Quick Set Fencing, Post and Tube Fencing, Stoneware and Cast-iron Surface Water Drains, Catchpits, Manholes, &c.; the Construction of Three Masonry and Steel River Bridges, and several Masonry and Concrete Culverts over Streams and Watercourses.

Plans and Specification may be seen by appointment, and Bills of Quantities and Forms of Tender obtained, from the undersigned upon the payment of a deposit of £5, which will be returned upon the receipt of fully priced Bill of Quantities and *bonâ-fide* Tender.

Sealed Tenders must be delivered to Mr. W. Spickett, Solicitor, Union Offices, Pontypridd, the clerk to the Council, on or before Wednesday, the 1st January, 1913.

The lowest or any Tender not necessarily accepted.

(By order)
COMER & MORGAN & THOMAS SAUNDERS
Engineers.

School-street, Pontyclun, Glam.
December 2, 1912.

BOROUGH OF GILLINGHAM, KENT.

TO CONTRACTORS AND MERCHANTS.

The Town Council of the Borough of Gillingham are prepared to receive Tenders for the following for the term of One Year commencing on the 1st day of April, 1913:—

1. Road Materials.
2. Portland Cement and Lime.
3. Requisites for Preservation of Works.
4. Stoneware Pipes, &c.
5. Timber.
6. Sewer Iron Work.
7. Coal and Coke.
8. Bricks.
9. Paints, Oils and Varnish.
10. General Stores and Ironmongery.
11. Disinfectants.

Specifications, Conditions of Contract and Forms of Tender (in duplicate), together with any other information, may be obtained from Mr. J. L. Redfern, Borough Engineer and Surveyor.

Sealed Tenders, endorsed with the name of the article tendered for, accompanied by samples of each class of material, and addressed to the undersigned, to be delivered not later than 12 noon on Thursday, December 19th, 1912.

Neither the lowest nor any Tender necessarily accepted.

F. C. BOUCHER.
Town Clerk.

Corporation Offices, Gillingham, Kent.
December 2, 1912.

WILLESDEN DISTRICT COUNCIL.

ANNUAL CONTRACTS.

The Willesden District Council are prepared to receive Tenders from persons willing to enter into annual contracts, commencing April 1st, 1913, to execute the following Works or to Supply the following Materials, viz.:—

1. Jobbing Works in construction of Sewers, &c.
2. Jobbing Works Mason and Pavier.
3. Supply of Artificial Slab Paving.
4. Supply of Tar Paving and execution of Tar Paving Works.
5. Supply of Gravel, Flints, Burnt Ballast, &c., for repair of roads, &c.
6. Supply of Broken Granite for repair of roads, &c.
7. Supply of Lime, Cement, Stoneware Pipes, &c.
8. Supply of Lamp Columns and Fittings complete.
9. Supply of Oils and Chandlery.
10. Supply of Coal and Coke.
11. Barging of Road Slop, &c., from Fernoy Wharf.
12. Supply of Horse Provender.
13. Supply of Ironmongery and Tools.
14. Supply of Timber.
15. Maintenance of Council's Telephones and Wires.
16. Wood Paving Works.

Specifications and Forms of Tender may be obtained upon receipt of 5s. for each Tender Form, on and after Monday, December 9th, 1912, upon application to Mr. O. Claude Robson, M.INST.C.E., Engineer to the Council, Municipal Offices, Dyne-road, Kilburn, N.W. The deposit for Tender Form will be returned upon receipt of *bonâ-fide* Tender.

Tenders to be delivered to the undersigned not later than 4 p.m. on Tuesday, December 17th, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
STANLEY W. BALL,
Clerk of the Council.

Municipal Offices,
Dyne-road, Kilburn, N.W.
December 3, 1912.

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& CO., Ltd.,
ASTON MANOR,
BIRMINGHAM,
MAKE
all kinds of
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SEE PAGES 13 & 14
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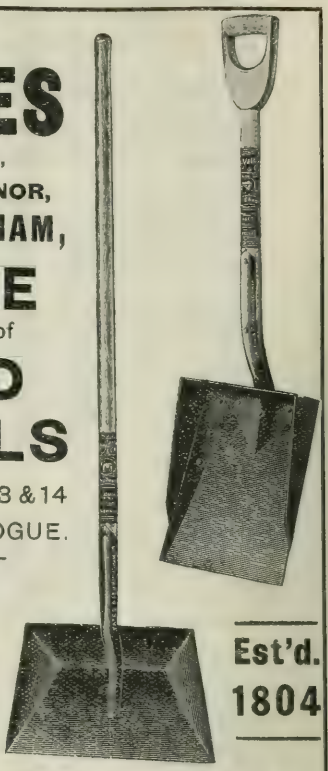

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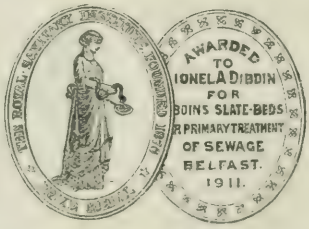

SMALL WORKING EXPENSES

CONTRACTORS TO H.M. GOVERNMENT.

SLATE BEDS

47 VICTORIA STREET, WESTMINSTER, S.W.

TELEPHONE—2211 VICTORIA.

The Surveyor

And Municipal and County Engineer.

Vol. XLII. DECEMBER 13, 1912. No. 1,091.

Minutes of Proceedings.

The Engineer as Arbitrator.

We were compelled by considerations of space to defer our comments upon the admirable paper on "The Effect of Recent Decisions upon the Arbitration Clause" read lately before the Institution of Municipal Engineers by Mr. W. Valentine Ball, M.A., barrister-at-law, and reproduced in our last issue. The municipal engineer who has a duty to perform to his authority is not infrequently appointed as sole arbitrator to settle disputes under contracts to which his own employers are a party. In such cases his position is, to say the least, a rather invidious one, and it often happens that when the occasion for his services in this judicial capacity arises the contractor realises very keenly that he would rather have his case adjudicated upon by some more independent tribunal. He then finds that, although the agreement to refer disputes to arbitration does not operate to oust the jurisdiction of the ordinary courts of law, he is precluded from bringing an action unless the arbitrator has given a decision, or he can show some sufficient reason why the matter should not be referred in accordance with the submission. It would appear at first sight that the admitted bias—to a certain degree—of an arbitrator who is bound to one of the parties ought to be a sufficient reason to preclude him from acting. In this connection, however, the courts have taken the view (and rightly so, in our humble opinion) that the contractor must abide by the terms of a contract which was entered into by him with a full knowledge of the circumstances; and that if he agrees that the engineer is to act as arbitrator in case of dispute, he cannot afterwards be heard to say that the very man whom he has already accepted is disqualified from acting on the ground of bias. If, however, circumstances affecting the impartiality of an agreed arbitrator arise *after the contract has been entered into* the position is evidently quite different, and in cases of this kind which were cited by Mr. Ball it was held that after-acquired bias (if such an expression may be permitted) may constitute a legal disqualification so as to prevent an arbitrator from acting.

Another class of cases in which it has been held that the engineer is precluded from acting as arbitrator are those in which to allow him to act would be to make him judge in his own, as distinguished from his master's, cause. For example, if facts subsequent to the contract have given rise to a substantial dispute in which there are allegations of continued unreasonableness on the part of the engineer, and that is the real dispute between the parties, the engineer would not be allowed to arbitrate upon the point. Again, a very similar class of cases, and one to which the principle just enunciated is equally applicable, occurs where the personal conduct of the arbitrator is of the essence of the dispute. The ground covered by Mr. Ball's paper up to this point is no doubt familiar to most engineers, but the author will receive the grateful thanks of most of them for having put into concrete form and logical order a series of propositions about which their ideas hitherto have been more or less hazy. Perhaps the most interesting part of the paper, however, was the section which was devoted to "suggested reforms." The proposed alternatives to the usual form of the arbitration clause were three in number. First, the entire deletion of the clause, involving recourse to legal proceedings for the settlement of all disputes in regard to which a friendly agreement could not be arranged. This appears to us to be entirely undesirable, and we confess that we are not much impressed by Mr. Ball's reminder that a dispute arising under a building or engineering contract would not be tried by a judge and jury, but by a referee. This might be the case if the dispute were of a substantial character involving the investigation of complicated facts and figures. But the absence of an arbitration clause would open the door to a large amount of petty litigation in the course of the execution of a contract of any magnitude if the parties found themselves unable to work upon a friendly footing. The second proposed reform was that the reference should be to an independent arbitrator. From many points of view this is of course a very satisfactory method to adopt for the settlement of disputes, but it is a very expensive proceeding, inasmuch as in case of dispute evidence has to be given on every minute point, owing to the arbitrator's lack of knowledge of the subject matter or circumstances of the contract. The third suggestion is Mr. Ball's own, and we will leave it for the consideration of our readers, merely saying for ourselves that it appears to be a very practical and reasonable one. It is that the arbitration clause should be framed so as to leave the decision of every question arising under the contract to the engineer, but subject to a proviso that, should it appear to the court on an application to stay any action or proceeding brought in relation to the contract that the engineer is disqualified from acting as arbitrator, the matters in dispute will be referred to an engineer to be agreed between the parties, or, failing agreement, to be nominated by the president of the Institution of Civil Engineers.

* * *

A State Highway System for California.

In August of last year a highway commission for the State of California was appointed, a sum equivalent to about $3\frac{3}{4}$ millions sterling having been previously voted for the making of a State system of highways. The routes already planned amount to over 2,300 miles; surveys are in hand, and the letting of contracts has begun. The main features of the system are two nearly parallel routes, running lengthwise from north to south of the State, one of them traversing the great central trough formed by the Sacramento and San Joachin valleys, and the other following the coast. The latter is located near the coast in some parts, and elsewhere passes through valleys some way inland. The general character of the highway system is imposed by the main topographical features, the greater part of the area being bounded on the east by the Sierra Nevada range and on the west by the coast line which runs nearly parallel to the mountains. The conditions

generally are such as point to the economic wisdom of the decision to make a State system of highways, planned and carried out as a whole. The area of the State is greater than that of the United Kingdom or Italy, and its population cannot be expected to reach two millions for some years to come. The conditions do not, therefore, favour the gradual building up of a State system of roads after the manner which has rightly been regarded as suited to the conditions in the State of Massachusetts and elsewhere. In California the highway system seems likely to be relatively more important in comparison with railways than are the highway systems of many of the other States of the Union and most European countries. The economic conditions and the distribution of the population are not such as to lead to the construction of a close network of railways, and outer influences are limited by the position of the State, a long and somewhat narrow area lying between the great mountain range and the sea, and marching on the north and south with areas by no means thickly settled, and not occupied by great centres of activity. The State is nearly 800 miles long by a little under 200 miles in width, but the most important part of it at the present stage in its development is only some 150 miles wide from the mountains to the sea. The climatic conditions usually associated with the name of the State are those of the south end, protected to the northward by a transverse mountain range. The northern part of the State is colder, and wetter. At San José, near San Francisco, the mean temperature of the year is about 58deg., which is about the mean temperature of Greenwich for the first week in June and the second week in September. At the same place the mean temperature from May to September is from 4deg. to 7deg. above that of Greenwich, and is about 10deg. above for the remainder of the year. In the south very high summer temperatures are reached. The State lies roughly between the same parallels of latitude as Algeria, the northern half of Morocco and the southern half of Spain. The northern extremity lies near the latitude of Oporto, Naples, Uskub, Mustapha Pasha, and Boston, U.S.A.; the southern extremity near that of Tripoli, Jerusalem, Lahore, and Nanking. Local climates are, of course, much affected by the great differences in altitude between the coast and the uplands. The very large sum, relatively to the resources of the State, which is now being expended, and the definite planning of a main road system for so large an area, suggest that the work of the Californian Highway Commission is specially worthy of the attention of those highway engineers who follow the developments of road engineering in many different countries.

* * *

The Road Board and the Metropolis.

The circular letter which has been sent by the Road Board to the highway authorities of Greater London is a timely and welcome document, a satisfactory feature of which is the indication of the total amount which the Board are prepared to treat as available, at present, for grants or short loans within this area. The decision [illegible] will not be extended for more than five years is sound finance, having regard to the class of work [illegible] As regards the particulars required from the [illegible] we think that costly widenings in closely built cities were not contemplated as within the scope of the Road Improvement Fund, which would indeed be quite inadequate for any such purpose, even if there were not any necessity for spending money on the country roads.

It was to be expected that the motor omnibus would loom large in any circular issued by the Road Board to Metropolitan highway authorities, and we trust that under the head of "Reconstruction of Road Crusts" special attention will be paid to the substitution of 9-in. concrete foundations in those streets where 6-in. foundations have been found inadequate. We offer the suggestion, and if it is worth anything at all it is worth at least half-a-million sterling, that a 9-in. concrete foundation need not be made with Portland cement throughout its thickness in view of the fact that other and cheaper materials than Portland cement concrete are amply strong enough to withstand the stresses which are imposed upon the lower part of a thick crust of this kind. Another welcome feature of the circular is the paragraph relating to the acquisition of land for widenings of important roads. The powers of the Road Board in this matter exceed, both in force and in simplicity, the powers of any other authority. The significance of the word "vacant" should not, however, be overlooked in this connection. Having regard to the purpose for which the Road Board was created, the extent and limitations of its sources of revenue, the urgent calls which are made upon it from various quarters, and the magnitude of a few specific works which it may be called upon to facilitate, most unprejudiced judges will, we think, agree that the Board has come to a wise decision with regard to the manner in which, and the extent to which, the Road Improvement Fund may be used at the present time within the area of Greater London.

* * *

Public Health of Staffordshire.

We have been favoured with a copy of the report of Dr. George Reid, the medical officer of health to the Staffordshire County Council, for the year 1911, and a perusal of it shows that the period under review was one of considerable progress and activity in many directions. The report incidentally forms a very good object lesson of the valuable work which is being done all over the country by the co-ordination of the work of the local medical officers of health which is effected by the county medical officer. Naturally a document of this kind, dealing with the public health administration of a county the conditions of which are in many respects peculiar and difficult, is concerned with a wide variety of subjects. Perhaps the most important part of the report, however, is that which deals with insanitary dwellings and overcrowding. In this connection Dr. Reid reports a considerable general improvement in regard to the activity and energy which are being displayed in dealing with this problem, and he quotes extensively from the reports which he has received from various localities. Some of the passages cited are of a very striking character. For example, the medical officer of health of Amblecote writes: "Just as the police officer can summon and get fined the man who uses obscene language in the street, so should the sanitary officer be able to deal in the same way with the filthy occupier, whose reckless habits are a menace to the lives of not only his own, but his neighbours' children." Again, the medical officer of health of Brierley Hill says: "The knowledge that a closing order under the Housing, Town Planning, &c., Act, 1909, is [illegible] a great incentive to many owners to take steps to put their property into habitable condition, and in a number of cases a preliminary intimation, or a personal interview, alone was sufficient to induce them to put their houses in repair. From the strongest utterance comes from the medical officer of health of the Borough of Stafford, who outlines a detailed plan for the provision by the municipality for the poorest of its members of sanitary houses, at a rental within their means, and for the inauguration of an educational scheme by which the tenants may be taught and encouraged to make proper use of the houses.

These observations show at once that much has been accomplished and that a great deal still remains to be done in certain districts. We have perused Dr. Reid's report with the greatest interest.

* * *

Newport Pagnell: A Report.

We have before us a copy of a report dealing with the sanitary circumstances and administration of the Newport Pagnell Rural District, which has just been published by the Local Government Board. The report was presented to the board by Dr. W. W. E. Fletcher, who had been deputed to hold a local inquiry, and, apart from the specific matters with which it deals, it raises once more the question of the necessity of providing an adequate staff for sanitary inspection. The district, which has two sanitary inspectors, comprises an area of 67,060 acres, and a population of upwards of 19,000 persons. Moreover, each inspector has hitherto held office as surveyor under the Public Health Act, 1875, and has been employed in a number of other capacities, in regard to each of which he has received some trifling remuneration. In these circumstances Dr. Fletcher's report reflects great credit upon these officers, who have done all that lay in their power, handicapped as they have been, to secure efficiency in the sanitary administration of the district. In 1909 the district was visited by one of the board's assistant inspectors, who concluded that the services of a third sanitary inspector were required. Dr. Fletcher, however, appears to have come to the conclusion that the existing staff is sufficient, providing that they have increased facilities for travelling. The council have accordingly resolved to continue with only two sanitary inspectors as hitherto, each of whom will still hold several minor appointments; they will, however, receive an inclusive salary, and each of them will be expected to provide and maintain a motor-cycle.

We are rather surprised that the report is silent as to the desirability of separating the office of sanitary inspector from other appointments—and particularly from that of surveyor. The whole tendency of modern legislation is, happily, to cast many additional duties upon medical officers of health, and as a consequence to increase the work of the sanitary inspectors. We have more that once expressed the opinion that the former should be whole-time officers, and we are also of opinion that the latter should be free from the cares of other work to devote themselves to the single task of carrying out their most important duties as sanitary inspectors.

* * *

Town Planning in Calcutta.

We have read with much interest a preliminary report which Mr. E. P. Richards, M.INST.C.E., chief engineer to the Calcutta Improvement Trust, has made to the trustees with regard to the policy which ought to be pursued in order that the planning of main traffic roads and the work of dealing with insanitary areas may proceed in harmony and in such a manner that neither work will check the other. On another page of the present issue we have summarised the main points of the report, and have added some passages taken from an *Indian Engineer* editorial, showing that the work of the trust is appreciated by the leading professional journal in India, and containing allusions to what has, up to the present, been a serious difficulty of the general situation. We hope, however, that matters are now to be placed on a better footing and that the energy with which Mr. Richards is throwing himself into his important task may, in the near future, be fruitful of results. Mr. Richards finds Calcutta a city very different from that garden city, Madras, with which, as assistant to the special engineer, and for a short term as engineer to the corporation, he was intimately acquainted. The half-million inhabitants of Madras are distributed between several towns and numerous villages and suburban areas included within the city boundaries, and we can well believe that Mr. Richards' close acquaintance with the varied conditions presented in this remarkable area was regarded as a valuable qualification by the trustees who are charged with the duty of town improvement in Calcutta. We wish Mr. Richards every success in his work, and we sincerely hope that the Calcutta authorities generally will take a broad and liberal view of the position and allow the trustees to change Calcutta into a city worthy of its place in the Empire.

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The Maintenance Clause.

A case of much interest and importance, involving a consideration of the legal effect of the maintenance clause in an engineering contract, was decided last month by Mr. Justice Rowlatt at the Manchester Autumn Assizes. The plaintiff, Mr. H. M. Nowell, had contracted with the Manchester Corporation, who were the defendants, for the construction of certain works, including a retaining wall and bridge. The contract contained a clause requiring the contractor to make himself familiar with the ground in which the work was to be erected; and the maintenance clauses (the period being one year) required the contractor to make good all failures of the work, and particularly "all slips, settlements, accidents, or defects on or upon any portion of the work." During the period of maintenance serious cracks appeared in the wall and bridge, and considerable evidence was given on the question whether these were due to bad workmanship or faulty design. The learned judge held, however, that this question was immaterial, inasmuch as on the true construction of the contract, and particularly of the clauses above referred to, the contractor was bound to make himself familiar with the soil, to erect the wall, and to maintain it *in that soil* for the period named, without failure or imperfection. It has not infrequently been held that unforeseen difficulties due to subsoil which render work more expensive to construct are among the risks that a contractor must take. We are unaware, however, of any previous case in which this principle has been applied to the *maintenance* of works, although, as the learned judge pointed out, it is difficult to see any distinction between the two in principle. The Manchester case is therefore of great importance to engineers, and should be carefully noted by them.

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The International Road Congress Traders' Committee.

We print elsewhere in this issue an official announcement which conveys some idea as to the character and extent of the admirable work which has been done by the Traders' Committee of the International Road Congress to further the success of that cosmopolitan gathering, a conference which will undoubtedly be the most important of its kind that has ever been held in this country. Generously as manufacturers and others have already responded to the efforts of the committee, collectively and individually, to obtain donations towards the funds necessary to ensure this success for the congress, a perusal of the list of donors suggests that there are many others who might reasonably be expected to subscribe. It may be that the appeal of the committee has not reached them, or, having reached them, is still under their consideration. In the former case we would ask those concerned to communicate at once with the hon. secretaries of the Traders' Committee; in the latter we would ask for realisation of the wise maxim, familiar in its Latin form, that he gives twice who gives quickly. Practical help might also be given to the committee in the way of suggestions for excursions and receptions that would appeal to the congress delegates from other countries, and by the submission of the names of those who, by securing spaces as exhibitors, would assist to make the congress exhibition as comprehensive and representative as possible.

Municipal Works in Hand at York.*

By F. W. SPURR, City Engineer and Surveyor.

In the following paper I do not intend to go closely into detail, but to confine myself to a description of a half-dozen works I have in hand at the present time.

I only consented to the meeting being held at York because your secretary assured me it was necessary to have an early meeting of the North-Eastern District representatives in some accessible and central place. I could therefore do no other than consent, although I could ill afford the time necessary for preparing even these notes. I trust, however, that the meeting will serve its purpose, and that some of the notes I am about to give will be of service to the institution.

The works I have referred to comprise: –

(1) The extension of the sewage disposal works at Naburn.

(2) The construction of storm-water tanks at Fulford pumping station.

(3) The construction of a new street linking up the centre of the city with Fishergate and Walmgate.

(4) The erection of thirty cottages for rehousing those displaced in carrying out the above scheme.

(5) Tar-macadamising of all cobble-paved streets.

(6) The extension of tramways.

EXTENSION OF SEWAGE DISPOSAL WORKS.

The extension of the sewage disposal works comprises the construction of two septic tanks, having a capacity of 1,200,000 gallons, making with the existing tanks a total capacity of 2,700,000 gallons, with ten continuous filters (each 104 ft. diameter and 6 ft. deep), in addition to two detritus tanks and humus tanks.

The contract for these works was recently let to Messrs. George Bell & Sons, Limited, of Manchester, their tender amounting to £21,351.

As the whole scheme provides for twenty-one new filters, it will be seen that a further contract will be necessary before this work is completed.

As probably some of you are aware, we have been treating a portion of the sewage of the city by means of open septic tanks and percolating filters for the last thirteen years, and for that purpose two of the precipitating tanks were converted for use as open septic tanks, the sewage passing through the length of both tanks before being carried by proportionate weirs and channels on to the two experimental filters, which I might here state have done their work in a very efficient and satisfactory manner, treating regularly 535,000 gallons per day, equalling 415 gallons per square yard per day.

I propose to construct the septic tanks of concrete with blue brick facings in cement mortar, a method of construction that has given the utmost satisfaction in the existing work. Arrangements for sludging and cleaning will be a repetition of what is provided in the existing tanks, the sludge being drawn off into a culvert at the deep end of the tanks, which is carried to a pump well near the buildings, and from which the sludge can be dealt with by the existing pumping plant.

It may be interesting here to state that the only part of the existing scheme which the Local Government Board consider superseded consists of six sludge presses and a length of sewage inlet channel. The presses will be abolished and the length of outlet channel will not be further required on account of diverting the end of the rising main to a new position, which more readily provides accommodation for detritus tanks. The steam-raising plant, air compressors, sludge rams—in fact, all other machinery—will be utilised in the new scheme for the purpose of tank cleaning and the removal of sludge to lagoons. I estimate that this plant will be required for about a month in each year, after which it will be entirely shut down and the power and lighting for the remainder of the year will be obtained from the electric generating plant installed at the York City Asylum not far away.

The two detritus tanks, each 51 ft. long by 11 ft. 3 in. wide, will be provided with an electrically driven dredger, and the detritus will be loaded into tip wagons running alongside the tanks.

The filters, ten in number, will be constructed on similar lines to the two existing ones which have proved so successful; the floors will be of concrete rising to the centre, and the walls of 9-in. brindled pigeon-holed brickwork in cement mortar. Floor tiles will be laid radially, and two tiers of air pipes extending almost to the centre of the filter will be provided at intervals of 2 ft. in the depth of the filtering media, which will not be smaller than about 1¼ in.

I have not yet fixed definitely on the type of distributor to be used, but it will be self-propelling, and of such construction as will permit compressed air being utilised for the purpose of cleaning the arms. Since I adopted this method on one of the existing filters some twelve months ago there has been no necessity to use the unsatisfactory brush, which, as you know, necessitates the removal of a plug at the end of each arm and the consequent pollution of the effluent channel.

The humus tank is divided into four sections, the bottom of each section being an inverted pyramid, the method of cleaning being by means of sludge syphons emptying into a steel tank in an adjoining position, from which it will be forced by means of compressed air to the sludge culvert. Provision is also made in the scheme for lifting the sewage by ejectors from each of the tanks back into the sewage channel whenever it may be necessary to empty them for sludging or other purposes.

It might be of interest if I give you the loan periods granted by the Local Government Board for this work, which are as follows:—

Detritus tanks, channels, rising main, bacteria beds, carriers, footpaths, banks, roads, ironwork, pipes, humus tanks and channels, and compressed-air chamber—thirty years.

Piling river bank, dredger lines and motor, ejector, sprinklers, electric cable to City Asylum, air compressor and motor, and steel ram—fifteen years.

In the working of the new plant against the existing I estimate a saving of £1,842 per annum, or £1,217 against £3,059.

STORM-WATER TANKS, ETC., AT FULFORD PUMPING STATION.

The works at Fulford are being installed to meet the requirements of the Local Government Board with regard to storm water, which up to the present time has been delivered direct into the river without any treatment of any kind.

The works provide a detritus tank and two storm-water tanks, each of 500,000 gallons capacity, and the sewage will pass through all three before overflowing to the river.

The character of the ground has necessitated special construction, inasmuch as it is subject to heavy flooding from the river, and as a consequence it has been necessary to guard against upward pressure.

It was my first intention to provide shallow and inexpensive tanks arranged with automatic valves to the river, so as to equalise any upward pressure during floods, but this scheme did not favourably impress the Local Government Board, who, as you know, look with suspicion on any possible short-cuts or by-passes. This being the case, it was necessary to alter the whole construction and practically provide covered tanks weighted by means of earth filling over a concrete roof. Piling has also had to be resorted to for the foundations, in order to resist the additional weight due to roof load. The length of the piles will average over 40 ft., and these are being driven by the Atlas Concrete Pile Company.

As the floor of the tanks will be subjected to either an upward or a downward pressure, it will be constructed of ferro-concrete, the reinforcement being woven mesh metal in two layers. The tanks will be emptied by decanting the storm water through floating arms, and the residue will afterwards be drawn off by gravitation to the receiving well immediately in front of the pump culverts.

The existing pumping plant consists of two direct-acting inverted triple-expansion plunger pumps for pumping to the Naburn disposal works, and these have a capacity when working singly of 4,665,000 gallons per twenty-four hours.

In addition to the above, two steam-driven centri-

* Paper read at a North Eastern District meeting of the Institution of Municipal and County Engineers at York on November 30th last.

nugal storm pumps are provided, each capable of lifting 10,000 gallons a minute and discharging direct into the river. These pumps will be replaced in the new scheme by electrically driven submerged centrifugals, but instead of discharging direct into the river they will be arranged to discharge into a receiving channel adjoining the detritus tank, and from this to the two storm-water tanks. A third centrifugal pump, but of the horizontal type, will be provided with a capacity of about 3,000,000 gallons a day for lifting sewage to the Naburn works, thus augmenting the main pumping plant, and I am hoping to be able to shut down the steam plant at night during dry periods of the year.

The normal daily flow of sewage is about 3,500,000 gallons per day, but as this is in a great measure diluted by subsoil water and leakages from the two rivers, the Local Government Board only require 7,200,000 gallons to be treated as sewage, anything in excess of this amount to be treated as storm water.

I regret I cannot give you further details of the new plant, as they are not yet settled.

The contract for the construction of the tanks has been let to Messrs. J. Bentley & Co., of Bradford, the amount of the tender being £10,754.

The loan period for these works is twenty years, and for pumping machinery fifteen years.

NEW STREET.

The new street referred to in my opening remarks is one which is now partially constructed, and tenders for the remaining portion will be obtained very shortly. The width of the street is 50 ft., and the total length 380 lin. yds. The object of its construction was to facilitate through traffic from the direction of Walmgate and Fishergate, and also to relieve congested traffic in Fossgate. The total cost of the street will amount to about £48,000, and of this amount £40,000 represents the amount expended on the purchase of property, leaving about £8,000 for street works, which include a bridge over the river Foss of 37 ft. span the full width of the street.

It will be seen from the drawings exhibited that a large amount of filling has been necessary to obtain the required headway over the river Foss and to ensure an easy gradient over the whole length of this road.

On account of the unsatisfactory state of the ground in the locality of the river Foss, considerable difficulty was experienced in the abutment foundations, also in the crossing of the river with an iron pipe sewer, especially during the construction of the latter, it being necessary to enclose all the sewer for the purpose after an accident by the contractors to dam the river above the point of crossing had proved unsuccessful.

The carriageway is constructed with a concrete foundation 6 in. thick, and finished with 4 in. of tar-macadam, while the footways will be paved with 2½-in. concrete flags, made at the corporation depot.

REHOUSING SCHEME.

The rehousing scheme has been brought about by the demolition of cottages on the site of the above-mentioned street, and the Local Government Board have sanctioned a scheme which provides for the erection of thirty cottages in five blocks of six, arranged on three sides of an oblong, the distance between the building lines being 118 ft., made up as follows: Two gardens 9 ft. each, two footways 6 ft. each, and two carriageways 15 ft. each, leaving a space of 46 ft., which it is proposed to utilise for recreation purposes.

Twenty of these cottages comprise a living-room 16 ft. by 12 ft., a scullery 8 ft. 9 in. by 8 ft. 6 in., and three bedrooms, with water-closet, coal-house and larder arranged within the main walls of the building. The remaining ten cottages are similar to those above described, except that they have four bedrooms.

Each cottage is provided with a copper and a bath in the scullery, a supply of hot water to the bath being arranged from the copper, while the kitchen range will be provided with an L boiler and tap for the supply of hot water for every-day use.

My first scheme was for cottages in blocks of four, and generally of larger dimensions than those included in the final scheme, but as it was found necessary to reduce the cost to a minimum, it was necessary to rearrange the whole scheme.

The estimated cost of the scheme is £7,547, made up as follows: Land, £1,092 8s. 4d.; cottages, £6,000; road making, sewering, &c., £455; total, £7,547 8s. 4d.

This work is out for cottages alone at £200 each, and I am expecting them to be erected for this amount. The rents for these cottages will amount to about 4s. 6d. for the smaller cottage and 5s. for the larger one, in addition to which rates will amount to 2s. per week per cottage, including water and poor rate.

TAR-MACADAM OVER COBBLES.

In February last the corporation made an application to the Local Government Board for a loan to cover the cost of paving all cobble-paved streets in the city with tar-macadam, eighty-six streets being included, representing an area of 44,528 super. yds., the estimated cost amounting to £7,575. Sanction for this amount has been given by the Local Government Board, the period for repayment being seven years.

The tender of Messrs. Henry Ellison, Limited, of Cleckheaton, amounting to £3,976, was accepted in May last for about half the work, and they are now engaged in carrying it out.

The reason for this work was that my council consider cobble paving to be unsatisfactory, insanitary and very noisy, and complaints from this cause are very numerous.

In addition to the area of cobble paving above named, a further area of 21,290 sq. yds. has been dealt with in a similar manner during the last four years, this work being done by administration, the cost being borne out of revenue.

In most cases it has been possible to get a layer 3 in. thick over the cobbles, but where this thickness could not be obtained, the cobbles have been lowered, but in all cases new channels composed of lock-grip setts 8 in. wide have been laid. Wherever cobble paving has been treated in this manner, it has proved most satisfactory, and is very much appreciated by residents in the streets so treated.

TRAMWAY EXTENSIONS.

The present system of electric tramways was commenced in September, 1909, the first section between Fulford and the city being opened in January, 1910. A second section to Dringhouses was brought into use in March, 1910, while the third section to Acomb, and a fourth section to Haxby-road were brought into use in June, 1910. The author was responsible for the whole of the permanent way, street improvements, the strengthening of Lendal Bridge, erection of car sheds and waiting shelters, &c., the total cost of this work amounting to £111,000. I am glad to say that the working of the scheme has proved successful, and the extension now to be taken in hand is through a very populous district, and I have every reason to believe that this will also prove as successful as the first installation.

The route length of the extension now to be taken in hand is 1 mile 1 furlong 3·80 chains, for the most part double track, and it includes a triangular layout at the junction of Queen-street, Blossom-street and Nunnery-lane.

The foundation for the track is composed of 6 to 1 concrete, 7 in. thick under the rails, finished with 1½-in. floating to receive 4½-in. creosoted redwood paving blocks, grouted with "Plascom." The rails will be British Standard Section No. 3, 6½ in. deep by 7 in. wide on flange, the weight being 100 lb. per yard, and they will probably be manufactured out of "Sandberg" steel. The joints of the rails will be welded by the Thermit process, and anchored on each side at a distance of about 1 ft. from the joint, intermediate anchors being provided at distances of about 15 ft., and the tie-bars will be cranked so as not to interfere with the coursing of the paving blocks. All joints (excepting, of course, at junctions with manganese steel) in the existing tramway track are welded by the Thermit process, and I am very pleased to say that up to the present time I have not found a single defective one. I believe this good result is obtainable in all cases where proper care is taken when the joints are being made, and always providing that it is carried out during mean temperatures. All points and crossings will be of manganese steel, firmly bedded into the concrete by means of cast-iron sole pieces, and the points will be of the double movable type, the facing points at junctions being electrically operated. I may say that on a short length of this track where the ordinary traffic is small tar-macadam will be substituted for wood pavement.

The electrical equipment will be carried out under the supervision of my colleague, Mr. J. W. Hame, the city electrical engineer. The total estimated cost of the extension, including electrical equipment, is £18,566.

Institution of Municipal and County Engineers.

DISCUSSION ON RAIL CORRUGATION.

Mr. R. J. Thomas, county surveyor, Buckinghamshire, the president, occupied the chair on Friday evening last at a meeting of the Institution of Municipal and County Engineers at Caxton Hall, Westminster, at which Mr. H. T. Wakelam, M.Inst.C.E., F.G.S., county engineer, Middlesex, presented a short paper dealing with the information received by the Tramways Committee of that body in connection with their investigations on the subject of rail corrugation. The attendance at the meeting included Messrs. W. Ashbee (Hanwell), W. N. Blair (St. Pancras), W. Bridges (Kilburn), A. T. Bridgewater (East Ham), J. S. Brodie (Blackpool), A. H. Campbell (Edinburgh), T. Cole (secretary, Westminster), J. W. Cockrill (Great Yarmouth), A. W. Currie (Stoke Newington), P. Dodd (Putney), W. J. Dresden (Battersea), W. Fairley (Westminster), W. H. Grieves (Sutton, Surrey), H. A. Giles (assistant secretary, Westminster), W. J. Hadfield (Sheffield), M. Hainsworth (Teddington), W. Harpur (Cardiff), R. B. Holt (Leeds), C. J. Jenkin (Finchley), W. T. Lancashire (Leeds), H. Marten (Streatham), E. B. Martin (Rotherham), H. Mattinson (Manchester), T. J. Moss-Flower (Westminster and Bristol), E. B. B. Newton (Paddington), J. P. Norrington (Westminster), A. P. Piggott, J. C. Radford (Putney), L. Raine (Hungerford), J. L. Redfern (Gillingham), F. Reed (Putney), R. Shaw (Ilford), G. G. Shepherd, S. C. Stone, G. Sturgess, J. Sutcliffe (Deptford), R. J. Thomas (Aylesbury), H. T. Wakelam (Middlesex), A. G. Whitfeild (Gold Coast) and H. G. Whyatt (Grimsby).

The President (Mr. R. J. Thomas), in opening the proceedings, said they were met that evening to discuss a paper, prepared by Mr. Wakelam, on the vexed question of the corrugation of tram rails. Proceeding to explain how this arose, he said the Tramway Committee of the council had been considering the question and sent out a formidable list of questions. As they could see, there were an endless variety of questions and a large number of answers, which it was felt should be placed in the hands of someone to tabulate. It was obvious that to a busy man the work of tabulation was one which would occupy a great deal of time and require a considerable amount of ingenuity. It was suggested that a meeting should be held to discuss the question, and Mr. Wakelam was asked to put his report in the form of a paper, the discussion of which he thought would prove interesting, if only because of the variety of opinions expressed.

RAIL CORRUGATION.

By H. T. Wakelam, M.Inst.C.E., F.G.S.,
County Engineer, Middlesex.

When accepting the invitation of the council of the institution to tabulate and report upon the returns received to the queries sent out by the Tramways Committee in connection with the above subject, the writer was not aware of the large amount of labour and time the work would involve—especially to one placed like himself, whose ordinary time is so strenuously taken up. It was only through a concession of a large portion of his limited leisure that he was able to prepare the compilation of replies to the numerous questions (71) circulated to engineers in charge of tramway systems in the United Kingdom.

After preparing the somewhat voluminous compilation it was necessary before the writer could arrive at any degree of finality on the question to prepare also an analytical tabulation, in a condensed form, to afford information sufficient to enable him to form any sort of conclusions as to the cause, or causes, of rail corrugation. Even after preparing the compilation and the analytical tabulation it was an onerous and difficult task to deduce from them sufficient data from which any degree of opinion on the subject could be given. This may be judged from the many different views set forth in the answers received to the questions circulated, some of the engineers replying stating

That corrugations develop most quickly on rails laid on rigid beds.
" " are most pronounced where the subsoil is plastic.
" " are most prevalent where the subsoil is waterlogged.
That corrugations are independent of the nature of the subsoil.
" " are independent of speed.
" " appear mostly on flat curves and straight tracks.
" " are more pronounced on outer rails.
" " are more pronounced where speeds are high.
" " are more pronounced where speeds are low.
" " are more pronounced where "coasting" is done.
" " are more frequent on gradients of 1 in 100 to 1 in 400.
" " are more pronounced at stopping places and on down grades.
" " are general on both up and down grades and on both flat and steep grades.
" " appear on the outside rails of curves, and on the inside rails of straight tracks.
" " are most prevalent on flat tracks.
" " are found on manganese steel points.
" " appeared in one case on a straight track only, and at one particular place only.
" " are most prevalent where brakes are applied.
" " are found in some places at an acute angle, but mostly at a right angle to the rails.
" " are continuous where they occur.
" " are found on single tracks where cars travel both ways.
" " are found on light tracks where the subsoil is spongy and marshy.
" " appeared only, in one case, where the rails were originally packed on a concrete bed.
" " are found on the same formation on both up and down tracks.
" " are most marked where the carriageways are not paved from kerb to kerb.
" " are mostly intermittent, but in places continuous.
" " appeared in some places, altered in their wave-lengths, and finally disappeared.
" " are not found on both rails at the same place
" " are found on inner rails, about double the length of, and slighter than, those on the outer rails.
" " do not appear where "coasting" is done, and where ordinary brakes are used.
" " are removed by cars.
" " are not found where the speeds are low.
" " are not found on ballasted tracks.
" " are not found on down grades.
" " are not influenced by slight differences in construction.
" " are not found where ordinary track brakes are used.
" " are not found to be more prevalent where the subsoil is waterlogged than otherwise.
" " are not found at stopping places.
" " are not found where the rails were originally laid in solid (puddled) concrete beds.

That loose rails tend to corrugation.
" corrugations in one system practically disappeared where the rails were lifted and tightened to the track bed; and
" the trouble is not created by the use of ordinary brakes.

From the foregoing and from the other information contained in the answers received to the questions circulated, it may be argued that the trouble is chiefly set up by combined influences, such as

(*a*) The constant oscillatory motion of the car wheels on the rail surface; due (1) to high speeds; (2) to bogie cars; (3) to short wheel bases; and (4) to heavy car platforms.

(*b*) The rigid bed, which, for stability of the road surface, must necessarily be laid down. In this connection it can be assumed with safety that the more rigid the road bed the more intense the impact of the rolling stock.

(*c*) Curvature of track. In this connection it is clear that the curves generally of tramways, steam railways and electric railways are affected by corrugation to a greater extent than straight tracks.

The aforesaid influences, conjointly with driving and braking, may be factors towards the trouble, although later in this paper the writer furnishes information which makes it exceedingly difficult for any definite opinion to be formed as to what is in reality its cause.

Speeds are much higher to-day than were possible with the old cable tracks, which tracks suffered from corrugation to a limited degree only. The trouble in this connection was always attributed to braking. Constant and rapid braking, under the fast traffic of to-day, no doubt cause varying and irregular impacts between the wheel tyres and the rails. These varying impacts, with the influences already referred to, may have a considerable bearing on the question, especially when (what are known as) "wheel flats" are correlatively considered. It may be that vibration, combined with the influences already mentioned, may also have some bearing on the question. To prove the length of vibratory waves along tramway rails

FIG. 1.

produced by varying speeds of rolling stock, the writer made actual experiments a few days ago on the Middlesex County system, and found that, in connection with a car travelling at a speed of 12 miles an hour, the wave was noticeable on the rail head at a distance of 240 yds. from the car; that at a distance of 160 yds. vibration was general; that at a distance of 70 yds. vibration was distinctly accentuated as the car passed over each joint; and that vibration was not so pronounced on the curves as on the straight tracks.

Thicker rail webs than those commonly used on tramways would no doubt obviate vibration to some extent, and in this connection lengths of track so constructed may well be laid for the purpose of experiments, with both high and low carbon rails.

Very little corrugation appears to be noticed where the car traffic is of a light nature, and the trouble appears to increase in ratio to the traffic. Tracks used by bogie cars are more corrugated than those confined to cars with fixed frames. This may be due to the oscillation caused by the small wheels of the former.

Tramway rails of the same section and make, subjected to the same tests, corrugate to varying degrees, and also vary considerably under actual wear. Rails supplied by firms in Barrow-in-Furness, Belgium, Leeds, Lorain, and Middlesbrough, to one particular system of tramways, have been known to corrugate. Corrugations (see illustrations) affect tramway rails laid on concrete beds of almost any strength or thickness. Corrugation is also experienced where the rails are laid on longitudinal wood sleepers (embedded in concrete), for instance, the system of construction adopted in the town of Hull.

It was stated at the Paris Congress that, from actual tests, soft rails corrugated less than hard rails. The tests were stated to have proved that in comparisons of wear after the first 30 000 cars over the tracks, the result of the next 65,000 was in favour of soft rails. Hard rails are, however, universally accepted as being the most economical for general wear.

In reply to questions sent out by your institution, it was stated (1) that in the town of Perth the trouble affects both rails, but on one particular length of track only; and (2) that at Sunderland corrugations appeared and disappeared on tracks where speeds were fairly high, and that, after disappearing for a time, they are again showing. In the latter connection it would be of interest to know whether or not there have been alterations or changed conditions in the tracks, or rolling stock, or in regard to the speeds at which the cars travel.

Those engineers who replied from the following towns—*viz.*, Accrington, Ashton-under-Lyne, Heywood, and West Bromwich—stated that the tramways there are not at all affected by corrugation. They appear to be exceptions to the general rule, and those members of the institution who are particularly interested in the subject may perhaps like to make an inspection in those localities, with a view to ascertaining whether or not there are favourable or local circumstances in regard to their immunity from the trouble.

There are undoubtedly unknown conditions attaching to the formation of corrugation which appear to be always in force. And it appears also to be the fact that there is some neutralising action which causes corrugations to appear and disappear. For instance, the case of the Sunderland tracks, already referred to, may well be cited.

The trouble does not affect the rail tread only. In some systems the wall faces of the grooves are also affected.

Being so much engrossed in the problem, the writer was impelled to extend the scope of his inquiries in the direction of permanent ways designed for steam and electrically driven trains. He is glad he did so, because the information gleaned in this direction forms not the least valuable portion of this paper.

Rail corrugation does not confine itself to tramways only, it is also met with very extensively on both ordinary steam and electric railways, as the following notes show. First, in this connection, it is of interest to know that corrugations are met with to a considerable degree on many lengths of such railways, and the illustrations accompanying this paper show the pitch and shape they take. Illustration No. 1 shows corrugations with an inch pitch on one of the chief English railways under fast trains. Illustration No. 2 shows an enlargement of the corrugations shown in No. 1. Illustrations Nos. 3, 4, 5 and 6 show varying corrugations on a line branching from one of the main trunk railways. The trains passing over these lines are all steam driven. This fact altogether upsets the theory of those who state that corrugations are set up by electrolytic action.

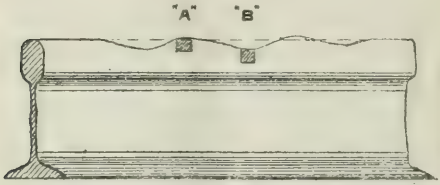
In regard to tracks used by electrically driven trains where the usual "side supported" construction has been adopted corrugations are constantly met with.

An important case having a great bearing upon the subject-matter of this paper is that of an electric tube railway, in which case the track, which has been in use about six years, was constructed to the design shown in illustration No. 8. Up to the present there is no sign of corrugation on either the curves or on other parts of the system. In contradistinction there is an electric railway, under the same control as the electric tube railway just mentioned, which was constructed on the ordinary steam track principle (illustration No. 10). On the latter corrugations have proved most troublesome—especially on the curves—although the rolling stock employed is common to both No. 8 and No. 10 systems. The rails used in each case were identical—*viz.*, Sandberg silicon.

Owing to the successful results obtained by the adoption of the centre supported track (illustration

No. 8) on the electric tube railway referred to in lieu of tracks on rigidly supported beds (illustration No. 9), it is, I understand, the intention of the executive engineer of another railway to reconstruct the whole of the system of which he has charge, on the centre supported plan (illustration No. 8). In his opinion, corrugations or "batterings" (which latter are, in reality, fully developed corrugations) are due to rigid beds.

From the foregoing facts, notwithstanding anything previously referred to in this paper, it may be well



assumed that the principal cause of the trouble arises from or in connection with track construction.

An experiment recently carried out on a curve of 10 chains radius (on an ordinary ballasted railway track) affords ground for reflection. Shortly after the curve was laid corrugations or batterings were very pronounced, and careful measurements as to their positions, depths and pitches were recorded. After a time the curve was taken up and relaid with new rails of an exactly similar pattern and make to those first adopted. After some wear batterings or corrugations appeared again at the same identical spots, and to the same depths and pitches.

The above sketch shows, in diagrammatic form, the waviness of the corrugations which appeared in both sets of rails laid for experiment. Drillings were taken from the crest of one of the rails at points "A" and "B" with a view to finding out whether or not there were any chemical changes in the structure of the metal at the points affected. It was analytically proved, from the drillings, that the chemical compositions were exactly the same in both cases.

Grinding, as you are aware, is much practised to get rid of corrugations as they appear. The writer has no information on the point as to whether rails corrugate more quickly after grinding than before.

Ordinary steam railways are, it is well known, built up on the side-supported principle, by constant packing of the track sleepers by platelayers. On these, as shown in illustration No. 10, corrugations are very prevalent.

For the purpose of this paper the writer has tried to find out in connection with both steam and electric railways—

(*a*) Whether the pitch of the corrugations or batterings varied with the speed of the trains?

(*b*) Whether the corrugations varied in their pitch in ratio to the speeds?

(*c*) Whether corrugations or batterings were more frequent on curves than otherwise?

The information received on points (*a*) and (*b*) is to the effect that trains travel over rails at different speeds, but no alteration in pitch of corrugations is forthcoming. In regard to point (*c*) corrugations or batterings are undoubtedly more frequent on curves than otherwise.

The writer thinks that from the foregoing information the cause of corrugation has been, for practical purposes, brought down to what may be termed a reducible minimum. By this he means that corrugation must form some inherent attachment to all track constructions which do not possess more or less resilient beds, on the lines of that shown in illustration No. 8, and it rests with some ingenious person to design a track for electric traction on roads which will give both resiliency and stability for tramway traffic, with reasonable maintenance charges, and, at the same time, provide a surface which will satisfactorily sustain for a reasonable period the ordinary road traffic.

The writer thinks that the replies received to the questions circulated make it abundantly clear that corrugations are not caused by—

(*a*) Electrolytic action.
(*b*) Rolling stock (*per se*).
(*c*) Driving and braking.
(*d*) Soft rails; or
(*e*) Resilient tracks.

That whatever the real cause may be, it is aggravated by—

(*a*) Impact and vibration.
(*b*) Hard rails.
(*c*) Rigid beds.
(*d*) Curvature.

A great deal of the information contained in this communication has already been sent by the writer, in the shape of a report, to the Tramways Committee of the institution. It is at the request of the latter that this paper has been prepared and presented to-night, with an invitation to those present to express their views in connection with the abstruse problem of the actual cause of rail corrugation.

DISCUSSION OF MR. WAKELAM'S PAPER.

Mr. M. Hainsworth (Teddington) said the subject was one of very great interest to local authorities, and he considered that the thanks of the meeting were due to Mr. Wakelam for his paper and also to the

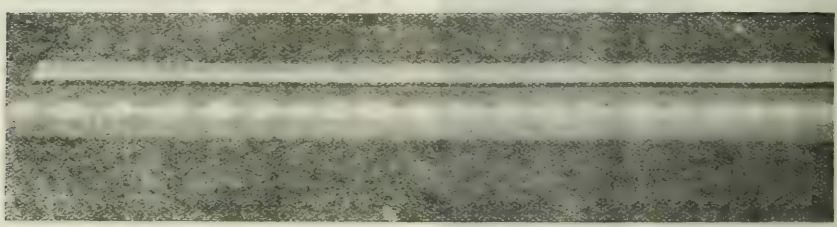


Fig. 2.

Tramways Committee of the institution for going into the matter. In Teddington they had suffered considerably from the trouble of rail corrugation, and particularly as regarded noise. It was alleged that the noise arose from corrugation and also from defective joints. The tramways company took steps to remedy the cause of complaint, and they welded the joints of their rails, ground down the joints to the level surface, and ground out the corrugations. The result was very noticeable: the noise was abated, and although it was twelve or eighteen months since the work was done there had been no recurrence of the noise, although he had to admit that the corrugations were now reappearing. A suggestion which he wished to put forward was that crystallisation of the fibre of the steel owing to constant vibration, as in the case of shafting in a shop or mill, might be held to account for corrugation. Owing to defective joints also it might be that wheels became irregular in shape and that the impact which resulted produced this trouble. He had wondered, too, whether rusting of the surface had anything to do with the matter. Then, again, the surface of the rails being attacked and corrugation arise by a similar process.

Mr. W. Fairley (Westminster) said he wished to bring some information forward which he thought might be of use to Mr. Wakelam. He had under his direction a small portable railway with a gauge of 3 ft. The rails were only 20 lb. per yard and very flat on the top. This little railway was worked by a petrol locomotive. Anyone who had anything to do with tractors of that description well knew that a good deal depended upon the man who was working the locomotive. The tractor only weighed between 18 and 20 cwt., and drew between 4 and 5 tons. The whole essence of the thing was that, in starting the tractor,

it had a certain amount of slip. He was interested to find on this tramway that corrugation occurred on the rails exactly similar to that found on the tramway systems of this country—the corrugation running at right angles to the face of the rail. They went into that, and the only conclusion they could come to was that this arose from slip. The part where the rails were affected was quite straight, and the speed was low at that point, but the locomotive there begins to start the trucks, and in doing so they had to manipulate it so that in a measure it went forward "hunting" they called it—pulling on the springs. After pulling on the springs it had to go back for a short distance, and if the wheels were rotating it must cause wear on the rail. He had given this as an instance where they had corrugation of the rail on a tramway which was not an ordinary tramway, neither steam nor electric. Yet they got exactly the same appearance on the rails. Might he suggest that after all, slipping had something to do with this? If anyone liked to go down to St. James's Park Station and watch the District trains there (and for preference go to the end of a train when a train was starting), the motor which was in the rear of the train evidently developed greater power than it could utilise, and if they went to the rear car when the train was starting they would see it "hunted"—that was pushed a series of waves up against the end of the train. In that case they would see that the wheels were revolving at a much higher speed than the train was going at. In the case of tramways where they were drawn by geared motors on the bogies, each of these bogies had a certain amount of play. The amount of play might be very small, but it was still there. He suggested that the possible reason for this might be the effort of starting the motor in pushing, and pushing on the springs forward and backward a little bit, and causing a grinding motion on the rail. Once they got

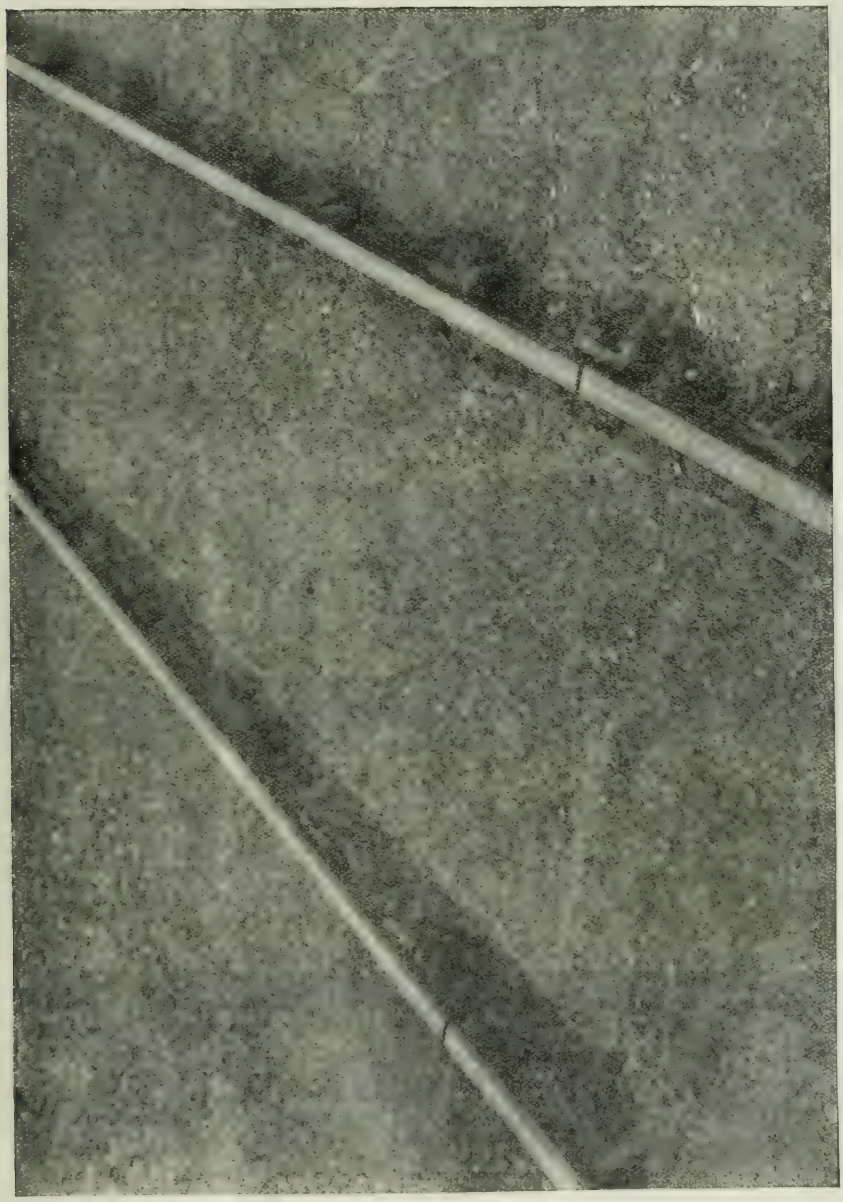


Fig. 3.

one spot on the rail they soon got another. They in the suburbs had had some interesting experiences recently of the effect of motor-'buses on macadam roads. If they looked at a macadam road which had had a fair amount of wear of motor-'bus traffic for some time, in the gaslight or moonlight, they would see the road was corrugated, only the corrugation was much more pronounced than was shown on the surface of the rails. He believed that arose first from a small indentation or pot in the road, and the motor running on to it jumped on to the next, and formed one after another. He thought the institution was greatly obliged to Mr. Wakelam for the immense amount of labour he had undertaken in tabulating these returns and writing this paper. What he admired most about the paper was the extreme honesty of it. It told them, "there are all the returns, and the returns are so contradictory that you cannot make much of them." He had put forward this theory of a light motor working on a tramway as one which might give them some clue as to corrugation.

Mr. W. J. Hadfield (Sheffield) stated that he was in charge of the construction and upkeep of about 80 miles of tramways in the city which he represented, and he was greatly troubled with corrugation. Mr. Hadfield went on to complain that, although the paper stated that questions on the subject had been circulated to engineers in charge of tramways throughout the United Kingdom, it was extraordinary that they had not been received by either Sheffield, Leeds, Manchester, or Glasgow, and he did not think it was for the good of the institution that towns of that kind should have been omitted. Everyone's thanks were due to Mr. Wakelam for what he had done, for the work he had undertaken was one which not many members of their body would have attempted. One reason suggested by the paper as a cause of corrugation was the constant oscillation of the car wheels on the rail surface due to the bogie cars. They had a fair amount of corrugation in Sheffield, but as they had no bogie cars they must dismiss those as a cause of corrugation. Cable tracks, the paper pointed out, suffered from corrugation to a limited degree only, and the trouble was always attributed to braking. The old cable line between Handsworth and Birmingham had been the subject of a careful investigation by a committee of the Municipal Tramways Association, and their report with regard to the corrugation which occurred showed that on that portion of the tramway inside the city on which the cars were run at a speed of 7 miles per hour no corrugation took place, while on the portion of the system outside the city where the cars were run at a speed of 9 miles per hour extensive corrugation developed. The speed of the cars running on the inside section was subsequently increased to 9 miles per hour, and corrugation then became general on that section, showing that the critical speed on that system was between 7 and 9 miles per hour. The wheels of the cars were 24 in. in diameter. In Sheffield, as a result of careful investigation, they had decided that braking had nothing to do with corrugation. The matter of vibration was most important, and ought to be considered carefully; in fact, according to one of the members of the Municipal Tramways Association Committee, there were eighteen separate and distinct movements in the

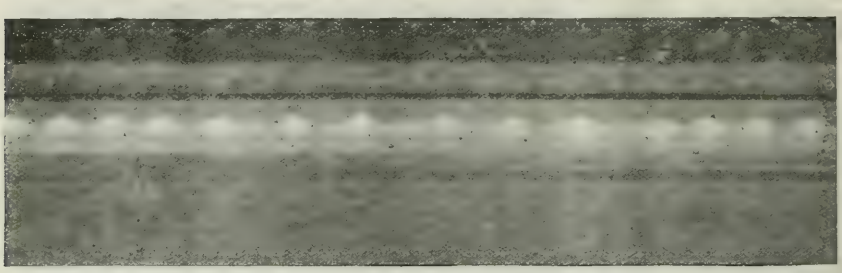


Fig. 4.

Fig. 5.

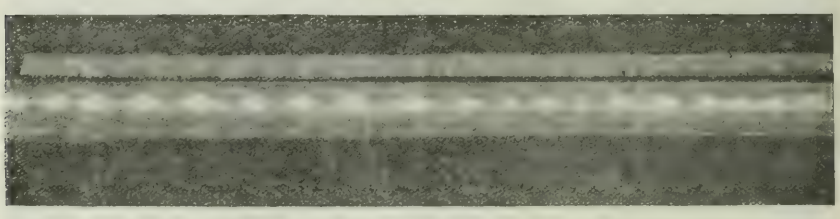


Fig. 6.

passage of a tramway car which ought to be investigated. With regard to rails, they adopted one of the British Standard sections, but found it unsuitable, the web splitting. If a rail were weak enough to split it would be weak enough to vibrate. In Liverpool, Leeds and Sheffield the tramway authorities had altered the rails according to their own ideas, and he himself was now using a 120-lb. rail—30 lb. more than the British

structive. There were references to the chemical composition, but nothing was said as to alterations in the structure. In Sheffield they had gone into that question. They had cut out pieces of corrugated rail, planed off the corrugated parts and put them into acid, and he had obtained most useful results in that way.

The President, referring to Mr. Hadfield's remarks

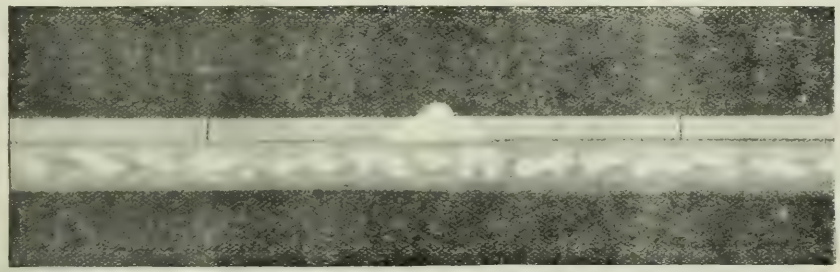
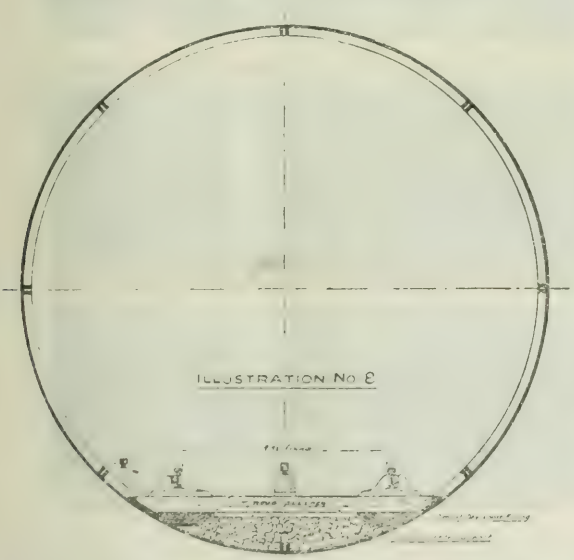


Fig. 7.

Standard section—and strengthened the web of the rail. It was stated that in some towns there was no corrugation, but it would be interesting to know what was the practice in those places in laying tramways. If conditions should be analysed closely they ought to get at the reason for the absence of corrugation. For

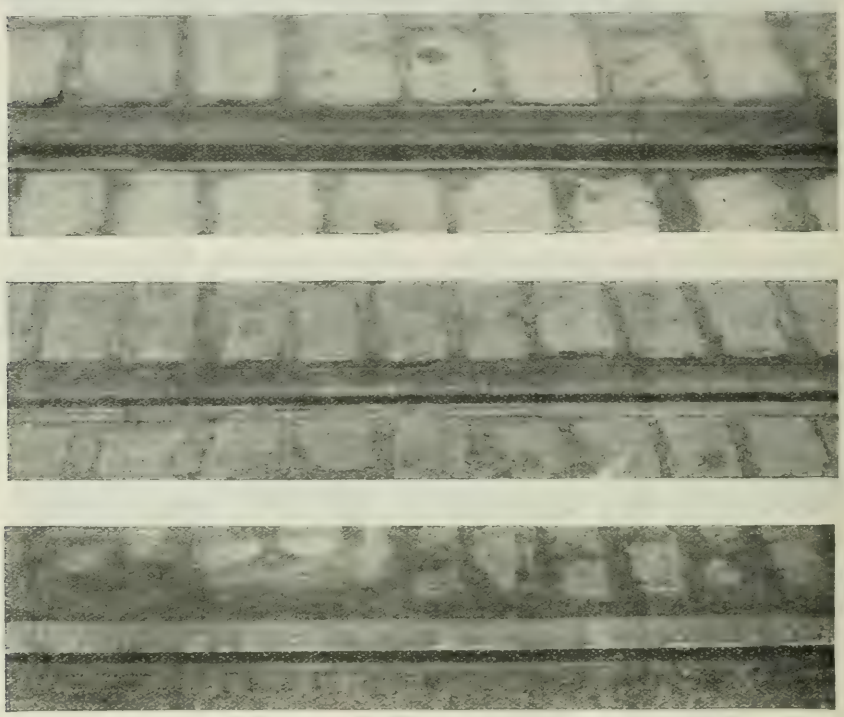
with regard to the omission of the four towns in connection with the Tramway Committee's inquiry, said his information was that the towns in question were applied to for information, but that no replies were received.

Mr. W. Harpur (Cardiff) proposed a vote of thanks to Mr. Wakelam for the very excellent paper he had given them. Mr. Wakelam was entitled to more than ordinary thanks for the immense amount of work, not only in writing the paper, but in tabulating the returns. It did not solve the difficulty, but it gave them any amount of room for thought and experiment and for endeavouring to try further what they could find out in reference to this vexed question of corrugation. Mr. Hainsworth said something in reference to grinding out corrugations. He would like to give them his own experience in regard to that. He was very proud for a time in finding that they had no corrugations on their tram rails in Cardiff for the first three or four years after construction. He was constantly being asked by tramway engineers about corrugations. He told them they did not know what corrugations were; they did not know anything about them. But they started, and once they did start they came on very quickly with hammered joints as well as corrugations. We took up the portions of the rail which were corrugated, ground out the corrugations, and they succeeded as Mr. Hainsworth said they did at Teddington. Since then they had followed that principle. As soon as they found a corrugation beginning to occur they got it ground out, and thus they kept the thing down to a minimum. Up to the present it was the only solution they had been able to find. The trouble was they found where they had loose rails they corrugated, and where they were tight on the bed they corrugated. That made one wonder whether or not the rigid rail was the best. It was a most troublesome thing to come to a conclusion. He must say he rather fancied the rigid bed had a great deal to do with corrugation. Naturally, if they had got two hard substances, one hammering upon the other, it had a bad effect upon the rails, and more or less upon the wheels also. Mr. Wakelam did not say anything in his paper as to whether he had heard of corrugation upon the trolley wires. He did not know whether anyone else had, but he was told that corrugations had appeared on the trolley wires the same as the rails. If that was a fact it showed that neither a rigid bed nor an elastic



instance, were the joints welded? He thought it was not impossible that the welding of the joints had something to do with it. The comparisons in the paper between the different tube railways were in-

bed had anything to do with the question. That was a point he would like, if they could, to find out something about. The question of the rails was the only thing they had to deal with in their institution; they had nothing to do with the trolley wires, and they had no occasion to find out about corrugation of those wires. They must try and find out that information from another source. Mr. Fairley mentioned about the question of slipping having something to do with it. He thought there must be a good deal in what Mr. Fairley said upon that point. His experience was that slipping was not at the start and stopping of the motor. He found where they had a compulsory stopping place for some little distance before the cars reached the stopping place they got no corrugation, but in between where the car attains its maximum speed there they corrugate. They found that corrugation occurred also where they had an optional stopping place—that was, where the cars pulled up when they were asked. Many of the cars run over those places. At compulsory stopping places they found no corrugation for some distance before and after. That convinced him it was the speed, which he would thought there was something in that, and to the fact that they were more or less loose, not so firmly connected as with the fixed truck cars. In the case given in the paper in which no corrugation had appeared, he would like to know how long the rails had been laid, and the frequency of the service of cars upon those tracks, because those were points which had a great deal to do with corrugation. Further, he would like Mr. Wakelam to ascertain the speed at which cars run over those lines. In summing up Mr. Wakelam thought that from the foregoing information the cause of corrugation had been, for practical purposes, brought down to what might be termed a reducible minimum. By this he meant that corrugation must form some inherent attachment to all track constructions which do not possess more or less resilient beds, and it rested with some ingenious person to design a track for electric traction on roads which will give both resiliency and stability for tramway traffic, with reasonable maintenance charges, and at the same time provide a surface which will satisfactorily sustain for a reasonable period the ordinary road traffic. He quite agreed with Mr. Wakelam that

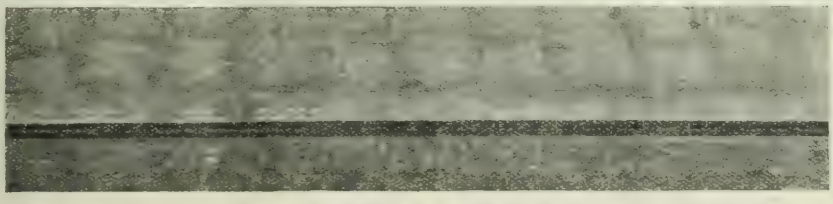


Early Indications of Tramway Rail Corrugation.

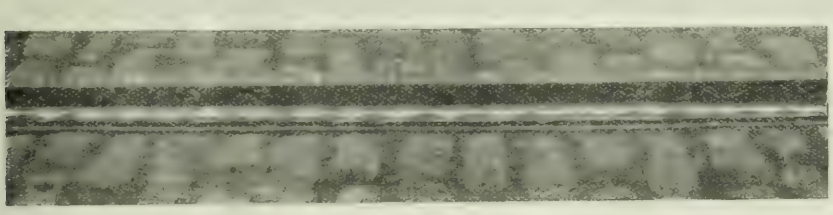
not say had everything, but had mainly to do with corrugation. That seemed to be largely borne out by what Mr. Hadfield had told them about the cable trams at Birmingham. Where the speed was 7 miles they had no corrugation; where the speed was 9 miles corrugation appeared. His experience at other places seemed to confirm that up to the hilt. But he was afraid that was not the experience of some other people. There was one statement he would like Mr. Wakelam to explain further, that in connection with a car travelling at a speed of 12 miles an hour the wave was noticeable on the rail head at a distance of 240 yds. from the car, that at a distance of 160 yds. vibration was general; that at a distance of 70 yds. vibration was distinctly accentuated as the car passed over each joint, and that vibration was not so pronounced on the curves as on the straight tracks. He wanted to ask Mr. Wakelam did he mean that he could see the corrugation at a distance of 240 yds.? Then Mr. Wakelam stated that "tracks used by bogie cars were more corrugated than those confined to cars with fixed frames. This might be due to the oscillation caused by the small wheels of the former." He this was just the thing that was wanted—that was, a certain amount of resiliency with stability—but the difficulty was how were they going to get that on the ordinary road. If they had a resilient tram track they must pull their paving to pieces; their paving must go with it or it was impossible to have a resilient track. He quite agreed with what Mr. Wakelam said, but he was afraid if that which he suggested was to be attained it must mean that the tram tracks must be taken off the streets and put elsewhere, either to a separate piece of road or to where the road traffic is not allowed to run as well as the tram lines. He hoped this paper might have the effect of putting those who had tram tracks under their care upon further investigation, and that they would find some solution for this troublesome question. It was a troublesome question, because corrugation of the rails not only meant corrugation, but a terrible noise, upsetting the nerves of people who lived upon the roads, and it also meant that they could not keep their track in decent order. The one thing followed the other, and unless they could find some solution they would be constantly troubled as they were at the present time. Mr. Fair-

ley spoke about the corrugation of road surfaces. It tended to show that they not only had rails which corrugated with high-speed traffic, but they got their corrugated roads, unless they had a surface which could not be corrugated, and they had not got that yet. As far as he could see, speed had more to do with the question of corrugation than anything else, but at the same time they could not suggest the reducing of speed. The tendency was to increase speeds everywhere, and for that reason they must try to find some other solution.

Mr. R. B. Holt, permanent way engineer, Leeds Corporation, said he wished to express his appreciation of the efforts of Mr. Wakelam to solve this elusive problem of rail corrugation single-handed. He had spent many years on this problem both personally and as a member of the committee appointed by the Municipal Tramways Association. He realised fully what an onerous work it was, and he thought that Mr. Wakelam must have discovered that the task of Hercules to clean out the Augean stables was mere child's play compared with this. Mr. Wakelam, no doubt, found that nothing of a reliable and satisfactory nature could be obtained from the replies to queries. He had generally found such replies to be erroneous and misleading; they generally recorded impressions, not facts, and it had been found possible to obtain quite different information on personal investigation. Mr. Wakelam's experiments in regard to rail vibrations were interesting, and he would like to have further information as to the type of recording instruments used, and perhaps Mr. Wakelam would inform him whether the results obtained were constants for different tracks and different cars at the same speeds. Reference was made to the absence of corrugations on some tracks, and on others the trouble was said to increase in ratio with the traffic; personally he had found no system which was entirely free from corrugations in one form or another, though some of these tracks suffered little or nothing from its presence. Many places had corrugation markings, very pronounced in appearance, but these did not develop. The rails which had suffered most on the tracks which he was responsible for were those of British standard quality, basic Bessemer steel. The earlier rails with low carbon cement, with a high percentage of manganese, gave better results, and the best results had been obtained from the use of Sandberg steel rails (basic Bessemer), with high percentage of carbon, silicon and manganese. These latter rails were by no means immune from corrugation markings; but after fine service in all positions, it had not been found necessary to grind out corrugations on rails of this quality. He would like to state that the appearance of bright corrugation markings (that was bright patches or bars across the rail treads) was not dependent upon the number of cars which had passed over the rail at that place. He had frequently seen markings of this description after the passage of one car which had been obliterated by successive cars. As would be seen in the interim report of the Corrugation Committee of the Municipal Tramways Association, artificial corrugation had been produced on rails by means of white oil paint fed through pads pressed lightly against the wheel tyres; but it was impossible to produce these indications at will, nor was it possible to obtain the same result again at exactly the same place. From this it would appear that the corrugative influence was without the rail. He found that corrugation was just as prevalent on tracks operated by single truck cars. In Leeds they had no other type, and they had suffered to a considerable extent. He was pleased to note that Mr. Wakelam did not consider that rails possessed any inherent tendency to corrugate; this had long been his conviction, but some rails were undoubtedly more prone to the destructive reaction than others. He could not support Mr. Wakelam in his finding to the effect that hard rails and rigid beds aggravated the cause of corrugations, neither did he see his reason for assuming that the rolling stock and resilient tracks were not the cause of corrugation. He had not found any reasonable connection between speed and the pitch of corrugation, but it was apparent that, under normal conditions, there was a critical speed somewhere between 7 and 12 miles per hour, above or below which corrugations did not appear to any great extent. He did not think that Mr. Wakelam could really be of the opinion that "flats" on wheels had the remotest bearing on the subject. Flats might only occur once or so on a wheel 8 ft. or more in circumference, and frequently long stretches of corrugation appeared at one time, in addition to which the vibration periodicity necessary to produce corrugations of 2½-in. pitch would vary between 63·36 impulses per second at 9 miles per hour and 105·12 impulses per second at 15 miles per hour. It might be of interest to the meeting to know that the Corrugation Committee of the Municipal Tramways Association, as the result of a number of experiments carried out in different places with a differential recording apparatus which recorded the relative difference between the distance travelled and the distance represented by the revolutions of the wheels, together with the slip and skid which took place, and also by means of hardened-steel studs inserted in the wheels of a car, discovered that slip and skid were continually taking place, and that a purely rolling motion seldom takes place. From this and numerous other experiments extending over a considerable period it was deduced that the slip and skid referred to took place owing to the different diameter of the wheels, which was prevalent, and which was largely the result of the unequal wear produced by the relative difference in the speed of the two motors. They thought that the slip and skid referred to, which resulted in attrition, might be responsible for the formation of the hollows, and that a purely rolling action, combined with increased pressure of hammer-



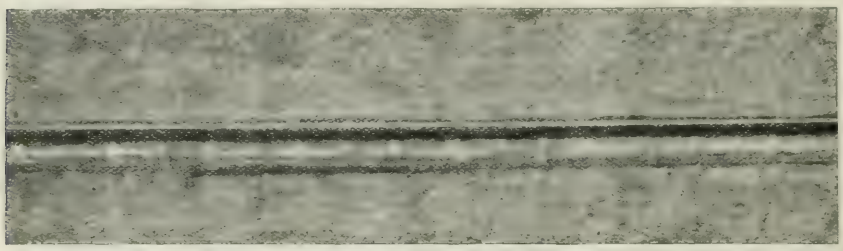
Development of Corrugations.



Corrugations on Flat Level Surface.

ing action, might account for the brightness of the crests. This, combined with synchronous vibrations between rails and wheels, appeared to him to afford an excellent field for the closest investigations; indeed, he was sure it was the threshold of the door leading to solution.

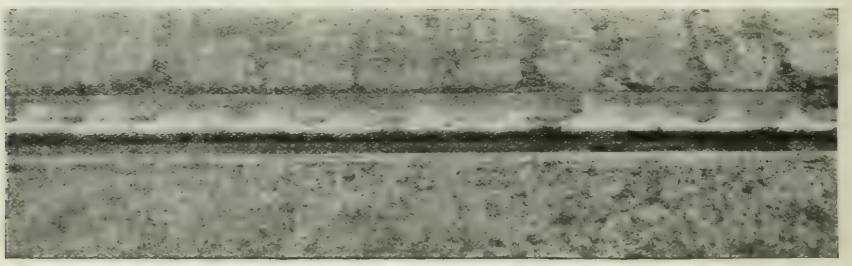
Mr. E. Benedict (Westminster) said that, as a former secretary of the Light Railways and Tramways Association, he had taken a great interest in the operation he had spoken of could be brought about he was sure they would have a better chance of getting to the root of the matter. A suggestion of Mr. Worby Beaumont, to which no allusion had been made that evening, was to his mind the only theory which accounted for the ridges of the corrugations being bright and the hollows dull. If the scooping out of the hollows was due to friction, surely they ought to be bright, but the theory was that, under certain condi-



Corrugations which Appeared after Four Years.
(Photo taken eighteen months after first appearance.)

question, and had read no end of reports, not only of that body, but of the Municipal Tramways Association and the International Tramways Association, whose headquarters were at Brussels. He had attended two of the congresses of the last named body, and at both of these the question of corrugation was brought forward. When he was secretary of the Light Railways

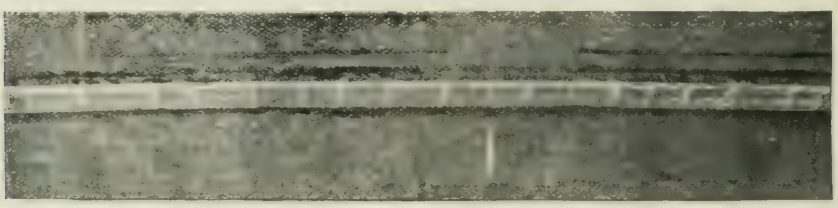
tions and with certain qualities of rail, cold rolling resulted in corrugation; in other instances it resulted in the spreading of the rail, and, when the rail was very hard, in pitting. If the rail was of such a quality as to allow rolling and hammering to affect it, then where the ridges were formed the wheel jumped over, leaving the ridges bright. That seemed to him very



Corrugations on Track. ¼" Tight to Gauge. 100' Radius.
(Flat level curve.)

and Tramways Association he tried hard to get the different interested societies to work together, but did not succeed in attaining his object. His successor, however, had succeeded, and the Light Railways and Tramways Association had co-operated with the Municipal Tramways Association in preparing the recently issued interim report. It appeared to him that the

near to the right thing. Mr. Worby Beaumont's contention was that it did not appear so often on steam railways because the wheels were larger, and so the weight per width of rail was less intense and spread over a greater surface. When they got small wheels the stress was much more intense, and that was why these corrugations appeared. It appeared to him to



Corrugations on 45' Radius.
(Level curve.)

Institution of Municipal and County Engineers had been working in a lonely furrow. Why should the labours of other associations be ignored? The action taken by the institution necessitated an enormous amount of industry, but the work had all been done before, and the overlapping which had taken place caused a great waste of energy. There was no reason why foreign nations should not work with us. Some of the municipal men at Glasgow were very useful members of the International Union, and if the co-

be a very sensible theory, which might be further investigated.

Mr. J. C. Radford (Putney) mentioned that he had seen corrugations appearing in road surfaces soon after the latter had been formed. He had often wondered why it was, and his impression was that it was due to the road ruckling under the roller. There might be something in it. Traffic would increase the corrugations.

Mr. Hadfield observed that Mr. Worby Beaumont's

theory seemed entirely to agree with what he said. The stress was put upon the web of the rail and it pulled it out. As to railways and tramways, the centre of gravity was very much higher in railways than in tramways.

Mr. HARPUR said he knew of a railway in South Wales on which the traffic was light—motor trains chiefly—and the rails on that line were badly corrugated. He attributed that to the light rolling stock, because on the heavy coal carrying lines they did not have it.

Mr. R. B. HOLT (Leeds) expressed regret that Mr. Worby Beaumont was not present that evening. His theory, as far as he (the speaker) could see, was that it was not so much a transference of metal as that the skin of the rail was stretched to such an extent that there was permanent distortion. They had some special tests made by Prof. Carpenter at Manchester University, and the view he took was that the metal was amorphous, the fact of the metal being so showing that hammering had taken place at that point.

Mr. J. W. COCKRILL (Great Yarmouth) stated that he had 14 miles of tramway track in his town, and no corrugations appeared on the first 6 miles done for five or six years. They allowed it to stand, and it ran itself out, but it appeared again after about eighteen months, and they started grinding. There was not much to do, however, and there had been no corrugations since. In another case they ground a little, and that had lasted about two years, and it seemed therefore that the operation would only be necessary every second year on their system.

The PRESIDENT (Mr. R. J. Thomas), in putting the vote of thanks, observed that, as far as he was personally concerned, he was in the fortunate position of having no tramways to look after, though they had something worse to look after in the corrugation of roads.

The vote of thanks was passed.

Mr. WAKELAM, in replying, said it had been a great pleasure to undertake the task of tabulating these returns and preparing the paper, though we found a difficulty in arriving any decision as to what was the cause of corrugation from the replies to the seventy-one questions which they formulated and circulated. There had been very many experiments carried out to find out the cause, there had been acid tests, driving tests, and all manner of other tests, and nobody seemed to have come to a definite conclusion as to what was the cause of the trouble. Mr. Benedict had referred to cold rolling and cold flowing having something to do with the cause of the trouble. Mr. Holt had replied to that, and had said that Prof. Carpenter, of the University of Manchester, had made a great number of microscopic observations in connection with that point, and he believed that his results did not quite coincide with the results or opinion that had been put forward by Mr. Worby Beaumont. Mr. Benedict also referred to the work of tabulation, and he was kind enough to say that he hoped the tabulation would be published by the papers, but he did not understand why the replies should be published, especially as Mr. Benedict stated that the work had already been carried out by other institutions, and they already had the information. He was sorry they did not know that the other institutions had got this information, because it would have saved himself and the Tramway Committee and the secretary of their institution the great amount of work and trouble which had been taken in collecting this information. They were glad to hear that Mr. Benedict was in a position to give them, because from the replies to this institution and the replies which had been given to the other institutions they might benefit, and might jointly come nearer to a solution. Mr. Harpur raised the point of corrugation in connection with trolley wires. Mr. Fairley referred to slip being the cause of corrugation. He did not think those two theories could go together, because there was very little slip in connection with the trolley wire. He did not think it was slip which was the cause of the trouble. The theory had been put forward that expansion and contraction of the rail head was the cause of corrugation. Engineers who laid tramway rails were very careful to see that the analyses of the composition of the rails were complied with. If these analyses were complied with, he did not see why one part of the rail should expand and contract and the other part remain in the same state. For that reason he did not think that expansion and contraction was the cause. Rails which were of the same construction microscopically and otherwise suffered in different degrees in different parts of the track. Therefore it could not be cold rolling or cold flowing, or anything of that kind, which caused a rail to corrugate for 20 yds. or 30 yds., and then remain good for 2 miles. A point put forward by another institution similar to their own was that a greater amount of resistance in the rail might cure the trouble. A rail having ·6 of carbon was difficult to handle, and if they got a higher amount of carbon than ·6 he did not know what was going to happen to the rail, because they were going to have a lot of breakages; and, as Mr. Harpur was good enough to remind him, there was difficulty not only in the handling, but the bending, of the rail. The Sandberg rail had proved itself as receptive of corrugation as the ordinary carbonised rail. There had been a large number of tests carried out, but it appeared to him that the whole thing had got into the state which resolved itself into one thing, that all the information which had been obtained on the subject should be sent to Dr. Glazebrook at the National Physical Laboratory at Teddington, where they could carry out comprehensive tests and researches, and let them know what was the cause of the trouble which people did not appear to be able to solve. He knew—and confessed—that the paper he had laid before them was not the last word on corrugation. Perhaps he might say that he was almost as ignorant of the cause of corrugation now as when he went into the tabulation and preparation of this paper. A friend of his had assisted him with tests with two pieces of steel, and with a plane surface moving regularly backward and forward over the steel there was, after a time, corrugation. There was no slip in connection with that, and no grinding motion, but still there was corrugation. Then, as to the rigid bed. There was no doubt that the rigid bed had a great deal to do with corrugation. When they took into consideration the condition on the Central Railway of London, undoubtedly there was a good deal to be said on that point, and resiliency would do a great deal to alleviate if not to rid them entirely of the trouble. Mr. Harpur wanted him to explain the distances referred to in the paper as to vibration waves. This vibration wave was noticeable at a distance of 240 yds. from the rail. The distance was measured by a tape measure on the road, and it was signalled when the car got to a certain spot. The instrument was put on, and the greatest distance at which it was noticeable was 240 yds. He had no evidence as to the difference of the wave in relation to the speed of the cars. That applied also to the 160 yds., the 70 yds., and also to the vibration on the curves. Mr. Harpur also called attention to the fact that speed might be a factor, if not the cause, of corrugation. He did not think Mr. Harpur could have read the paper very carefully, because he would see the corrugations were more defined and noticeable where speeds were low on the curves than on the straight tracks, so it could not be speed which was the cause of the trouble. He had only to say as to corrugations appearing and disappearing that that was a curious thing. That had been mentioned in the case of Sunderland, where they experienced the same phenomena in connection with corrugations. If corrugations appeared and disappeared, as they had been known to, it seemed they were further from a solution than when they started, because they must find out the cause of the appearance and the cause of the disappearance. It was his opinion that money would be wasted if isolated experiments were carried on; but with regard to tabulation, a good deal of money could be saved if this information were sent to Dr. Glazebrook and he went into the whole question. Whether it was a national question he did not know, but to tramway companies and to corporations who were interested in the upkeep of tramways, and who had to spend some thousands a year, as they had in Leeds, he should say that money spent in connection with researches by Dr. Glazebrook would be very well spent.

WEST MIDLAND DISTRICT MEETING AT BIRMINGHAM.

A West Midland District meeting of the Institution of Municipal and County Engineers was held at Birmingham on the afternoon of Thursday, November 21st, Mr. A. T. Davis, M.INST.C.E., county surveyor of Shropshire and chairman of the district, in the chair. The chairman was supported by Mr. A. D. Greatorex, M.INST.C.E. (West Bromwich). The members assembled in the reception-room at the Council House

Birmingham, those present being Messrs. Hy. E. Stilgoe (Birmingham), H. H. Humphries (Birmingham), J. E. Parr (Birmingham), W. E. Ballard (Birmingham), C. F. Gettings (Worcestershire), H. J. Coleby (Atherstone), F. C. Cook (Nuneaton), W. Plant (Stafford), A. E. Currall (Solihull), G. W. Lacey (Oswestry), W. A. H. Clarry (Sutton Coldfield), R. C. Moon (Nuneaton), W. H. Jukes (Tipton), W. O. Thorp (Malvern), F. Woodward (Stourbridge), G. Green (Wolverhampton), members; A. R. Gray (Birmingham), H. W. Barker (Birmingham), B. C. Hammond (Worcester), R. Fletcher (Worcester), E. J. Goodacre (Nuneaton), associate members; and H. Bradley (Worcester), student.

The minutes of the last West Midland District held at Stourbridge on July 6th—were read and signed.

Mr. A. T. DAVIS thanked the members for electing him as chairman of the district, and proposed the election of an executive committee. This was seconded by Mr. A. D. Greatorex, who suggested that the number to serve on the committee should be fifteen, exclusive of the district representative, district chairman and district secretary, who are also to act on the Executive Committee. The proposition was supported by Mr. Gettings and carried unanimously.

The following resolution, proposed by the chairman and seconded by Mr. H. E. Stilgoe, was carried unanimously: "Resolved that the following members and associate members of the institution be elected *en bloc* to serve as an Executive Committee:—

Warwickshire.—S. Douglas (Kenilworth), member; E. J. Goodacre (Nuneaton), associate member; A. R. Gray (Birmingham), associate member; H. Richardson (Birmingham), member; J. Willmot (Warwick County), member.

Worcestershire.—C. F. Gettings (Worcester County), member; F. Woodward (Stourbridge), member.

Staffordshire.—A. Burton (Stoke-on-Trent), member; W. B. Chancellor (Lichfield), member; H. J. Clarson (Tamworth), member; A. D. Greatorex (West Bromwich, past-president), member; G. Green (Wolverhampton), member; J. Moncur (Staffordshire), member.

Shropshire.—G. W. Lacey (Oswestry), member.

Herefordshire.—J. Parker (Hereford), member.

The CHAIRMAN announced with regret the absence through illness of Mr. H. Richardson, hon. district secretary, and further announced Mr. Richardson's resignation as secretary. Mr. G. Green (Wolverhampton) proposed, and Mr. G. W. Lacey (Oswestry) seconded, that a very hearty vote of thanks be given to Mr. Richardson for his services, and the hope conveyed to him that he would have a speedy return to health.

The CHAIRMAN proposed the following resolution, which was seconded by Mr. H. H. HUMPHRIES (Birmingham), and carried unanimously: "Resolved, that Mr. F. C. Cook, ASSOC.M.INST.C.E., borough surveyor, Nuneaton, be appointed as hon. district secretary."

The position was accepted by Mr. COOK, who thanked the members for electing him.

The CHAIRMAN asked the members to try and arrange for visits to their towns during the coming year.

Mr. H. E. STILGOE, M.INST.C.E., city engineer and surveyor, Birmingham, then described to the members the following town planning schemes which are being dealt with at Birmingham: Harborne and Quinton, 2,320 acres; East Birmingham, 1,443 acres; North Yardley, 2,861 acres; South Birmingham, 7,000 acres. Plans of the schemes were exhibited and inspected by the members.

The CHAIRMAN proposed, and Mr. GREATOREX seconded, a hearty vote of thanks to Mr. Stilgoe for arranging the meeting at Birmingham, and for his explanation of the town planning schemes.

An appeal was made by Mr. GREATOREX to the members to subscribe annually to the Widows' and Orphans' Fund of the institution.

The CHAIRMAN, on behalf of the institution, thanked the Lord Mayor of Birmingham for granting the use of the room for the purpose of the meeting.

In the absence of Mr. Richardson, the duties of secretary were performed by Mr. J. E. Parr, ASSOC.M. INST.C.E. (Birmingham).

SOUTH-EASTERN DISTRICT.

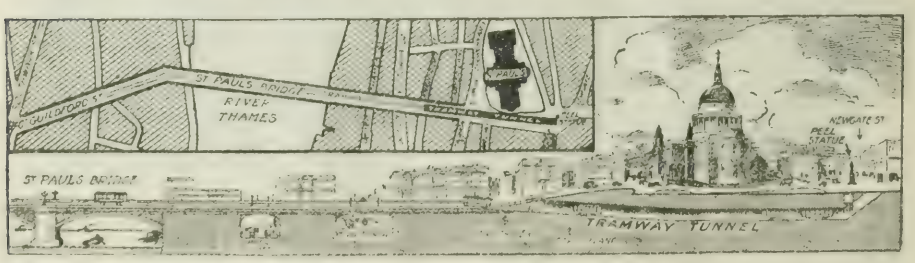
A meeting of the District Executive Committee of the South-Eastern District was held at 11 Victoria-street, S.W., on Saturday last, when particulars were discussed with respect to the meeting—particulars of which appear elsewhere in this issue—to be held at Sidcup on Wednesday, January 8, 1913, to be followed by a dinner at Frascati's Restaurant. Replies to the invitations sent out have been most satisfactory, and the committee trust that those members who have not replied will be able to attend the meeting and the dinner in the evening.

The British Association.—Next year's meeting of the British Association will be held at Birmingham, opening on September 10th, and extending over eight days.

London Tramways Scheme.—At their meeting on Tuesday last the London County Council, after considerable discussion, decided not to proceed with the scheme to construct a tramway from the Marble Arch along Edgware-road to Cricklewood. It had been proposed to seek the necessary powers in the next Session of Parliament.

The Institution of Civil Engineers.—The highest marks in the October associate membership examination have been obtained by Mr. C. Quartanos, of Newcastle-on-Tyne, and Mr. H. Knowler, Wimbledon, Surrey. The council have accordingly directed that Mr. Quartanos, who is ineligible for the Bayliss Prize by reason of his not being a present or former student of the institution, shall receive honourable mention, and that the prize—of the value of £15—shall be awarded to Mr. H. Knowler, STUD.INST.C.E., under the conditions of its foundation.

PICTURE PLAN OF SUBWAY FOR THE PROPOSED SOUTHWARK TO CHEAPSIDE TRAMWAY.



From the *Daily Mail* we reproduce the above picture plan of the subway for the proposed new tramway route through the City of London. An official protest against it has been sent by the Dean and Chapter of the Cathedral to the Chairman of the L.C.C., as it is considered that the construction of the subway, part of which will be 22 ft. below St. Paul's Churchyard, would entail serious risk of weakening the foundations of Wren's great building. The plan shows that the new tramway will run from Southwark Bridge-road, through Southwark, along Guildford-street, and across the new bridge over the Thames. It will be carried overhead across Queen Victoria-street and through a subway from Knightrider-street through Cannon-street, Watling-street, and St. Paul's Churchyard, to Peel's statue in Cheapside.

THE GENERATION AND DISTRIBUTION OF PRODUCER-GAS IN SOUTH STAFFORDSHIRE.

By HERBERT ALFRED HUMPHREY, M.INST.C.E.

[Abstract of a paper read at an Ordinary Meeting of the Institution of Civil Engineers on Tuesday last.]

The South Staffordshire Mond Gas (Power and Heating) Company is a pioneer undertaking, since it is the first example of a company giving under Parliamentary powers a supply of producer-gas for public purposes. The advantages of such a supply have now been amply demonstrated, and, in view of the probability of other schemes of a similar nature being carried out in the future, precise information and data should prove of interest. The Act contains clauses prohibiting the sale of gas for domestic purposes or for illumination, and the limit of carbon monoxide in the gas distributed is fixed at a maximum of 14 per cent.

The area of supply comprises 123 square miles, within which there are six corporations, sixteen urban district councils, and three rural district councils. For the central station an area of about 40 acres of land, adjacent to railway and canal, was secured at Dudley Port, Tipton, which is practically the centre of gravity of the whole area. The designs of the central station plant and buildings, and the distribution system, were carried out by the author, as consulting engineer to the company, and the contract for the whole of the work was let to the Power Gas Corporation, Limited.

The unit of plant adopted was based on a capacity for gasifying 140 tons of coal per day, and consisted of eight Mond gas producers, together with the necessary gas-cooling, cleaning, and compressing plant; plant for the recovery of sulphate of ammonia and tar; and the machinery, comprising steam boilers, circulating pumps, electric generating plant, motors, fans, &c. The first unit erected was started in operation in February, 1905, and at the present time additions are being made which will increase the output by about 80 per cent.

Of the eight Mond producers one is a spare, and each producer is rated at 20 tons of coal per twenty-four hours, but in meeting the peak of the load the producers have been worked at 50 per cent above their rated capacity.

OPERATING RECORDS AND OTHER DATA.

Typical analyses of the fuel used are given, and the methods of handling the fuel and ashes are described. Curves have been plotted showing the coal gasified, sulphate of ammonia made, and the tar sold per month for the thirty months from January, 1910, to June, 1912. Other curves give the total gas made and the total gas sold for a period of eighteen months, and, in order to show the fluctuations of the gas supply from hour to hour, the meter-readings at the central station are plotted in the form of a curve covering a period of one week. At the peak of the load an output of 1,000,000 cubic feet per hour has now been reached, and the plant, which was designed for gasifying 140 tons per day, has reached the rate of 200 tons per day. Curves showing the principal temperatures and pressures throughout the plant have been plotted, and tables showing the calorific value of the gas over long and short periods are given. The Mond producer-gas distributed averages over 150 B.Th.U. per cubic foot, and the regularity of the calorific value is remarkable.

DISTRIBUTION OF GAS.

Owing to the fact that considerable portions of the area of supply are subject to subsidence, due to the presence of disused coal mines, and for other reasons, such as cost, number of joints, &c., steel mains were adopted in preference to cast iron. The author mentions his experience on this subject. Special attention is paid to the coating of the steel mains laid underground, to prevent attack due to the acid water which is prevalent in the district. All mains between 36 in. and 21 in. in diameter, inclusive, are of the locking-bar type, particulars of which, and of the method of jointing, are given. For the smaller mains, welded steel pipes with screwed joints are employed. Up to September, 1912, there were laid 22,666 yds. of locking-bar pipes with lead joints, and 29,181 yds. of steel pipes with screwed joints, making a total of 29·45 miles. Additional mains are now being laid. Drawings showing the types of pipes, joints, &c., are also given, and the special precautions taken to ensure a continuous supply are mentioned.

CALCULATIONS FOR FLOW OF THE GAS.

The method of calculating the size of mains required and the formulas used are set out in an appendix, and an account is given of some important experiments carried out by the author to ascertain the loss by friction in a long length of trunk mains. For this purpose the trunk main between the central station and Bilston, consisting of 10,254 yds. of pipes ranging in size from 36 in. to 27 in. in diameter, was used, and air was blown through these pipes in varying quantities and at various pressures. The results obtained are given in tabular form and show the extent to which the presence of a large number of branches, crosses, valves, and other specials serves to increase the frictional losses. Plans of all the mains laid up to date are given, and the more important features of the distribution system are discussed.

USES OF THE GAS.

The gas supplied to the consumers is used for two purposes—namely, for the production of power in gas-engines and for various forms of heating in furnaces, &c. There are at present over one hundred and fifty gas-engines connected with the company's mains, and it is a significant fact that practically every suction-producer situated near the mains has been shut down, the owner finding it more advantageous to take a supply from the Mond gas-mains. From this cause forty-five gas-producer plants have been thrown idle, twenty of these being suction-plants and twenty-five pressure producer-plants.

A schedule of prices under which gas is supplied is given in an appendix, the price varying, according to the quantity taken, from 1½d. to 2¾d., and the present costs of production and distribution of the gas are compared with the estimates given when the Bill was before Parliament. These figures show that the estimated costs of production based on a much larger plant have been practically realised in connection with the first unit installed. The average price received from consumers was, in June, 1912, about 1·75d. per 1,000 cubic feet, and this is equivalent, having regard to its calorific value, to lighting-gas at 7d. per 1,000 cubic feet, so that the benefits derived by the consumers are obvious. They are further illustrated by some actual examples of saving due to the use of the gas.

A list of the heating operations for which the gas is used is given, and additional uses for the gas are constantly being found. Temperatures up to 1,600 deg. C. are being regularly maintained, and the use of gas for heating operations has proved very satisfactory, the constancy in the calorific value of the gas enabling results to be repeated with certainty. Also, there being no stand-by losses and no fuel and ashes to be dealt with, there is realised additional economy and cleanliness. It is probable that the success which has attended the supply of a cheap fuel gas in South Staffordshire will direct attention to this important subject and will serve to demonstrate the advantages which could be derived by other industrial areas from a similar supply. The subject has been removed from the experimental stage and the safety and convenience of such a supply has been amply proved. For the year 1911 there was a gross trading profit of £8,856, and it is expected that when the new plant, now in course of erection, is brought into use, the financial results will be greatly improved.

North Woolwich Pumping Station Extension.—North Woolwich pumping station is to be enlarged, at a cost of £51,000. The London County Council have spent £4,000,000 during the last fifteen years upon Metropolitan schemes.

Ferro-Concrete Bridge Work in Suffolk.—The opening of a new bridge over the Stour between Sudbury and Ballingdon took place recently. The structure, which is 150 ft. long and 36 ft. wide between parapets, is built in five spans entirely of ferro-concrete. The spans are supported between the abutments by four rows, each containing four ferro-concrete piles, 16 in. square by 17 ft. to 30 ft. in length. Three steam rollers, weighing approximately 35 tons, were used in the tests, which resulted in a maximum deflection of a trifle over $\frac{1}{8}$ in. The work, which has cost £1,900, has been carried out by Messrs. Holloway Bros., Limited, to the designs of the county architect, Mr. A. A. Hunt, for the West Suffolk County Council.

The Effect of Intercepting Traps in House Drainage.*

By EDWARD WILLIS, Assoc.M.Inst.C.E., F.S.I., Engineer and Surveyor to the Chiswick Urban District Council.

The origin of the intercepting trap in house drains may be considered to be largely due to the conditions which were found to exist in sewers laid prior to or about the middle of last century. Undoubtedly at such time many sewers in use were practically elongated cesspools, and defective both in construction and gradient, the result of such defects being that offensive and often dangerous gases were considered to be given off.

Some of these gases, being lighter than air, travelled along the several house drain connections, and rose to the highest available position in such drains or soil pipes. It was at this point that serious trouble apparently arose therefrom, since it is known to every municipal engineer that ventilating pipes to water-closets, sinks, lavatories or baths were practically unknown prior to the above date, and when the traps became unsealed the alleged dangerous gases were driven into the houses.

Even the heavier gases, such as carbon-monoxide, together with deleterious micro-organisms, often obtained access to the house, thus lowering the vitality of residents and creating a predisposition to disease.

The old-fashioned "D" trap was a frequent cause of trouble, for with the then fashionable pan-closets the safe wastes or overflows often discharged into the sewer side of the "D" trap. Theoretically the sewer was nearly always twice trapped by the moving pan containing water above the base of the hopper, and by the "D" trap at the base of the container, yet in practice the direct pipe from the safe to the sewer side of the trap formed a complete circuit of sewer air from the street to the interior of the house. It was another frequent practice to take the overflow from the main water supply cistern into a soil pipe on the sewer side of the "D" trap, and wastes to sinks, baths and water-closet safes were similarly treated, thus affording direct access for sewer air to the surface of water in cisterns, or into bath-rooms and lavatories, which often adjoined bed-rooms and living-rooms, and were sometimes "en suite" therewith.

It is evident that such conditions, even assuming the whole of the house drainage to have been otherwise comparatively good, would tend to result in disease or delicate health, and when some of the early sanitary reformers first evolved the idea of the intercepting trap, it was hailed as a panacea for many drainage evils.

Undoubtedly, assuming the conditions which then existed, the intercepting trap may have served a useful purpose, but the time has come (in fact, for many years such time has been present in the opinion of many surveyors) when it is a moot point if this appliance is still always desirable. Assuming the previous remarks are correct, the principal object of the intercepting trap has passed away, as sewers and house drains, such as those described above, are practically unknown in the modern development of towns and cities.

It is quite possible in some of the larger and older towns that there may be still some sewers of the character mentioned, and if the drains have not been relaid to modern requirements, one would even suggest that, subject to efficient ventilation at either end, a properly designed intercepting trap might still exercise a useful purpose from the point of view of the householder, but from the local authority's standpoint the author is convinced, and has been for many years, that the use of an interceptor is detrimental to efficient sewer ventilation, and results in the sewage commencing to decompose prior to its delivery into the sewer.

From the recent report, it seems certainly probable that the Local Government Board will approve of by-laws omitting the use of this appliance, or will make the use of the interceptor optional at the discretion of the local authority, now that sewers and house drains are laid under efficient supervision and tested hydraulically by capable and trustworthy officials. The Local Government Board deserves the congratulations and thanks of all sanitarians for pleading such a quantity of evidence for the use of local authorities, and such evidence has certainly opened up a wide field of practical investigation, which should result in great benefit to the general public.

The subject is so essentially a practical one, with which every surveyor to a local authority must have had a greater or less degree of experience, that no excuse is needed again to debate upon the many experiments or results deduced therefrom, which are detailed in the report itself or in the appendices.

The author, while engaged as a building surveyor, personally examined upwards of 1,000 interceptors, both in house drains during construction and after these were in actual use, and in many instances his observations agreed with those mentioned in the report, though in a few his experience does not entirely coincide therewith, as will be mentioned hereinafter.

For convenience of reference it seems desirable in the following notes to keep to the headlines adopted in the report, and the author's deductions from the report and extracts from his own experience will be briefly noted under each heading, and summarised at the conclusion of the paper.

Disadvantages of the Intercepting Trap.

Upon examination of intercepting traps, both during the construction and testing of house drainage and in many instances subsequently to the occupation of the premises, the author had the advantage of testing their effectiveness with actual paper and fæces, instead of adopting artificial fæces, as appeared necessary in the very useful experiments carried out by Mr. Patten Barber.

His experience agrees to some extent with that of the last-named engineer, but not entirely, since he found that no 2-gallon flush would clear any type of interceptor experimented with, and the 3-gallon flush only occasionally was successful in removing fæces and paper. A full bath of water emptied in the orthodox method through the waste pipe was also never successful in entirely removing the paper and fæces from many of the traps tested, but a single large pail of slops or water on a reasonably short house drain was in every case successful where the other above-mentioned means of flushing were unsuccessful.

This points to one necessary alteration in the present regulations and design of sanitary fittings—*viz.*, improvements in the method of flushing house drains.

His experience of the blockage of intercepting traps has been extensive, and the causes have been found to include stoppers, paper, fæces, dusters, brushes, and the usual miscellaneous assortment of minor articles, while cement has also been found to be the cause, in some instances, by unduly restricting the effective area of the trap.

The actual setting of the interceptor does not appear to have received sufficient consideration. The best depth of water seal and cascade may also be included in the same category.

In the experiments carried out by him many years ago, before there was any thought of a commission or departmental committee's report upon this subject, he deduced the following—*viz.*, that with a normal house drain and water-closet flush, cascades of less than 2 in., or from 4 in. to 6 in in depth in an ordinary interceptor were seldom self-cleansing, but that when approximately between 2 in. and 4 in. in depth the interceptor tended to be self-cleansing after one or two flushes.

His experiments did not include consideration of the actual capacity of the trap, and he therefore does not propose to deal further with this item or with the other more general matters mentioned in this section of the report, as these are already well known, unless it becomes necessary so to do in replying to the criticisms on the paper.

Advantages of the Intercepting Trap.

The opinion that traps of small water seal act as permanent barriers to the passage of rats through drains has now been clearly demonstrated as fallacious. In one case the author was personally examining an ordinary disconnecting chamber, when a rat came up through a trap (the cleaning arm being

* Paper read at a meeting of the Lower Thames Valley District Surveyors' Association on Saturday last.

properly sealed), and was running along the channel, but upon seeing him turned and dived through the trap again. On another occasion, when accompanied by a witness, a similar thing happened, thus adding proof to the above contention that the intercepting trap does not entirely prevent the excursions of rats into the house drainage system. If, then, the intercepting trap is not ratproof, the ordinary ground floor of basement water-closet, with small water seal, is also not ratproof. Therefore, should the intercepting trap be obsolete, some special provision must be made to eliminate the risk of rats entering into the basement or ground floor premises through the water-closet.

In connection with this matter the author would strongly emphasise the importance of using syphonic or valve closets, primarily because of the effective double seal, which is given by both these appliances, and, secondly, owing to the advantages that would accrue from the more efficient flush obtained by each, and specially referred to above as being urgently required to cleanse both drain and trap.

With reference to the Bristol experiments, the author has again had the advantage of actual experience practically identical therewith. In a certain street where a sewer is headed up by the flood tide whenever any obstruction prevents the proper use of the outlet flap valve, the included air is forced through every house trap with the smallest seal, and the other traps only show slight movement of the water, but no bubbling. This points to another helpful solution of the problem—*i.e.*, that if the water seals of our closets are increased, there is no prospect of sewer or drain air obtaining admission to the house, even when under great pressure, if a trap at ground level with shallow water seal can be provided and have attached thereto a ventilating pipe which would always act as a primary vent for sewer or drain air when under pressure in times of flood, heavy rains or special flushing. The Bristol experiments may therefore be said to have also been of great benefit in proving the above point.

CHEMISTRY OF SEWER AIR.

In connection with this portion of the report, it is both impossible and inadvisable for an engineer to discuss it in detail, but the author differs with the observation of one of the witnesses where he implied that sewer air is only harmful when accompanied by offensive odour.

His experience proves that such is not the case, and this could probably be further proved by many other engineers. Carbon-monoxide, which is highly dangerous, and carbon-dioxide are both odourless gases, and he has no doubt from the occasional effect of sewer air on lamps, that both these or similar harmful gases are at times generated in sewers and drains.

He once had a most unpleasant experience of an assistant being practically overcome, probably through carbon-monoxide, and it was with great difficulty he forced him through the sewer into fresh air. The sewer in question was only 580 ft. in length and 3 ft. in diameter, and there was actually no fæces, but only clean water running at the time of inspection, and no odour whatever was noticeable therein, but flocculent matter was visible in the bottom and at the sides.

The currents of air in sewers and the condition of the latter should therefore always be the subject of careful examination prior to the entry of any men, or work by them therein.

BACTERIOLOGY OF SEWER AIR.

The evidence under this heading is somewhat extraordinary after the usual preconceived ideas respecting it, but certain points are very instructive—viz., that the ordinary flowing sewage apparently gives off practically no bacteria until the water is subjected to agitation and splashing.

It seems particularly strange that the external air should in some instances contain more pathogenic micro-organisms than the sewers, and the only solution that occurs to the author in regard thereto is that in unventilated sewers the deleterious gases that may be given off have also a germicidal action upon micro-organisms, while those that reach the atmosphere or surface of the street are benefited or nourished by the purer air obtainable. In any case, the results obtained by the witnesses have astonished the majority of sanitarians.

BACTERIOLOGY OF DRAIN AIR.

Briefly, the substance of the report is that drain air is infinitely worse bacteriologically than sewer air. If this is actually true, then undoubtedly from a bacteriological point of view it would seem advantageous to dilute drain air with sewer air; but in any case, from the observations and experiments, there appears to be no serious objection to sewer air mixing with drain air.

One general point in connection with the evidence under this heading is that, if some contrivance can be evolved for efficiently flushing with disinfecting media the soil pipes and all exposed portions of the drain and its contents, the danger of drain air would be removed. It is probable that some such arrangement may eventually be found beneficial.

GENERAL EVIDENCE.

This is somewhat on the lines which one might expect from the other portions of the report. Sewer men, as a rule, do not certainly appear to suffer from illnesses more than other municipal employees.

The experiments in connection with animals are not quite unanimous, but the consensus of opinion appears to point to ordinary sewer air being not unduly harmful to them.

One of the most important pieces of general evidence that the report advances appears to be the general health in Germany, where intercepting traps are absolutely tabooed. In Cologne they were tried for a time, but the disadvantages so far outweighed the advantages that they were removed.

VENTILATION OF SEWERS.

The report seems to imply that the ventilation of sewers is not so important as has been considered in the past, and the author does not entirely agree with the findings of the committee in regard thereto. He cannot help stating that he would not risk the lives of any of the men under him in sewers which were solely unventilated, unless it were first possible to circulate a current of air through, and a lamp requiring oxygen for combustion burnt satisfactorily in them. He is, therefore, particularly keen upon the advantages which would accrue to the ventilation of sewers if the intercepting trap is omitted. Primarily he considers "house drainage" is part of the sewerage system of a district, and as such each house should share the burden of efficient ventilation.

SUMMARY AND CONCLUSIONS.

For those who have not time to read the whole report, the author would strongly recommend them to consider this part in detail. It is an excellent résumé of what has gone before, and even if only the summary of conclusions had been made public, the Local Government Board would have performed a service of lasting benefit to the general public. Unfortunately the result of the report is not yet set forth—*viz.*, as to whether the Local Government Board will enforce the use of the intercepting trap, will make it optional, or will cease to allow its use in the future.

The suggestions that have been made to root out all existing traps are, of course, absurd, since no sanitary expert would advise the wholesale destruction of an appliance which although not perfect, has in many cases, and may even still in some cases, prove of benefit, but it does seem most important that in the development of new estates where sewers are laid under efficient supervision, and where drains should be equally efficient, the trap should be omitted, and each house take its normal share in the ventilation of sewers.

CONCLUSION.

In concluding the above notes the author would like to express his appreciation of a report so full of information, a great deal of which would have been unobtainable by the ordinary observer. The experiments appear to have been carried out in a most careful, systematic, and thorough manner, and the results obtained therefrom must undoubtedly be treated with the utmost deference by all thoughtful sanitary experts.

Personally, he is of opinion that the deathblow of the intercepting trap has fallen. It may take a long while to entirely disappear, but a strong case has been made out for its future omission. What, then, will take its place? He suggests the following points for consideration—*viz.*:—

(1) Improved flushing arrangements whereby rapid discharge of large volumes of water are obtained daily through every portion of the house drainage system, which would prevent stagnation or retention of paper and fæces in the pipes.

(2) Effective double seals on all water-closets slop-closets, sinks, lavatories, and baths.

(3) Effective ventilating pipes clear of the second

water seal, recommended above, and ventilating or puff pipes between the first and second seal.

(4) Entire abolition of fresh-air inlets at or near the ground level.

(5) The erection of all ventilating pipes above the ridge of the highest roof immediately adjoining, and as far removed as possible from any window.

(6) An efficient ventilating pipe of the height before described, at each end of any drain which necessarily passes under the building.

(7) The provision of iron drains whenever passing underneath domestic or public buildings.

(8) The provision of at least one trap of shallow water seal, say not less than ½ in. and not more than 1½ in., with provision, by drip tap or otherwise, for always keeping same sealed, and with vent pipe therefrom if the ordinary ventilating pipes were omitted on any branches from internal drains.

(9) All waste pipes to be treated similarly to soil pipes as regards double seal traps and ventilation, and the abolition of open heads.

(10) Means of efficiently flushing all ventilating and soil pipes.

(11) Statutory regulations requiring the examination of house drains not less than once in every six months, with lesser intervals when special conditions render same desirable.

CORRESPONDENCE ON MR. BOULNOIS' PAPER.

The December issue of the *Journal* of the Royal Sanitary Institute contains three interesting communications submitted in connection with the discussion duly reported in The Surveyor of the 22nd and 29th ult.—on the report of the Departmental Committee of the Local Government Board on Intercepting Traps in House Drains, which Mr. H. Percy Boulnois, M.Inst.C.E., recently initiated.

Mr. W. C. Tyndale (War Office) said he agreed with Mr. Boulnois that the report was a most useful one, as, apart from the question of the use of the intercepting trap, it threw light on other matters, and stamped with official recognition certain views with regard to sewer air, &c., which hitherto had not been generally accepted. It was satisfactory to feel that their useful servant, but half enemy, the sewer, was not quite the bad character that it had generally been believed to be, and that its breath, although offensive, was not necessarily deadly. Personally, he was glad to find that the use of iron pipes for house drainage was looked upon with favour, but, on the other hand, he had wondered at the light-hearted suggestion that a way to get over the charging with sewage of a disconnecting manhole, when the trap became blocked, would be to continue the drain from the trap, through the manhole by a closed iron pipe, with a lid provided for the clearing out of the trap. It had evidently not been considered what would be the result of opening the lid on a surcharged drain to get at the trap. It might possibly result in an inquest on the operator, with a verdict of "Found drowned." No, this was no remedy for the flooding of the manhole. A better course would appear to be to put up with the surcharging, and to have the socket of the clearing arm fitted with one of the best forms of locking stoppers, actuated by a chain from the top of the manhole. The committee had considered this arrangement, but offered the objections that such stoppers were expensive, and that they might become defective, and fail to act; but as to this he might say that excellent stoppers were to be obtained, which cost only about 5s., and were practically proof against corrosive action. A great deal had been said as to the tendency of a trap to retain the solids of sewage, and in the report of the committee it was stated that experiments showed that with a 4-in. trap from 52 to 67 per cent of solids were retained, and with a 6-in. trap from 73 to 78 per cent, with a 2-gallon flush. Dr. Parkes had shown how misleading such results might be on account of the nature of the artificial solids used in the experiments. They all recognised that traps did retain solids, and Mr. Boulnois had pointed out that the drains also did the same; indeed, it was common knowledge that this was the case. No one that he ever heard of had ever suggested that a 2-gallon flush was expected to remove the solids at once through the drains and trap to the sewer. But he should like to draw attention to the fact that while fresh sewage was arriving in the drains and trap previously arrested solids were simultaneously being carried along the drains, and out of the trap, to the sewer, so that the arresting of solids was of short duration, and practically no decomposition in the trap and drains took place. Anyone unacquainted with the working of a good system of drains would discount many statements which had been made that all the percentage of solids left in the trap never passed out but broken up and decomposed, and that the trap and drain were charged with a mass of putrid sewage. He attributed most of the greater number of cases of blockage were caused by the falling into the trap of the stoppers of the cleaning arm, and by the admission of foreign substances. As to the first, he had found that this might be obviated by the use of a proper stopper, which, as in the second he experience, which was extensive in connection with all classes of dwellings, taught him that certain details of a drainage system offered opportunities for the introduction of articles which would stop up almost anything, to say nothing of a trap. This was more particularly so in the case of the dwellings of the lower orders, and it was in connection with the trap at those dwellings that the greater number of blockages were usually found. The women frequently emptied pails down the water-closets without always knowing what the pails contained, and rags, bits of hearthstone, small brushes, &c., were passed into the drains. The children also, having so little space and opportunities for amusement, seized with delight the opportunity afforded by a grating of any sort to push in pebbles, sticks, and in fact anything they could lay their hands on, and they not infrequently lifted the grating of a gully and endeavoured to stop it up. He was of opinion that if the authorities would turn their attention at least to the better covering of gully traps, the locking of the gratings, and the putting out of reach of children the fresh-air inlets, the percentage of stoppage of traps would be considerably reduced. In the case of the married quarters in barracks, the regulations provided for the fixing of a special slop-water gully close to the back entrance, and these had proved of great advantage in the prevention of the stopping up of traps. Mr. Boulnois said that "our long-cherished belief in the efficacy of the trap has been rudely shaken." He did not agree. It all depended upon what was expected of the trap. His view had always been that its main object was to shut off from the house drains the very foul air from the sewers. He was quite content to believe, and welcomed gladly the statement that sewer air was comparatively free from microbes, but, on the other hand, he could not agree with the suggestion that sewer air was less foul than that of house drains. (Of course, he was speaking of a proper system of the latter.) It was common experience that it was frequently possible to tell on opening the manhole on a house system whether there was a trap on the outlet drain, or whether the stopper of the trap was in its proper place, as if not the drains were found to be charged with that peculiar and highly offensive odour which was easily recognisable as sewer air. The enormous difference between the atmosphere in a good system of house drainage and that of the sewers convinced him that, whatever an intercepting trap might not do, it at any rate freed the house drains from most offensive smells. It was true that drain air was offensive on the discharge of a water-closet, but these conditions were only intermittent, while the offensiveness of sewer air was perpetual. He could not contemplate with equanimity the laying on of highly offensive air to a system of house drains which otherwise would be inoffensive, nor the possibility of causing the soil and ventilating pipes to become the disseminators of sewer gases at altitudes and in positions which were recognised to be suitable for house drain ventilators. He considered that the omission of the intercepting trap would have the most disheartening effect on all those whose aim and object it was to provide and maintain clean and comparatively inoffensive drainage systems, as without a trap all such efforts would be in vain. In his opinion any legislation having the object of abolishing the use of the intercepting trap would be the first retrograde step in domestic sanitation, and a grave one at that, since this became more or less a science.

Mr. W. Kaye Parry (Dublin) said that for the last thirty years he had a very extended experience as regarded intercepting traps on house drains. During that period he had issued from his offices 4 500 reports on the drainage of houses, institutions, hospitals, and other buildings. Each one of these reports had

been based upon a careful and thorough examination of the drainage, together with the application of the usual tests. More than half of these inspections he had made personally, and the great majority of the remainder had been made by his partner. During the same period the drainage of some 1,550 buildings had been completely reconstructed under his supervision and that of his partner and staff, and in respect of each of these new systems of drains a certificate had been issued to the effect that they were satisfactory. In each case where a certificate had been issued an intercepting trap had been provided, and in all instances the drain had been subjected to the water test. A stoppage of the interceptor would, therefore, be speedily followed by the flooding of the low-level yards and areas, thus causing great discomfort to the occupants. It was not unreasonable to infer that had such occurrences been experienced he would have been made aware of the trouble in view of the sanitary certificate. Some of these certificates dated back as far as 1884, and yet he was unable to recall one single instance in which a complaint had been made of inconvenience caused by such stoppages. Of the 4,500 inspections made some 1,800 had been re-examinations of houses previously inspected, and he had never yet come across a drain gorged by a choked interceptor. His experience led him to the opinion that when a proper type of intercepting trap was used, and when the drains were properly laid, graded, and flushed, the interceptor did not get blocked. If these traps were abolished it would be impossible to provide fresh-air inlets on house drains, and without air inlets house drains would be always more or less foul, even if they were provided with special shafts. It was the free passage of pure air through these drains which kept them sweet and free from smell. When either air inlets or outlets were obstructed, the air in the drains was always found to be offensive, and complaints were made of bad smells. All modern house drains had an inspection chamber, and some of these chambers were in small enclosed areas and yards. Occasionally the covers of these chambers were lifted when inspections were being made or for other purposes, and in the absence of intercepting traps all the foul gases of an evil smelling sewer would then be released in close proximity to the dwelling. Whatever benefit might accrue as regarded the better ventilation of public sewers by the abolition of the intercepting trap, it would involve the sacrifice of the most important features connected with the perfect sanitation of the individual houses. If trouble was experienced in some towns from stoppages in intercepting traps, the remedy consisted not in the abolition of the traps, but in the reconstruction of the house drains on more perfect lines. His experience led him to believe that the intercepting trap was an effectual barrier against the incursion of rats. They were very seldom found in well-drained houses, and when they existed their presence had almost invariably been traced to incursions from adjoining houses where the sanitation was imperfect.

Prof. Bostock Hill (Warwickshire County Council) said he could not help feeling that in some quarters at least there was a tendency to attribute all the evils to the intercepting trap—a bête noir. His experience as a Public Health Committee was a limited and valuable one, and did not appear to be in accordance with those views. The one great fallacy underlying the objection to the use of the intercepting trap appeared to be the supposition that all sewers were of the same type, while, as a matter of fact, the conditions existing in different localities were widely different. It had been quite customary to make use of sewers to carry down pipes from the separate system, and particularly in those places where the sewers were of inconsiderable size. These sewers much more closely approximated to drains in their character, and could not be compared with the large sewers of London and many other towns. He had had [illegible] years' experience of that type of sewer. He believed he had seen more than one instance when the absence of an interceptor had caused injury to health as well as nuisance to householders. He was not, in consequence, prepared to advise local authorities to abolish those traps, but rather to attempt to discover in each case where they had been the cause of complaint why such complaint had arisen, and how they could be remedied. He endeavoured to show before the Institute some years ago that the unnecessary multiplication of traps was an evil, but the complete abolition of interceptors was a totally different thing, and one which should not be universally accepted as sanitary practice on the evidence at present submitted.

CEMENT LINING FOR STEEL PIPES.

At a meeting of the New England Waterworks Association (the *Contract Record* of Toronto states), Mr. Alfred D. Flynn, department engineer, Board of Water Supply, New York City, read a paper entitled "Protection of Steel Pipes in Catskill Aqueduct," describing the lining of some 33,000 ft. of steel pipe with cement.

Steel having been selected as the metal for the pipe plates, attention was directed to the best method of protecting it. Reports of experience from many places and special examinations of many steel pipe lines of varying ages gave convincing proofs that none of the pipe coatings commonly used was possessed of qualities giving it more than a few years' useful life. One or two cases of use of Portland cement mortar on a small scale in pipes and wide experience in reinforced-concrete construction of the protective action of the cement on the steel pointed to a method for coating the pipes. After some study it was decided to jacket the steel syphons of the aqueduct outside with rich concrete mixed about one part of cement to three parts sand and six parts broken stone or gravel, with a minimum thickness of 6 in., and to line them with Portland cement mortar, 2 in. thick at the minimum.

For lining the pipes, two distinctly different methods have been adopted by the two contractors; on Contract 62 grouting with forms has been employed, and on Contract 68 mortar has been applied by means of the "cement gun." In this particular work grouting proved to be more economical and the "gun" has been discontinued.

It is hoped that these pipes will last a hundred years; they may last much longer, barring accidents. Some abuse or unappreciated condition may lead to earlier partial failure, necessitating reconstruction. The gain in smoothness of interior by covering the rivet heads and the plate laps has been computed to so increase the hydraulic capacity that three pipes equal four without lining. The total cost for the syphons with three lined and jacketed pipes is estimated as about the same as for four pipes constructed and coated in the more usual way. Obvious incidental advantages are secured by the more permanent construction.

LOWER THAMES VALLEY DISTRICT SURVEYORS' ASSOCIATION.

MEETING AT TWICKENHAM.

An ordinary meeting of the above-named association was held at the Town Hall, Twickenham, on Saturday last, when the chair was taken by the president of the association, Mr. H. F. Coales, ASSOC.M. INST.C.E. The attendance was even better than that at the previous meeting, and a paper on the effect of intercepting traps in house drainage was given by Mr. E. Willis, ASSOC.M.INST.C.E., F.S.I., engineer and surveyor to the Chiswick Urban District Council. A discussion upon the paper—which appears elsewhere in this issue—afterwards took place, but was adjourned owing to the lateness of the hour.

The question of the ownership and use of fire hydrants was discussed, and was also adjourned for further consideration at the next meeting.

The committee considered, among other items, the thickness of walls in various classes of reinforced concrete buildings, various forms of roof covering, and the question as to who is the owner of gravel surplus from the laying of a sewer in an old parish road at least 100 years old.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. C. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Ltd. Price 10s. 6d.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

HIGHWAY: DEDICATION. RIGHT OF ACCESS. — The decision of Mr. Justice Joyce in *Tottenham Urban District Council* v. *Rowley* (noted at p. 912 of vol. xli.) has been affirmed by the Court of Appeal. It will be remembered that the case raised an important question as to the dedication of a street where only a portion thereof has been made up. The defendant laid out a new street, known as Keston-road, in accordance with approved plans. The road runs east and west, being bounded on the north by a public park belonging to the council, and on the south by houses of the defendant. The southern half only of the road was made up, but the whole road was thrown open and used by the public. The council having made an opening in their fence in order to obtain access to the road from their park, the defendant blocked up the opening, contending that the northern half of the road had not been dedicated as a public highway. Mr. Justice Joyce held that the whole of the road had been dedicated, and that the council were entitled to access thereto from the park. In the Court of Appeal the Master of the Rolls said that the defendant contended, with truth, that the mere intention indicated by depositing plans to make a highway was not sufficient by itself to establish that his intention had been carried into effect. The judge had, however, found a dedication of the whole road, and he (the Master of the Rolls) did not think they would be justified in interfering with that finding on the evidence. On the appeal the defendant only challenged the finding so far as regards the northern half, but his lordship was unable to follow this. There must be a dedication of the whole or none. Another point made was that the plan showed a footpath along the northern side. There was at present no footpath, but in any case the owner of adjoining land was entitled to gain access to the highway. It was a right to be exercised reasonably, so as not to interfere with the rights of the public. The council were entitled to a reasonable extent and at reasonable times to cross the footpath, which was a different thing from driving along the footpath. Any other view would lead to absurd consequences. Could not the owner of a suburban villa cross the path on a bicycle, or drive his pony-trap up to the stable at the side of his house? In his opinion, the rights of the public were subject to reasonable exercise by adjacent owners of their private rights. It was not open to the defendant to say, "I intended to dedicate to the public without giving any rights to adjoining owners." Such a qualified dedication, if it were possible in law, which he doubted, must be established by clear evidence, and no such evidence was forthcoming in the present case.

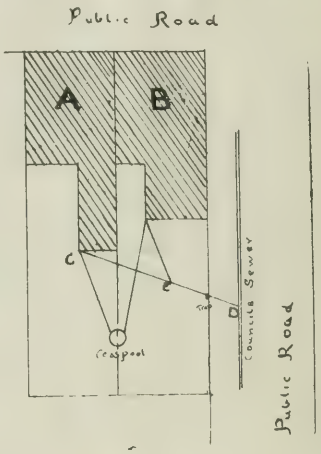
QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

PRIVATE STREET WORKS.—"J. G. S." writes: My council have recently made up a street under the Private Street Works Act, 1892. Tenders were advertised for, but none received, and the work was carried out by me. I shall be glad to have your opinion on the following points: (1) Can the council include 10 per cent for contingencies in addition to the 5 per cent for "commission in respect of surveys, superintendence and notices" in preparing estimates for the provisional apportionments? I believe it was so held by the King's Bench Division in or about the year 1909. (2) Can the cost of advertising and printing notices be included in the final apportionment as actual expenses, and added to the cost of the execution of the actual works, or must such expenses be defrayed out of the 5 per cent commission for surveys, superintendence and notices? (3) Can the council include a profit, say, 10 per cent, on the actual cost of labour and materials to the council, in making up a new street, in the final apportionment of ascertained expenses to be paid by the owners? The work of making up the street in question was carried out by the council's workmen, as, although tenders were advertised for, none were received.

(1) I am not aware of any such decision, and I think it is very doubtful whether such a vague item as "contingences" can properly be included. (2) I think these expenses must be defrayed out of the 5 per cent commission. (3) In my opinion they cannot.

HOUSE DRAINAGE.—"Doubtful" writes: Some twenty-four years ago two houses were drained to one common cesspool. The local authority some eighteen years ago laid in sewers. The property A



and B then belonged to one man, and was connected to the sewer by means of a single drain (C—D), since when the property has passed into several hands. Can B cut off the drain from A, and is the pipe from E to D a public sewer?

The pipe from E to D is a public sewer. Inasmuch as it is less than 20 years since the properties ceased to belong to one owner, the owner of A cannot have acquired the right to drain through B's property by prescription. I do not think a grant or reservation of such a right would be implied on the severance of ownership, because this mode of drainage is merely a convenience and not a necessity. Unless therefore the right was expressly granted or reserved on the severance of ownership B can cut off the drain from A. If the premises are leasehold, the lease of B probably contains the usual reservation of the right of drainage through the property.

WATER SUPPLY: "PROPER SUPPLY."—"A. Q. H. A." writes: The accompanying sketch shows a group of cottages, all of which obtain their water from a well, the water being good. The council have constructed sewers adjacent to the cottages, and desires to serve notice on the owners to connect the closets to the sewers, but, owing to the fact that water has to be carried from the well, it is impossible to install water closets. Other closets are already connected to the sewers by means of the slop-water system, but it is impossible to adapt this system to the first-mentioned ones, owing to their situation. The district is supplied with water by a joint water board, which would probably lay the mains free of cost on condition that all the cottages took a supply. Could it be held that the existing water supply is not a proper supply within the meaning of sec. 62, Public Health Act, 1875, and consequently the process of this section adopted, and afterwards that indicated by the enclosed notice?

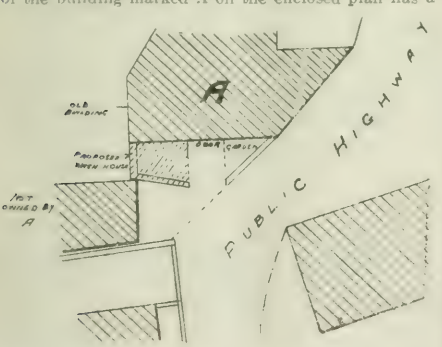
This section applies "when on the report of the surveyor of a local authority it appears to such authority that any house . . . is without a proper supply of water, and that such a supply . . . can be furnished thereto at" such cost as specified in the section. This appears to leave the question of what is a proper supply to the decision of the local authority, upon the report of their surveyor, subject presumably to appeal to the Local Government Board under sec. 268 of the Act. In my opinion, therefore, if on the report of their surveyor the supply appears to the corporation not to be sufficient, they can proceed under sec. 62. When a sewer and water supply sufficient for the purpose are available the powers of the special Act as to closet accommodation can be put into operation.

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
Appointments Vacant	850
Assistants' and Students' Section	832
Bituminous Materials	833
Calcutta Improvement Trust	811, 839
Cement Lining for Steel Pipes	829
Correspondence	833
Effect of Intercepting Traps in House Drainage	826, 834
Engineer as Arbitrator	809
Generation and Distribution of Producer-Gas in South Staffordshire	825
Institute of Sanitary Engineers' Election of Council	834
Institution of Municipal and County Engineers:—	
Discussion on Rail Corrugation	814
Notices	849
South-Eastern District	824
West Midland District Meeting at Birmingham	823
Institution of Municipal Engineers:—	
Joint Western and South-Western District Meeting	840
North-Western District	846
Notices	849
Institution of Water Engineers	849
Law Notes	830
Local Government Board Inquiries	835
Lower Thames Valley District Surveyors' Association	829
Maintenance Clause	811
Meetings	852
Municipal Competitions Open	850
Municipal Contracts Open	850
Municipal Work in Hand at York	812
Municipal Work in Progress and Projected	836
Newport Pagnell: A Report	811
Personal	838
Public Health of Staffordshire	810
Rail Corrugation	814
Recent Publications	847
Repair of Macadamised Roads	849
Road Improvements in the Metropolitan Area	810, 846
School Buildings	848
Self-Starters for Motors	849
Sewage Disposal in Sheffield	848
State Highway System for California	809
Steam Haulage	834
Summer School of Town Planning	831
Surveyors' Institution	849
Tenders for Municipal Works or Supplies	852
Third International Road Congress	811, 833
Town Planning in Calcutta	811, 839
What is a Garden City	834

PUBLIC HEALTH (BUILDINGS IN STREETS) ACT, 1888.—"Lakes" writes: I shall be glad if you will give me an early reply as to whether you consider the owner of the building marked A on the enclosed plan has a



right to erect a wash-house in front of his building, as shown by the dotted line, the space now being a garden surrounded by a dwarf wall.

The peculiar arrangement of these buildings makes this a difficult question to answer, but assuming that the wall facing towards the street of the building not owned by A is the front main wall thereof, I think the erection of the proposed wash-house without the consent of the urban district council would be a contravention of sec. 3 of the Public Health (Buildings in Streets) Act, 1888.

RAIN-WATER PIPE.—"G. J. R." writes: In constructing a building I have fixed a down pipe to convey water from the roof to the ground, after which it flows on to and over the public footpath. The surveyor to the urban district council has served me with a notice requiring me to connect the down spout with the surface-water sewer. I am willing to place an iron channel across the public path and connect to it, but wish to avoid the extra expense of connecting with the surface-water sewer. (1) Can the district council force me to connect with the surface-water sewer? (2) If not, and I put an iron channel across the public path, who would be responsible for the maintenance, renewal and cleansing of the iron channel? (3) If I fixed an iron channel, have the local authority power to decide on the pattern and strength of the channel?

(1) The rain-water pipe falls within the definition of a "drain" (*Holland v. Lazarus*, [1904] 1 K.B. 289). The council can therefore apparently require it to be connected with the sewer under sec. 25 of the Public Health Act, 1875. (2) I think the owner would be responsible. (3) If the street is a highway repairable by the inhabitants at large, the consent of the council would have to be obtained, and might be given conditionally on the channel being approved by them.

STREET WIDENING.—"H. F. H." writes: An urban district council's by-laws state that new streets must be constructed of a minimum width of 36 ft. The council are desirous of widening a very narrow main street (12 ft. 3 in. in width) within their district, and have prepared an expensive scheme of widening to a width of 25 ft. The question has arisen as to whether, on application being made to the Local Government Board for sanction to a loan for the purpose, the board would refuse their sanction on the ground that the council were not complying with their by-laws as to width of new streets. Will you please advise whether the widening of an existing street comes within the definition of a new street?

Sec. 154 of the Public Health Act, 1875, authorises the purchase of premises for widening a street, or (with the sanction of the Local Government Board) for making a new street. A proposed new street under this section must comply with the by-laws in force as to new streets, otherwise the board would not entertain an application for sanction to a loan. (See Lumley's "Public Health Acts," 7th Edition, p. 325). Apparently, however, this does not apply to the widening of an existing street.

"POUNDS."—"C. F. S." writes: Scattered about many rural districts are "pounds" used formerly for the detention of straying cattle? I shall be glad of your observations as to the ownership of these various "pounds" at the present time. In this district a number of them appear to have been claimed by the lord of the manor. I cannot find anything in the Highways Act dealing with the matter, excepting the 1847 Act (Police), which deals with towns.

An old parish pound which was originally acquired by the surveyor of highways passes to the district council as his successor. A pound not so acquired probably belongs to the lord of the manor ("The Law Relating to Highways," by H. H. Copnall, 2nd edition, p. 78).

SUMMER SCHOOL OF TOWN PLANNING.

In view of the success of the first Summer School of Town Planning held at the Hampstead Garden Suburb in August last under the auspices of the University of London, it has been decided to hold a second summer school next year at the same centre. It will last for a fortnight, commencing August 2nd and continuing till August 16th, and during that time lectures and demonstrations on town planning and subjects practically connected therewith will be given by some of the leading authorities. Last summer certificates were awarded to the students by the Extension Board of the London University, and a number of architects and engineers have already found these certificates of great advantage. Next year it is hoped that, with the experience of the first summer school, the course will even be an improvement upon last year's. The Hampstead Garden Suburb, the 400 acres extension of which forms a great portion of the town planning scheme recently submitted to the Local Government Board by the Finchley District Council, makes an ideal centre for a study of this kind. The practical difficulties which town planners have to overcome can here be studied on the site as they actually occur, and the lectures are rendered of considerably more value by constant illustration of outdoor practice. The school will, as before, be specially adapted to the needs of municipal engineers, architects and surveyors.

Particulars can be obtained upon application to the hon. secretary of the Summer School, Mr. J. S. Rathbone, the Institute, Hampstead Garden Suburb, London, N.W.

Road Construction and Maintenance in Glasgow.—Paving with granite or whin setts in Glasgow during the financial year ended May 31st last cost, according to the report of Mr. Thos. Nisbet, the master of works, £10,959. The total expenditure on the maintenance and repair of streets was £85,463, the amount being smaller owing to the impossibility, on account of railway and other strikes, of obtaining, at the proper times, the necessary supplies of material.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

290. Design of Struts.—Explain why the resistance of a long strut depends more on the stiffness of the material than on its strength. ("Designer.")

291. Hydrostatics.—Calculate the total and resultant pressures on the interior curved surface of a hemispherical bowl of radius r placed with its diametral plane horizontal and just filled with water. (W. H. B., *Barking.*)

292. Foundations.—Sheet piling is required round the foundations of a warehouse to hold in the soil, which is of a loose, sandy nature. Give neat sketches showing how this would be carried out. (T. R.)

293. Road Making.—State the advantages claimed for the parabolic camber over the circular camber in road construction, and give a sketch with figured dimensions of a camber which produces the best results. (A. S. C., *Hove.*)

294. Traction.—Compare the tractive force required for heavy vehicles over roads of various surfaces and grades, and show how this affects the cost of transport. (H. V. O., *West Bromwich.*)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

288. Mechanics.—Explain clearly the distinction between a vector, a scalar, and a rotor quantity. ("Beginner.")

Physical quantities are divided into two classes, according as they (1) are or (2) are not related to any definite direction in space.

(1) In the first class there are such quantities as numbers, time, temperature, mass and energy.

They are absolutely specified when two things are given:—

(*a*) The kind of quantity.
(*b*) The amount of it present.

Such expressions as 3 ft., 10 lbs. and 20 ° F. are examples of this class, and can be geometrically represented by straight lines drawn to a scale such that their lengths are proportional to the amount of the quantities, as in 3, 10 and 20 in the given expressions.

(2) A quantity which is related to a definite direction in space is called a vector quantity.

The quantities displacement, force, momentum, acceleration and velocity are vector quantities.

Consider displacement which is a pure vector. The displacement of a point is the distance the point is moved in a given direction. Hence displacement may be represented by a straight line drawn to scale so that the lengths of the lines represent the magnitudes of the displacements, and the directions of the lines give the directions in which the body is displaced. An arrowhead is used to indicate the sense of the motion.

All vectors are confined by the parallelogram law, so familiar in the case of finding the resultant of two forces acting at a point.

A vector can be moved parallel to itself; then it will be readily seen that the same vector can be used to represent the motion of points moving with the same speed in parallel paths.

The wind may be cited as an example of a vector; it has magnitude, direction and sense, but not position.

A vector quantity is a vector having a definite position in space, or a "localised vector."

Thus, a force is only fully specified when its magnitude, direction, sense and its point of application are given.

Rotation about a fixed axis is specified by giving its magnitude (or angular velocity), sense (whether to right or left hand), direction of the axis, and the position of the axis. For it is clear that the rotation about one axis is very different from a parallel axis 1 ft. away from the first.

Such quantities as force, acceleration, rotations and spins are examples of rotor quantities; they possess all the properties of vectors, and are usually treated as such. In fact, rotors are confined by the same laws as vectors. They are localised vectors. (H. V. O., *West Bromwich.*)

A scalar quantity is one which can be specified without any reference to direction or position—such as algebraic quantities, mass, and time.

A vector quantity is one of which direction is a necessary element—such as velocity, acceleration and force, and it can be completely expressed geometrically by a straight line when length, direction and sense are known, though the line may have any position in space.

A rotor quantity is a vector whose position in space is definitely fixed, and is thus completely specified as a vector, with the addition that one point on its axis must be known.

A straight line representing a scalar may be moved to any position whatsoever, and still completely represent that quantity; for a vector, the line may be moved parallel to itself to any position; but the similar representation of a rotor quantity can only move to and fro along its own axis—*i.e.*, its direction must always pass through a fixed point. (H. E. L., *Islington.*)

289. Strength of Materials.—Compare the resistances to bending of a wrought-iron I beam, flanges 6 in. by 1 in., web 8 in. by ⅜ in., when upright, and when laid on its side, thus ⊟.

The resistance of a beam to bending $= f\frac{I}{y}$

where f = maximum fibre stress.
I = the moment of inertia of the section about an axis perpendicular to the plane of bending.
y = distance of extreme edge from axis.

When the beam is upright the total depth = 10″.

$\therefore y = 5$ and $I = \frac{6 \times 10^3}{12} - \frac{5\frac{1}{4} \times 8^3}{12}$

$= 500 - 224 = 276.$

$\therefore$ Resistance to bending $= f\frac{276}{5} = 55{\cdot}2f.$

When the beam is on its side the total depth = 6″.

$\therefore y = 3''$ and $I = 2 \cdot \frac{1 \cdot 6^3}{12} + \frac{8 \times \frac{3}{8}^3}{12}$

$= 36 + \frac{9}{32} = 36{\cdot}3$

$\therefore$ Resistance to bending $= f\frac{36}{3} = 12{\cdot}1f$

To compare these resistances the induced stress f must be the same in both cases, and the ratio of the bending resistances becomes $\frac{55{\cdot}2}{12{\cdot}1} = 4{\cdot}55.$

(H. E. L., *Islington.*)

The moment of resistance or resistance to bending of a beam is obtained from the formula $MR = \frac{fI}{y}$.

Where MR represents moment of resistance.

f represents tensional or compressional strength of the material, per square inch.

I represents moment of inertia of section in inch units.

y represents the distance of the extreme fibres from the neutral axis, in inches.

As the material is the same in each case, the value of f, whether for tension or compression, is constant for any position of the beam, and may therefore be neglected in this calculation.

After eliminating f, the resistance of the beam

to bending depends upon the value $\frac{I}{y}$—that is, upon the "modulus of the section."

Let the upright position (I) of the beam be (1), and the horizontal (—) position be (2).

Then $MR_1 : MR_2$ as $\frac{I_1}{y_1} : \frac{I_2}{y_2}$

$$\frac{I_1}{y_1} = \frac{\frac{6 \times 10^3}{12} - \frac{5 \cdot 25 \times 8^3}{12}}{5} = \frac{500 - 224}{5} = 55 \cdot 2$$

$$\frac{I_2}{y_2} = \frac{\frac{2 \cdot 6^3}{12} + \frac{8 \cdot 0 \cdot 75^3}{12}}{3} = \frac{36 + 0 \cdot 28}{3} = 12 \cdot 09$$

$MR_1 : MR_2$ as 55·2 : 12·09 or $\frac{MR_1}{MR_2} = \frac{55 \cdot 2}{12 \cdot 09} = 4 \cdot 57$ nearly).

The resistance of the beam to bending is 4·57 times greater when upright than it is when laid on its side, that is, —. (A. S. C., *Hove.*)

THIRD INTERNATIONAL ROAD CONGRESS.

FOREIGN AND COLONIAL DELEGATES.

The Governments of the following countries have accepted the invitation of H.M. Government to appoint delegates to attend the forthcoming International Road Congress, London, 1913: Algiers, Argentine, Austria, Belgium, Bulgaria, Chili, Colombia, China, Cuba, Denmark, France, Germany (including separate delegates from the States of Prussia, Bavaria, Saxony, Baden, Brunswick, Hamburg, and Alsace-Lorraine), Hungary, Japan, Luxembourg, Switzerland, Monaco, Netherlands, Norway, Russia, Servia, Siam, Spain, and the United States.

The following Governments within the British Empire have appointed, or propose to appoint, official delegates: Canada, India, New South Wales, New Zealand, Queensland, South Australia, and Victoria.

In addition to delegates appointed by the Governments, many provinces, municipalities and local authorities in all parts of the world have appointed representatives to attend the congress. The most recent intimation received by the local organising council arrived this week from Mayor Gaynor of the City of New York, who writes: "The matter of good roads is of the highest importance. No road is a barbarism; roads mean civilisation, and the best roads the best civilisation. I shall be very glad to appoint delegates from the City of New York."

FORMATION OF TRADERS' COMMITTEE.

The organisation of the congress is in the hands of a committee formed of representatives of railway authorities, scientific institutions, learned societies, organisations of automobilists, cyclists, road users and others. The organising council received some time ago offers of practical assistance from many of others engaged in the road industry, and it was decided to form a Traders' Committee. This committee is composed of representatives of all branches of road makers, including manufacturers of steam rollers and road locomotives, road tarring appliances, stone paving, and those engaged in the construction of bituminous roads, wood-paved roads, quarry owners and others. The president of the committee is Lord Cowdray; the vice-president, Mr. Edward Hickman, J.P.; the chairman, Sir Herbert Praed; and the vice-chairman, M. E. B. Chittenden. Other members of the committee are Messrs. J. W. Astolown, H. K. Bamber, J. G. Barford, H. D. Blake, H. F. Berry, F. E. Bristowe, F. M. Bond, A. Brooks, W. Chappell, S. Constable, D. G. Comyn, L. Cooper, A. E. Dalzell, J. Dairy, H. F. Ellerton, H. Grace, W. T. Graves, W. Pearce Green, T. J. Jennings, J. Mackay, W. Manuelle, T. Milne, P. Morris, H. Pitts, J. Purdy, Colonel Thompson, and Dean Ward. The hon. secretaries are Messrs. H. Beadle and H. L. Wettern.

The Executive Committee of the congress will be glad to welcome any further offers of assistance, and to make any additions which may be necessary to secure that all branches of the industry are adequately represented.

The Traders' Committee at the moment is applying themselves in three directions: (1) In raising funds for the congress; (2) in arranging excursions and entertainments for the members of the congress; and (3) in making proposals to render the exhibition to be held in connection with the congress of the utmost value to the British trade. As regards funds, the committee have already collected the sum of over £1,000, and they have received considerable assistance from the Association of Bituminous and Other Paving Material Manufacturers.

The list of subscriptions to date is as follows:—

	£	s.	d.
Anglo-Mexican Petroleum Products Company, Limited	105	0	0
Tarroads, Limited	100	0	0
Enderby & Stoney Stanton Granite Company, Limited	52	10	0
Mountsorrel Granite Company, Limited	52	10	0
Tarmac, Limited	52	10	0
Aveling & Porter, Limited	50	0	0
Barford & Perkins, Limited	50	0	0
British Macadams, Limited	50	0	0
Gas Light & Coke Company, Limited	50	0	0
T. Green & Sons, Limited	50	0	0
London Granite Company, Limited	50	0	0
A. & F. Manuelle	50	0	0
Penmaenmawr & Welsh Granite Company, Limited	50	0	0
J. Mowlem & Co., Limited	50	0	0
Wm. Griffiths & Co., Limited	50	0	0
Ellis & Everard	25	0	0
Hadfields Steel Foundry, Limited	25	0	0
South Metropolitan Gas Company	25	0	0
Clee Hill & Cleobury Granite Company, Limited	20	0	0
Pwllheli Granite Company, Limited	10	10	0
Chas. Brand & Son	10	10	0
Phœnix Engineering Company, Limited	10	0	0
W. Weeks & Sons, Limited	10	0	0
W. H. Willcox & Co., Limited	10	0	0
Johnston Brothers	10	0	0

Per the Association of Bituminous and other Paving Material Manufacturers.

	£	s.	d.
Bristowe & Co., Limited	50	0	0
Limmer Asphalte Paving Company, Limited	50	0	0
Trinidad Lake Asphaltic Paving Company, Limited	26	5	0
Roemac, Limited	25	0	0
Chittenden & Simmons, Limited	25	0	0
Constable, Hart & Co., Limited	21	0	0
Robinson Brothers, Limited	21	0	0
Robt. Johnston & Co., Limited	10	10	0
Joshua Smart & Son	10	10	0

A list of excursions which will be open to members of the congress has been prepared by the committee, and a number of practical proposals for making the exhibition of the utmost value have been adopted.

CORRESPONDENCE.

"In all things, all sincerity, all earnestness, all reverence, all humility, all truth and truth's consistency."
GEO. HERBERT, *"The Temple."*

BITUMINOUS MATERIALS.

To the Editor of THE SURVEYOR.

SIR,—Notwithstanding that Mr. Jas. Bastian's criticisms do not appear to me to be a very helpful contribution towards the solution of the nomenclature problem, I will, nevertheless, reply to his questions as follows:—

(1) The word "pure" prefacing natural asphalt or solid bitumen is meant to imply that it is the unadulterated hydro-carbon as provided by Nature.

(2) Natural rock asphalt should be spelt with a final "e," not only because it is the present practice, but also because it is the Continental spelling of the word asphalt. I quite agree that the definition of this material should be a lime ore naturally impregnated with bitumen so as to differentiate it from the synthetic product which has been proved to be inferior to the natural material.

(3) Despite Mr. Bastian's surprise, I still didactically adhere to my statement as to what is known as "asphaltum," and do not admit that gilsonsite, which is one of the purest forms of solid native bitumen, comes into this category at all, but, on the contrary, is a natural material.

Perhaps Mr. Bastian will now, instead of expressing his opinion that Mr. Hutchinson and myself are in error on several points, assist in endeavouring to arrive at definitions which will stand without being disputed for all time. Meantime, it might help matters if Mr. Dussek, who refers to my having mentioned what is common knowledge that the Road Board was in its infancy in 1910, and state, by what logical reasoning I know not, that if this is so, it could hardly have grown up in this short time to now assume, as I suggested, the position of instructor, and explain to road engineers in this country the real meaning of the unquestionably still much misunderstood words asphalt and bitumen, notwithstanding which he somewhat contradictorily, in the last paragraph of his letter, endorses this suggestion, but with the proviso that the views of those who have made a study of the subject are taken, which undoubtedly the Road Board did in a like manner before issuing their specifications relating to tar.

It will, of course, be of great interest to peruse Mr. Dussek's pamphlet on the subject when issued, but, with all due deference to Mr. Dussek, his pamphlet

is not likely to carry the same weight with road engineers as one issued by or under the auspices of the Road Board.—Yours, &c.,

CECIL NATHAN.

3 London Wall Buildings,
London, E.C.
December 7, 1912.

STEAM HAULAGE.

To the Editor of THE SURVEYOR.

SIR,—I have read with much interest the paper by Mr. Symons on the above subject, published in a recent issue of your paper, and having regard to the number of inquiries which I am receiving with regard to this type of haulage, it is evidently one which is receiving the consideration of many municipal surveyors.

It has occurred to me that possibly some further information as to the results of actual working may be useful to those who are considering the subject, and as my council two and a-half years ago decided to purchase a steam wagon and trailer, principally for haulage of road and other materials, I am able to give the results of the first two years' working.

Our wagon was purchased in July, 1910, from Mann's Steam Wagon Company, of Leeds, for £625, and is capable of carrying 5 yds. in the tipping body of the wagon and 3 yds. in the trailer.

The Local Government Board granted a seven years' loan without public inquiry.

The wagon is also fitted with a 1,000-gallon removable street watering tank, but we have not used this very much, as we find it considerably more remunerative to use the wagon for haulage of material.

The following is a brief statement of the cost of working and work carried out:—

	Year 1910-1911. £ s. d.	Year 1911-1912. £ s. d.
Repayment of loan and interest ...	100 3 11	100 3 11
Wages, driving and extra loading	172 19 10	184 0 2
Fuel ...	42 3 6	47 18 2
Engineer's stores, &c.	19 13 4	20 5 0
Repairs allowed . .	40 0 0	40 0 0
,, (actual)	(25 10 8)	35 16 4
Insurance ..	6 7 9	6 16 8
Rent of cover shed	3 15 0	3 15 0
	£385 3 4	£442 5 0

From these amounts there were certain sums to be deducted for private haulage, undertaken at a profit, thus reducing the nett cost to the council.

	Year 1910-1911. Miles.	Year 1911-1912. Miles.
Wagon ran (full)	2,785	2,786
,, ,, empty	2,456	2,455
	5,241	5,241
Ton mileage of materials carried ..	16,175	19,360
Cost per ton-mile (net cost)	4·82d.	4·26d.

I may say that, comparing the two years' work of the wagon with the previous years, when all haulage was carried out by horses, the wagon has saved my council at least £300 per annum.

Our average distance of haulage may be stated at approximately 2 miles, and there are many points which must be considered before it can be said that a steam wagon is suitable for the requirements of a particular district. Facilities for loading quickly, average distance of haulage, amount of work to keep the wagon running, are some of the principal points of consideration.

At the time my council were considering the purchase of the wagon I found several surveyors were most ready to afford me information as to their experience, for which I was much indebted to them, and I shall only be too pleased in return to afford any surveyor who may be in a similar position any information as to my experience of the work and cost of steam haulage.—Yours, &c.,

HORACE C. FREAD,
Engineer and Surveyor, Esher and the Dittons Urban District Council.

Thames Ditton.
December 9, 1912.

INTERCEPTING TRAPS IN HOUSE DRAINS.

To the Editor of THE SURVEYOR.

SIR,—The letter from Mr Walter Jennings, published in your issue of the 6th inst., with reference to his "closet of the century," appears to me an entirely retrograde step.

During the last sixty years water-closets have been undergoing the natural process of simplification, which is inevitable with all human inventions, and in that period we have come from the Bramah closet with its filthy pan and container down to the simple, clean and safe wash-down closet, with its P trap discharging directly into a 4-in. ventilated soil pipe. Now Mr. Jennings wants to go back on this, and to introduce a second trap about 2 ft. below the first one. This necessitates the ventilation of the space between the two traps, and he shows for this purpose two puff pipes, one marked "inlet" and the other "outlet;" it also necessitates a trap on the flush-pipe, as shown by the drawing (which is not very clear in this respect) in his advertisement of the closet, and all this in addition to the "anti-syphonage pipe" which is necessitated by the presence of the fourth, or usually so-called "intercepting trap," at the lower end of the house drain. This complicated battery of traps is a quixotic attempt to deal with an imaginary evil, but their use will be fortunately limited by the cost. The advertisement will no doubt appeal to many people who have more money than knowledge of the subject, as this arrangement will probably work all right with clean water in the showroom, but I venture to predict that after twelve months' ordinary use the space between the two seals would be very foul indeed, even with a 3-gallons flush. I quite agree with Mr. Jennings that a 3-gallons flush is very desirable for any water-closet, as there is no point upon any house drain where it can be more effectively used. I also agree "there is great indifference on the part of householders in attending to and examining their house drainage systems." But this is not to be cured by more inspections, for which we have ample powers, but by better education, and by making all forms of sanitary appliances as simple and at the same time as effective as possible.—Yours, &c.,

R. READ.

Guildhall,
Gloucester.
December 9, 1912.

WHAT IS A GARDEN CITY?

To the Editor of THE SURVEYOR.

SIR,—I think Mr. Craske and myself are quite agreed as to the meaning and objects of a "garden city." As I have said previously, I have every sympathy with the "garden city" movement, and it was only the attempt to ignore its commercial aspect and unduly laud the philanthropic side against which I protested. So long as "garden cities" must be developed by "commercial companies on business lines," I fail to see how it can be said that the motives are "entirely disinterested," as claimed by Mr. Culpin. The motives and objects of the man or woman who invests in consols or corporation stock are no doubt quite praiseworthy, but I do not see that they are of a philanthropic character; though seeing that they only get about 3½ per cent against the 5 per cent interest paid by the garden city companies, it is obvious that the holder of consols is at least equally as disinterested as the shareholder in a garden city company.—Yours, &c.,

A. J. PRICE.

Lytham.
December 11, 1912.

THE INSTITUTE OF SANITARY ENGINEERS: ELECTION OF COUNCIL.

To the Editor of THE SURVEYOR.

SIR,—Again I wish to make use of your excellent and far-reaching columns on behalf of the "cause of the profession," and trust you will again grant me this privilege.

An entire change of the council of the above institute is needed, and members are about to be given the opportunity of making one. In the new ballot list shortly to be issued may I appeal to members to vote for municipal engineers in almost every case, and to pick out the most eminent of these for the honoured posts? A reference to the recently issued membership lists of the other institutions will probably greatly assist in detecting the best and most qualified, and I hope that this opportunity will be seized to the full to make this institute of still greater value municipally to its members.—Yours, &c.,

FELLOW.

December 10, 1912.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

East Ham T.C. (November 12th. Mr. R. H. Bicknell). -£3,883 for the purchase of 9 acres of land for the purpose of a public recreation ground. The town clerk, Mr. C. Eustace Wilson, stated that the council desired as long a period as possible in which to repay the loan. The borough engineer, Mr. J. E. W. Birch, said it was proposed to lay out the new land by distress labour. The inspector: What will be the cost of laying out? Mr. Birch: The estimated cost is £1,210 for contract, and a further £264 for distress work. The price of material will be £418.

Runcorn R.D.C. (December 10th. Mr. F. O. Stanford). £18,500 for a sewage disposal scheme for the townships of Grappenhall, Latchford Without, and Thelwall.—This was an adjourned inquiry, and the sitting was mainly occupied in hearing the objections of the Manchester Ship Canal Company and a number of ratepayers and property owners in the district of Latchford Without.

Sandgate U.D.C. (November 22nd. Mr. W. O. E. Meade-King).—£5,500 for the purposes of a water supply, including the construction near the Moore Barracks of a reservoir to hold 200,000 gallons, and near the Seabrook-road, Hythe, of a reservoir to hold 150,000 gallons, and the execution of other works.—It was stated that the proposal was to utilise water from the council's own sources at present running to waste and carry it to a high-level chamber, so as to enable them to dispense with purchasing from the company water in bulk. The council wished to be able to supply the whole of their district, and they would be able to give a constant water supply to all the houses in the parish of Sandgate, instead of a supply during certain hours as at present. The surveyor, Mr. C. Jones, stated that the total weight of the reservoir and its contents would be about 2,369 tons. The weight of the soil which was on the site was 3,254 tons.

Stockport T.C. (December 10th. Mr. F. H. Tulloch). —£15,000 for the extension of the police buildings.—It was explained by the town clerk Mr. R. Hyde, that the scheme would provide for sixteen new cells, a new parade room, and new police offices and quarters. The courts would remain untouched. The extension would meet the requirements of the borough in the way of a central police station for the next thirty years.

Westhoughton U.D.C. (November 19th. Mr. P. M. Crosthwaite).—£440 for additional stabling, &c., at their storeyard, and £2,140 for works of water supply, including the construction of a water tank to hold 200,000 gallons at Syndale Hill.—The clerk, Mr. T. Partington stated that a request had been made for a supply of water at a greater pressure and the Bolton Corporation, from which the supply was obtained, had agreed to give a supply from Entwistle reservoir conditionally on the council undertaking to lay 230 yds. of 12-in. pipes and erecting a water tower or tank at Syndale Hill to equalise the strain on their high-pressure filters in connection with the reservoir. The council had agreed to those conditions, and the benefits that would accrue from those arrangements might be summed up in a few words—namely, the cisterns would hold 200,000 gallons, or one day's supply—and would minimise the risk of the water being stopped through any accident to the Bolton mains or any other cause. With a supply of 200,000 gallons in the power cistern the council would be able at any time to cope with a fire independent of the supply from the Bolton mains. Evidence was also offered with respect to the proposed loan for additional stabling.

APPLICATIONS FOR LOANS.

Aldershot U.D.C.—£6,800 for the completion of the surface-water drainage scheme.

Alnwick U.D.C.—£4,000 for a water supply scheme.

Brighton T.C.—£1,000 for new houses on small holdings land.

Bromley T.C. £463 for laying artificial stone paving.

Bungay U.D.C. £3,500 for a housing scheme.

Colne T.C.—£2,000 for a water supply scheme, and £4,875 for works of paving.

Croston U.D.C.—£2,100 for works of sewerage.

Dartford U.D.C.—£1,900 for street improvement work and £420 for the provision of a fire station and hose.

Felixstowe U.D.C. £1,000 for street lighting purposes.

Cainsborough U.D.C.—£1,000 for gas cookers.

Cateshead T.C.—£23,000 for a refuse removal scheme.

Clastonbury T.C.—£4,295 for new gas mains and cookers.

Marlborough T.C.—£2,600 for a housing scheme.

Marsden U.D.C.—£1,050 for road works, £350 for a motor ambulance house, and £7,000 for extensions to the sewage outfall works.

Middlesex C.C.—£441 for works at the New Hanwell school, and £1,400 for a site for a school at Southall.

Neath T.C.—£1,075 for extensions of the gas service.

Reigate T.C.—£6,000 for the construction of new roads.

Wanstead U.D.C.—£2,000 for sewerage works.

Wolstanton U.D.C.—£500 for a water carriage scheme.

Worthing T.C.—£1,940 for improving Chapel-street.

LOANS SANCTIONED.

Berwick T.C.—£21,850 for a water supply scheme.

Colne T.C.—£21,462 for private street improvements.

Darwen T.C.—£10,600 for street improvement works.

Dewsbury T.C.—£7,415 for the electricity undertaking and £900 for a water aëration plant at the public baths.

Doncaster T.C.—£1,214 for paving works.

Guildford T.C.—£925 for the purchase of a motor fire engine and £408 for alterations at a fire station.

Hendon U.D.C.—£3,799 for works of road improvement.

Newport (Mon.) T.C.—£2,685 for alterations at Friar-street depot.

Norden U.D.C.—£1,155 for sewerage works.

Ramsgate T.C.—£3,205 for the extension of the East Cliff.

St. Thomas R.D.C.—£600 for workmen's cottages at Whimple.

Shrewsbury T.C.—£1,438 for widening two bridges.

Westhoughton U.D.C.—£3,000 for granite paving works.

FORTHCOMING INQUIRIES.

DECEMBER.	£
16.—**Biggleswade.** For the provision of dwellings (Mr. W. H. Collin)	4,526
16.—**Leigh-on-Sea.** For gas supply and street works (Mr. R. H. Bicknell)	6,505
17.—**Blackpool.** For the provision of public conveniences (Mr. M. K. North)	2,100
17.—**Byker, Newcastle.** For cemetery purposes (Mr. F. H. Tulloch)	12,400
17.—**Cambridge.** For works of sewerage (Mr. Courtenay Clifton)	1,224
17.—**Friern Barnet.** For paving works (Mr. R. H. Bicknell)	850
17.—**Grimsby.** For works of culverting (Mr. H. R. Hooper)	5,900
17.—**Llandaff.** For water supply purposes (Major J. Stewart)	850
17.—**Merthyr.** For the provision of workmen's dwellings (Mr. Edward Leonard)	10,250
18.—**Aberdare.** For the provision of dwellings (Mr. Edward Leonard)	3,750
18. **Portsmouth.** For private street works (Mr. R. H. Bicknell)	3,706
18. **Whitley.** For street and sewerage works (Mr. F. H. Tulloch)	3,450
19.—**Chorley.** For fencing and laying out a recreation ground (Mr. M. K. North)	2,212
19.—**Manchester.** For the purposes of a recreation ground (Mr. Edgar Dudley)	197 0
19. **Silsden.** For street improvement purposes (Mr. F. H. Tulloch)	1,875
19. **Stourport.** For a water supply scheme (Major J. Stewart)	1,400
20.—**Crompton.** For road reconstruction (Mr. F. H. Tulloch)	3,703
20.—**Trowbridge.** For sewage disposal purposes (Mr. R. G. Hetherington)	16,000

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Building—Barnsley £15,000, Lambeth, Middlesex £21,250, West Hartlepool; housing and town planning —Bungay, Hendon, Stafford; refuse collection and disposal—Gateshead; roads and materials—Dunoon, Tenby, Twickenham; sewerage and sewage disposal—Bulkington, Larne, Warwick; water, gas and electricity—Aberdeen £25,000, Carlisle £7,000, Nuneaton £15,000, Torquay.—Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

ADMINISTRATION.

Oldham T.C.—The Cleansing Committee have agreed to advance the wages of employees by 1s. per week until they are sixty years of age, after which they will revert to the present scale. Sweepers' wages will be advanced from 18s. to 19s. per week, and those of the gangers and dandymen from 19s. to 20s. per week.

BUILDINGS.

Aberdeen T.C.—A sub-committee has been appointed to inquire into the question of providing baths in the up-town district.

Barnsley T.C.—A committee which has been considering the subject recommended the council to build a new town hall and municipal offices, at an estimated cost of £15,000.

Bradford T.C.—The Baths Committee on Monday revoked the decision arrived at by the council in October to construct an open-air bath at Fairweather Green, owing to difficulties that have arisen with respect to the site.

Builth Wells U.D.C.—The council are considering the erection of a pavilion at an estimated cost of £1,000.

Carnoustie T.C.—The burgh surveyor has received instructions to prepare plans for the extension of the pavilion and tennis courts on the links.

Glamorganshire C.C.—A higher school, designed by Mr. D. Pugh-Jones, county architect, and built at a cost of £9,447, has been formally opened.

Hornsea U.D.C.—A suitable site has been obtained for the proposed new pavilion.

Lambeth B.C.—The question of erecting a swimming bath on the land adjoining the town hall at Brixton-hill is under consideration.

Littlehampton U.D.C.—The Duke of Norfolk has offered to provide a bandstand on the foreshore, and the council have accepted the gift.

Middlesex C.C.—A secondary school is to be built at Goldhawk-rise, Hendon, at an estimated cost of £21,250.

Motherwell T.C.—Alterations, estimated to cost £1,000, are to be carried out at the public slaughter-house.

Rathdown No. 1 R.D.C.—Plans have been passed for a public library to be built at a cost of £1,500.

Southampton T.C.—The tender of Messrs. C. J. Lear & Son, of Alverstoke, at £14,576, has been accepted for building a new school at Regent's Park.

Uckfield U.D.C.—Negotiations are to be opened up with the rural district council as to the advisability of erecting a joint hospital to be maintained by both councils.

Uxbridge U.D.C.—Six slipper baths are to be erected at the depot Waterloo-road at a cost of £300.

West Hartlepool T.C.—The council have accepted the offer of a public swimming bath from an ex-mayor and have agreed to provide a site for the building.

Weymouth T.C.—A scheme for the improvement of the harbour is to be carried out at an estimated cost of £12,000.

HOUSING AND TOWN PLANNING.

Bungay U.D.C.—A scheme has been approved for the purchase of 12 acres of freehold land and the erection of twenty workmen's dwellings, the houses to be in blocks of four each with 16 ft. frontage at an approximate cost of labour and land of £145 per house.

Farnham U.D.C.—A scheme has been passed for the erection of fourteen cottages at a cost of £3,120.

Hendon U.D.C.—It has been agreed to build fifty artisans' dwellings at Child's Hill, subject to the sanction of the Local Government Board to a loan of £8,990, and the tender of Messrs. C. H. Gibson & Sons, of High Wycombe, has been conditionally accepted for the work.

Newquay U.D.C.—An offer of land on a 200 years' lease has been accepted for the purpose of erecting workmen's dwellings.

Northampton T.C.—In connection with the scheme for fifty cottages at Kingsthorpe, the tender of Mr. J. W. Gossage, at £8,946, has been accepted, subject to the sanction of the Local Government Board.

Stafford T.C.—The council on Tuesday appointed a Housing Committee with power to prepare a scheme for the erection of sixty artisans' dwellings.

PARKS AND OPEN SPACES.

Hove T.C.—Acting on a report by the borough surveyor, Mr. H. H. Scott, the Parks, Baths and Cemetery Committee recommend that trees and shrubs should be planted on the north-east side of Hove Park at an estimated cost of £45; that the iron railing at Portland Recreation Ground be painted at an estimated cost of £8; and that a brick wall be erected on the north side of Portland Recreation Ground, and an iron hurdle fence on the west side, at an estimated cost of £185.

Withernsea U.D.C.—The surveyor, Mr. J. H. B. Kirton, has prepared a scheme for new public gardens to contain a bowling green, tennis courts, and, in all probability, a pavilion in the centre, and he has received authority to proceed with the laying out of the ground.

REFUSE COLLECTION AND DISPOSAL.

Gateshead T.C.—The council have approved the design of Messrs. L. G. Mouchel & Partners, for the erection of a staith in Pipewell-gate, for the purpose of refuse disposal, at a cost of £10,000. The cost of the scheme, including the purchase of adjoining property, and the provision of stables, is estimated at £23,000.

Saddleworth U.D.C.—The council have decided to undertake the removal of domestic refuse in Uppermill Ward and Greenfield Ward, and for this purpose two additional horses are to be purchased.

ROADS AND MATERIALS.

Bristol T.C.—The consulting engineer, Mr. T. H. Yabbicom, has reported to the Sanitary and Improvements Committee that he has been able to negotiate a series of purchases of land and buildings for street widenings. The chairman of the committee stated that in one instance Mr. Yabbicom had obtained a reduction in price from £2,000 to £300.

Cork T.C.—The Works Committee have passed an order for the repair of North and South Main streets, including the laying of Trinidad asphalt pavement, at a cost respectively of £1,660 and £1,322.

Dunoon T.C.—The burgh surveyor has prepared a plan for the widening of the promenade, which will have to be reconstructed in consequence of damage done by a recent storm, and negotiations are to be opened up with the feuars with a view to obtaining the necessary strip of land for the scheme.

Eastleigh and Bishopstoke U.D.C.—The county council have agreed to lay down about 1,100 to 1,150 yards of 2-in. slab paving in Southampton-road, in order to improve the footpath, at a cost of £230 to £300 on condition that the district council are willing to pay half, and this the council have decided to do.

Gower (Glam.) R.D.C.—Plans are being prepared for an alternative road from Bishopston to Kittle, Gower, thus obviating the danger and inconvenience of the steep incline known as Kittle Hill. The road is to be continued over the common at Bishopston and a bridge erected over the stream at a point above the existing ford.

Hornsea U.D.C.—Street improvement works, estimated to cost £368, are to be carried out.

Luton T.C.—Butlin-road and Shaftesbury-road are to be made up, at a cost of £546.

Middlesex C.C.—It is proposed to lay down "Durax" paving in the Uxbridge-road, at a cost of £4,018.

Portslade U.D.C.—The Road Board have promised a grant of £50 in connection with the surfacing with granite of a portion of the old Shoreham-road, from Southern Cross to Portslade Lodge.

Preston T.C.—Property in Market-street, High-street, Lawson-street and Starchhouse-street is to be purchased for £2,650, for the purpose of a local improvement.

Runcorn U.D.C.—Moughland-lane is to be widened, at an estimated cost of £870.

Swindon T.C.—Plans have been provisionally approved for the widening of Coate-road, at a cost of £3,348.

Tenby T.C.—Upon the recommendation of the surveyor, Mr. B. Morley, it has been decided to pave The Norton, one of the main thoroughfares, with granite.

Twickenham U.D.C.—The council have approved the plans and estimates of the surveyor, Mr. F. W. Pearce, for making up the following roads under the Private Street Works Act, 1892: Cole Park-road, £5,117; Cole-road, £462; Hill View-road, £821; and Ivy-road, £341.

Walsall R.D.C.—The surveyor, Mr. W. Young, has been authorised to forward to the Road Board, in support of an application for a grant, estimates in bad prepared of the cost of widening and generally improving Portland-road, Aldridge, and Thornhill-road, Streetly. He said the amounts were £1,753 and £1,366 respectively.

West Bromwich T.C.—The Highways Committee recommend the purchase of land and houses for the improvement of the road from Hollyhedge-road to Water-lane, and Cooper's Hill-street.

Westhampnett R.D.C.—A tar-spraying machine, with a boiler capacity of 80 gallons, is to be purchased, at an approximate cost of £40.

SEWERAGE AND SEWAGE DISPOSAL.

Acton U.D.C.—A public convenience, to cost £700, is to be provided at the Mount.

Bulkington U.D.C.—The surveyor, Mr. Edward Cuthbert, has received instructions to prepare a sewerage scheme.

Clevedon U.D.C.—The surveyor, Mr. G. W. Knowles, with the assistance of the medical officer, has been asked to report on a sewerage system for the lower portion of the town.

Halifax T.C.—The tender of Mr. B. Riley, at £2,215, has been accepted for a sewerage scheme for Northowram.

Larne U.D.C.—Mr. G. Midgley Taylor has received instructions to prepare a sewage disposal scheme for the town.

Llanelly R.D.C.—The council have instructed Mr. E. J. Schenck, of Westminster, to prepare a scheme of sewerage for parts of the parish of Llanelly Rural and Pembrey, including Felinfoel, Dafen, Bryn, &c.

Scarborough R.D.C.—The surveyor, Mr. J. A. Iveson, has prepared a sewerage scheme for part of West Ayton.

Warwick T.C.—The services of an engineer are about to be engaged to draw up a scheme for pumping the sewage automatically by electric power to extend the covering tanks at the outfall works, and to lay about 30 more acres of land for irrigation purposes.

WATER, GAS, AND ELECTRICITY.

Aberdeen T.C.—A sub-committee is considering the specifications for the covering of the reservoirs, at an estimated cost of £25,000. The Mannofield reservoirs occupy about 9 acres, and it is suggested that when they are covered in earth they should be laid on the top of the covering, and the available space laid out as a recreation ground with bowling greens.

Beverley T.C.—The tender of Messrs. Worth, Mackenzie & Co., at £1,546, has been accepted for the supply of a gas engine and pumping plant at the waterworks.

Cannock R.D.C.—Improved pumping machinery is to be provided at the waterworks at a cost of £250.

Cardigan T.C.—Authority for a loan is to be sought to carry out a scheme for extending the present water supply. The engineer, in his report, states that his proposal to the council was that they should combine provision for more water for the higher houses in the borough, with the supply of St. Dogmell's, and in order to accomplish this it would be necessary to build a new reservoir to hold approximately 70,000 gallons. The approximate cost would be from £1,800 to £1,900.

Carlisle T.C.—A water supply scheme for the outlying districts, estimated to cost £7,000, is to be carried out.

Derry T.C.—The council have abandoned the proposed Burngibbagh water scheme, which they adopted only recently. In the course of the discussion on the subject at the last meeting of the council, the city surveyor stated that in October, 1911, there was a flow of 800 gallons per minute in the Burngibbagh stream. The quantity never fell below that during the dry weather; there was plenty of water there if it was pumped to keep the city safe during a water famine. As to filtration, only the water from Killea was filtered. With regard to the quality of the water, he could only take the analyst's report, which was favourable.

Hastings T.C.—The council have accepted the quotation of Messrs. C. A. Parsons & Co. for carrying out alterations to the turbine at the electricity works, and supplying a new alternator, for the sum of £1,728, and the offer to purchase the existing alternator for the sum of £100.

Huddersfield T.C.—The corporation are seeking power, in the Parliamentary Bill they are promoting, to purchase the Dean Head reservoir from the Dean Head Commissioners, and to maintain the reservoir as part of the waterworks undertaking.

Keighley T.C.—The Waterworks Committee recommend the acceptance of the following tenders in connection with the proposed line of pipes from Denby Hill to Moss Carr: William Morley & Sons, of Keighley, at £2,359, for carting pipes, excavating and refilling trenches and other subsidiary works; Guest & Chrimes, of Rotherham, at £376, for the supply of sluice, air and other valves.

Lanarkshire C.C.—The District Committee of the Middle Ward propose to ask Parliamentary authority to provide additional waterworks involving the construction of a storage reservoir in the parish of Crawford and service reservoirs in the parishes of Lesmahagow and Shotts, together with the necessary road and other works; to abandon the construction of the Glengavel reservoir authorised by the Act of 1896; to extend the area within which the committee is authorised to supply water so as to include part of the parish of Rutherglen; and to acquire by agreement such works as exist within the limits of supply of the committee as extended by the Order.

Nuneaton T.C.—For the purpose of an improved water supply it has been decided to complete a scheme at Griff, a point at the southern extremity of the borough, where a pit was sunk about twenty years ago. The project involves a capital expenditure of £15,000. It is to be taken in hand almost immediately, with the object of being sufficiently advanced by the coming summer to reinforce the old works.

Salford T.C.—It has been decided to purchase a plot of land in Liverpool-street, containing 38,790 sq. yds., for gasworks purposes, at a total cost, including payments for paving charges, buildings, and plant upon the land, cost of new roadway and boundary walls, &c., of £53,000.

Sleaford R.D.C.—A scheme is under consideration for improving the water supply of Little Hale, at an estimated cost of £950.

Torquay T.C.—In connection with the new water main scheme, a reservoir is to be constructed on the highest elevation obtainable for the purpose of a supply for Warberry Hill.

York T.C.—The council on Monday night resolved to promote a Bill for the purchase of the undertaking of the York United Gas Company, at a cost of £435,000.

MISCELLANEOUS.

Nottingham T.C.—The council have decided to promote a Parliamentary Bill empowering them to run motor 'buses or trackless trolley vehicles, and also to extend the existing tramways.

Cuckfield R.D.C. On condition that he provides himself with a motor cycle, Mr. A. McArthur, highways-surveyor, is to be allowed £12 per annum for depreciation and £14 per annum for upkeep.

PERSONAL.

Mr. Walter Butler, surveyor to the Fareham Urban District Council, has had his salary increased by £25 per annum.

Mr. W. Harpur, city engineer of Cardiff, has been appointed to act as consulting engineer in connection with the Pontypridd Urban District Council's new sewerage scheme.

Mr. A. Edwards, chief assistant to Mr. Henry Silcock, engineer and surveyor to the Blackwell Rural District Council, has been unanimously appointed surveyor of the Northern Highway District of the Southwell Rural District Council.

Mr. John Gibson, assistant in the department, is vacating rates for appointment as inspector of cleansing and lighting to the Corporation of Edinburgh in succession to Mr. George A. D. Mackay, retired. It is understood that opportunity will be taken to reorganise the department to some extent.

Mr. John Stanley Sawdon, assistant surveyor, Margate, has been elected by examination an associate member of the Institution of Civil Engineers. Mr. Sawdon is also a member and holds the diploma of the Institution of Municipal and County Engineers, and has held appointments at Cheltenham, Kettering, Uxbridge, Staines, Northwood, Chertsey and Hayes.

Mr. H. Knowler, of the borough engineer and surveyor's department, Wimbledon, has achieved a notable success at the examination for associate members of the Institution of Civil Engineers, held last October. The council of the institution have, as noted elsewhere in this issue, awarded him the Bayliss Prize, a distinction given to the student of the institution who obtains the highest marks at the examination. There were upwards of 150 candidates, many of them from universities. Mr. Knowler read for the examination with Mr. Harold B. Hayes, ASSOC.M.INST.C.E., also of the borough surveyor's department, Wimbledon, and late lecturer on surveying at the Hackney Technical Institute.

Messrs. William W. Newman, ASSOC.M.INST.C.E., deputy-engineer, Watford; J. Cecil L. Verley, ASSOC.M.INST.C.E., senior engineering assistant, Manchester Corporation; R. N. Montgomery, ASSOC.M.INST.C.E., B.A., assistant engineer, Dublin; W. R. Jenkins, ASSOC.M.INST.C.E., B.SC., Swansea; and James Hassall, ASSOC.M.INST.C.E., assistant chief engineer, Sheffield, have been selected for interview in London in connection with the appointment of engineer as assistant to the chief engineer to the Karachi Municipality. Mr. Measham Lea, ASSOC.M.INST.C.E. For the appointment of assistant chief officer to the municipality over 300 applications have been received, and the following six candidates have been selected for interview in London: Messrs. George Funnell, chief clerk, town hall, Chiswick; George Wesley Lewis, assistant secretary, Birmingham Corporation; John Chaston, chief clerk, Kettering Corporation; C. Hamilton McGuinness, assistant secretary, His Majesty's Road Board, London; Richard Moore, assistant solicitor, Bury Corporation; and Arthur Coomber, head clerk, metropolitan borough of Battersea.

The Chingford Reservoir. It is announced that the King will open the Chingford reservoir in February next. The reservoir will rank as one of the largest of its kind in this country. A difficult feature of the undertaking has been the diversion of the river Lea and [illegible] through the site of the reservoir, and the substitution of a new channel for the old river-course. Again, the puddle had to excavate below the bottom of the valley to enable a perfectly watertight wall of puddle clay to be joined to the impervious stratum. The reservoir covers an area of 116 acres, has a capacity of 300,000,000 gallons, and is protected by 4½ miles of embankment. The embankment has been formed of material excavated from within the reservoir, and contains 2,060,000 cub. yds. of earthwork and 253,000 cub. yds. of puddle. The summit is 15 ft. wide and 5 ft. above top water.

Birmingham and Midland Institute Scientific Society. The seventeenth annual soiree of this society will be held at the institute on Wednesday, January 8th, commencing at 7.15 p.m.

The Contour Survey of Bushey.—Mr. A. J. Laing writes: With reference to my article on "The Contour Survey of Bushey" in the issue of THE SURVEYOR for December 6th, I have to draw your attention to a misprint at the bottom of the first column on p. 773, in which a plus sign instead of a multiplication sign is printed. The last line reads: From the formula, generating number + $\cos^2$ vertical angle; it should read: From the formula, generating number × $\cos^2$ vertical angle.

Birmingham Electricity Supply: New Generating Station.—The Electric Supply Committee of the Birmingham City Council on Wednesday generally approved of a scheme for the construction of a new generating station on land acquired from the Drainage Board at Saltley. The ultimate desire is to lay down plant for the production of 100,000 kilowatts, but the work will be done in sections. The first section will be for 25,000 kilowatts, and the work will be finished in about four years' time. The cost of that section will be about £250,000. The other sections will be carried out as required.

FOR OTHER ADVERTISEMENTS

See End of Paper.

WANTED—second-hand oil engine, 10 to 20 h.p., with or without plunger pumps, preferably three-throw.—Surveyor, Town Hall, Alton, Hants.

A VACANCY occurs for a well-educated youth as Pupil in the office of a Water Engineer to an Urban District Council on the South Coast.—Box No. 1,207, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

CITY OF MANCHESTER.

The Rivers Committee require the services of a competent Clerk of Works immediately on the Main Drainage Works. Salary £3 3s. per week. Applicants must be prepared to work night duty if required. Applications, stating full particulars as to experience, &c., accompanied by copies of three recent testimonials, to be addressed to the Chairman of the Rivers Committee not later than 10 a.m. on Monday, December 30th.

Canvassing, directly or indirectly, will disqualify.

THOMAS HUDSON,
Town Clerk.

Town Hall, Manchester.

THE MALDENS AND COOMBE URBAN DISTRICT COUNCIL.

DIESEL OIL ENGINE AND PUMPING MACHINERY FOR SEWAGE DISPOSAL WORKS.

The Council invite Tenders from Engineers and Builders for

(1) Supplying and fixing 50 B.H.P. Diesel Oil Engine;
(2) New Skylights, Engine Foundations and General Builder's Work;
(3) 8-in. Centrifugal Pump, Feed Pump, Shafting and Pulleys, Belting, and repairs to existing Pump.

The Plans may be inspected, and Specifications, Bills of Quantities, and Forms of Tender obtained, on application to the Engineer and Surveyor (Mr. Reginald H. Jeffes, A.M.I.C.E.), at the Municipal Offices, New Malden, between the hours of 9 a.m. and 5 p.m. (Saturdays, 9 a.m. and 1 p.m.), upon payment of a deposit of £2 2s. in each case, which shall be by cheque made payable to the Council.

The deposit will only be returned on receipt of a *bonâ-fide* Tender accompanied by the Bill of Quantities attached, duly priced in; and in the case of the accepted Tender the deposit will be retained until a contract and bond have been entered into with the Council, and in the event of a withdrawal such sum will be forfeited.

Sealed Tenders, in official envelopes, must be received by the undersigned by not later than the first post on Tuesday, 14th January, 1913.

The Council do not bind themselves to accept the lowest or any Tender.

JAMES WM. JOHNSON,
Clerk to the Council.

Municipal Offices,
New Malden, Surrey.
11th December, 1912.

CALCUTTA IMPROVEMENT TRUST.

CHIEF ENGINEER'S PRELIMINARY REPORT.

In a preliminary report to the trustees of the Calcutta Improvement Trust, Mr. E. P. Richards, M.INST.C.E., chief engineer of the trust, draws attention to some of the more important matters of principle which must be taken into consideration in town improvement work, and briefly discusses some of the "local schemes" with regard to the way in which they may fit in with a general scheme on broad lines. Mr. Richards advises that no more local schemes shall be taken up until the general scheme has been drawn up, since these local schemes require much attention, and would prevent the chief engineer and his deputy from devoting their time to the main problems.

A COMPREHENSIVE VIEW.

The smaller works of a city, Mr. Richards points out, must always be subject to the greater works, especially as regards town planning, and this applies with special force to Calcutta. The present and future main traffic routes should be fixed and the suburbs laid out as the first and most important problems.

The square meshes made by the existing network of Calcutta streets are of great size, the meshes containing no secondary network of streets, but being filled with a tangle of lanes, alleys, passages and footpaths, the proportion of real streets per square mile being abnormally low. The narrow streets of the main network of Central and Northern Calcutta are, however, remarkably well placed as regards their general position; they are straight, and run mostly north and south and east and west. The lack of diagonal roads is striking, there being only three real diagonal roads in the city.

The main traffic routes in Calcutta are, then, narrow streets, but, "by means of judicious widenings," writes Mr. Richards, "new parallels, new diagonals, new bridges, new city inlets and outlets, and the improvement, opening up and beautification of main-road junctions and traffic centres, I believe the present main-road plan of Calcutta can be converted into one quite exceptionally fine."

THE POSITION AS REGARDS LOCAL SCHEMES.

In every great city there are certain improvements which must be done, and it is often expedient to proceed with one or more of these while the general planning scheme is being formulated, and, accordingly, the chief engineer has examined the local schemes already planned, and makes the following recommendations:—

Local Scheme No. 1.—Regarded as the worst of four groupings of insanitary areas, practically all the property here is hopelessly bad, and an almost complete sweep is required. There seems to be little or no risk in dealing with the area as now planned. By the time the work has been done the main traffic routes will have been laid down, and the only large road likely to affect the scheme can be aligned by the time the area involved has been cleared for action.

Local Scheme No. 2.—The area is small, and the present and future main traffic lines which bound it being definite, the risk of any later alteration of the preliminary plan is not great. About 90 per cent of the area is covered by "bustee," insanitary property, or vacant land. The scheme may be recommended pending settlement of the final scheme. Sham Bazar Park local scheme may, from the engineering point of view, be commenced as soon as possible.

Local Scheme No. 3.—Acquisition, clearing, filling and levelling can all go on, and by the time the street lines are planned the main scheme will be sufficiently advanced to allow of alterations being made in the local scheme should this be necessary.

Local Scheme No. 4.—There is no engineering objection to continuing this scheme. The proposed width of 100 ft. for the main traffic artery is about what it should be. There is some danger that property which will not be needed may be acquired in this area under the scheme as it stands at present.

Mr. Richards hopes to submit by next January or February a general outline city scheme dealing with all great roads, chief foci, main traffic roads and suburban expansion.

"INDIAN ENGINEERING" ON THE IMPORTANCE OF THE WORK.

The importance which our contemporary *Indian Engineering* attaches to the work of town improvement in Calcutta may be judged from the following passages, which are taken from an editorial article in the issue of August 31, 1912:—

"In almost every outlook on the desolation of large cities and their slums taken by any professional authority of any note, in almost every scheme of reform planned by any statesmanlike city authority for ameliorating the moral atmosphere of slums, the first point on which the mind has been focussed is the cleansing of human hovels, hotbeds of disease and immorality, and their conversion into homes."

After expressing regret that the Calcutta Corporation were not taking the right course in the matter of the improvement of the city in this respect, our contemporary proceeds:—

"It is melancholy work reading the story of Calcutta hovel reform from the model 'kintal' effort of 1884 down to the corporation poor housing scheme of two years ago. In both, as in all similar local effort, some individual enthusiasm has started the one great reform needed in Calcutta, only in time to beat against the dense conventional traditionary respectability which, by natural selection, prefers—how not to do it. In these reflections no shaft is aimed at the Calcutta Improvement Trust, to which, under special legislation, a particular task has been assigned, and which, under a fairly able and energetic chairman, is fulfilling it as well as may be expected in a local experiment which has been inaugurated without special experiences. . . . The Calcutta Improvement Trust is apparently sailing in the right direction in reconstructing the city of Calcutta. So far as its realignment of roads and revolution of 'bustees' provide space and atmosphere for better homes for the poor, it does well, but it cannot be expected to turn aside from its paramount task to undertake what is rather the work of the corporation. . . ."

Reference is then made to the rejection by the corporation of a scheme on which the Improvement Trust had spent much time and labour:—

"Hours of thought and labour were flung into the cesspool of the corporation's neglected duties, just when it needed only a little moral earnestness and that mixture of insight and foresight which is the mark of statesmanship to bring it to fruition. Some day! And so, instead of seeing to-day, as Calcutta might have seen, the first monument to its altruistic zeal for the amelioration of the dwellings of the poor, there is nothing to bear witness to its fit of temporary philanthropy, which has melted into thin air like the morning mist, while the Improvement Trust, as might have been expected, and was indeed foretold, is pursuing its own proper course, clearing up congested localities and placing decent roads, leaving the construction of dwellings for the poor, not perhaps for the Greek Kalends, but at any rate for some other time, which may be two or ten years' distant from to-day, when the first great reform of Calcutta might have been realised, if there had been moral strength enough in the corporation to resist the dulness which baulked it."

Motor-omnibus Traffic: Conference of Local Authorities. The Lord Mayor of London has convened, and will preside over, a united conference of all the local and highway authorities in the Metropolitan Police area, to be held at the Guildhall on Tuesday next, at 2.45 p.m., to decide what concerted action should be taken in the interests of the public with regard to the motor-'bus traffic of London. Each local authority is being invited to send two delegates to the conference.

The English Bridge, Shrewsbury.—The scheme for the widening of the English Bridge at Shrewsbury, which a short while ago, despite numerous difficulties and disappointments, seemed to have arrived at the stage of fruition, has had another set-back. This has been due to the action of the Local Government Board in declining to allow the repayment of principal and interest on the loan to extend over a longer space of time than thirty years, whereas the borough council had been hoping to get the period lengthened to fifty years—on the ground presumably that posterity would benefit from the work to as great a degree as the present generation. The board's decision, of course, means that a much larger sum will have to be raised by the borough rates each year to repay the borrowed money, and this at the present juncture—something which (the *Wellington Journal* states) is not regarded with equanimity by the ratepayers generally.

Institution of Municipal Engineers.

JOINT WESTERN AND SOUTH-WESTERN DISTRICT MEETING.

A joint meeting of the two districts was held at Gloucester and Exeter on Friday and Saturday, November 29th and 30th. The chair was in both cases occupied by Mr. Frank Latham, the president of the institution, and among the members present were Messrs. Henry Hulse, chairman of the Western District of the institution, W. Whitehouse (Cinderford), G. J. Elliott (Lydney), F. G. Church (Gloucester), T. Orchard (Clutton), C. F. Sanderson (Martley), A. W. Humphreson (Bewdley), Robert Ellis (Tiverton), S. Algar (Exeter), C. Durie (Williton), A. Tillotson (Honiton), A. J. Redfern (Honiton), Thomas Jones (Crediton), and Richard Lake (Sidmouth). The visitors included G. S. Clarke (Exeter), A. Eastwood (Exeter), T. G. Taylor (Plymouth), F. P. Ivey (Bristol), Councillor Algar (Exeter), and others. Also present were Messrs. John Brook and C. O. Baines, hon. secretaries of the respective districts, and B. Wyand, secretary of the institution.

Mr. WEAVER mentioned a little omission that was made at the meeting of the branch in Dean Forest, in June, in neglecting to thank Mr. Whitehouse for the very valuable paper he read on that occasion. He now moved that the best thanks of the meeting be given to Mr. Whitehouse for his excellent paper and for the able manner in which he conducted and arranged the meeting.

Mr. ELLIOTT seconded, and Mr. HULSE and the CHAIRMAN supported the proposition, which was carried with acclamation, and Mr. WHITEHOUSE briefly replied, saying that if he did anything on the occasion in question calculated to be at all useful to the institution he was more than repaid for the trouble he took.

The minutes of the last meeting were read by Mr. Brook and confirmed.

THE PRESIDENT'S ADDRESS.

The president opened the proceedings with the following address:

It is my privilege to be with you to-day in my capacity as president, and I can assure you that the best welfare of the members of the Institution of Municipal Engineers appeals to me to no small extent. The council have serious questions affecting the interests of the profession constantly under their consideration, and my visit here to-day is to endeavour to enlist the hearty support and co-operation of these districts in the furtherance of the council's schemes for placing the profession on a basis of proficiency, supported by security, protection and superannuation.

Those who constitute the profession of municipal engineering are necessarily dispersed over a very wide area, which at one time militated against their opportunities for meeting together. This hindrance, however, has now been removed. One of the objects of the institution was to divide the country into districts, and for each district to have its own chairman, secretary and committee; in fact, each district was to have "Home Rule." This progressive and original scheme has been achieved, with the result that the members have regular opportunities of meeting together in their respective districts to discuss topics for the acquirement of knowledge and for the advancement of the profession. This successful organisation is now working throughout the country, and engineers will undoubtedly benefit thereby. The general activity and union which have been manifested prove that the time was ripe for such an organisation.

The work which has been set on foot by officials for officials, and carried forward with one common cause and on one common level must ultimately benefit the profession permanently. A great deal has been done and the council have important measures under consideration, by which the interest of the younger members entering the profession may be increased and their status promoted. The council realise that the younger men to-day must form the basis by which the status of the coming municipal officers must be set in the future. They further realise the importance attached to the condition under which the municipal engineer at present holds his office.

To pass through a sufficient course of training, to enter on the multifarious duties of a responsible engineer, is not only a very costly process, but occupies the primary years of one's life. The worth of energetic and trustworthy officials who have accumulated knowledge by their genuine interest is unfortunately often treated lightly as compared with personal influences and congenial circumstances.

The calling of the municipal engineer is a high one, and contributes much to the welfare and economy of every country. He must be capable of applying his experience to difficult problems, and of using his mental powers for the purpose of inventing a means to a successful end. The duties for which he is responsible demand strenuous attention, and his mental faculties must be kept particularly active. His interest must be centred first and foremost on the success of his undertakings. It is much more fatiguing to the body to exercise one's mind over problems which entail stress of brain power and nervous energy than to execute mechanically.

It is said that the craftsman lives by the sweat of his brow, but in reality this is more a truism in the case of the hard thinker. Those who do not witness the strenuous hard study exercised by the capable officer behind the scenes, but merely see the comparative ease with which he utilises the materials at his disposal, can have no conception of the amount of brain-energy and long hours spent in acquiring that confidence displayed in the execution of successful works.

The high and onerous position which the modern engineer holds is controlled by the Public Health Act, 1875. In that Act he is referred to as "surveyor." The Towns Improvement Clauses Act, 1847, imposed the duty on local authorities to appoint a local surveyor, and this appellation was re-enacted in the Public Health Act, 1875. The duties, however, of the "surveyor" had considerably advanced between 1847 and 1875, and instead of his being merely an overseer of very indifferent highways, as was previously the case, the scope for his mental activities was developing in due ratio with the evolution of the country from the transition state of 1847. While this was the case, the Public Health Act, 1875, besides re-enacting the old misnomer "surveyor" as applying to the engineer who is responsible for carrying out town improvements, deprived him of the protective measures contained in the earlier Act of 1847, such expressions as the following having been omitted entirely—"Prescribed approval," "subject to approval by one of Her Majesty's principal Secretaries of State," "with the like approval, may remove any such surveyor."

When the Public Health Act, 1875, was enacted, the term "surveyor" was intended to signify a supervisor, but time and circumstances have changed the definition of the term. The profession of "surveyor" is restricted to those branches contained in the curriculum of the Surveyor's Institution, which omits the engineering, architecture, and multifarious duties which go to constitute the profession of a municipal engineer. The prodigious advance in municipal work, which has been brought about by Acts of Parliament, together with the entirely altered conditions under which the population live and travel, render it necessary that the legal title be changed. To be strictly correct the officer referred to should be designated a "public health engineer."

With reference to the question of superannuation and security of tenure for the municipal officer, I must say that every possible effort has been made in the past by this institution. The profession has a strong federation in that wonderfully successful organisation the National Association of Local Government Officers, whose membership will exceed 30,000, and with which this body is affiliated. That association devotes its attention entirely to matters affecting the best welfare of municipal officers, including superannuation and security of tenure, besides rendering legal assistance to its members in cases where the National Council shall deem it necessary. Our institution is privileged in being represented by three delegates, nominated by our council, while our genial assistant secretary, Mr. A. Winter Gray, is a member of the National Association's council.

The National Association is pressing its object with untiring enthusiasm. It is fully alive to the fact that legislation in the past has turned a deaf ear to the needs of the municipal engineer, who is more responsible than any other person for turning the Govern-

ment's sanitary laws and measures for promoting healthy conditions and for the prosperity of the community to practical account.

On the other hand, Parliament has listened very attentively, and granted superannuation to Civil servants, poor-law officers, and school teachers, while medical officers and sanitary inspectors are granted protection. Besides all this, Parliament has enforced measures for compensation and insurance for every class of workpeople, who become entitled also to the Old-age Pension. Surely, what is good for one section of the working community is good for the other, and no branch has a greater claim than the public health engineer.

For many years the question of superannuation and security of tenure has been a serious bone of contention between municipal engineers and the Government. There seems to be antipathy against it which is a very difficult obstacle to overcome. However, an assurance one way or the other is absolutely necessary, as at the present time of uncertainty it is difficult to advise what steps it would be best to take in formulating a scheme to take its place.

I can only impress on the minds of the members how important it is for each and every one to do all within his power to demonstrate to the members of Parliament of each district the necessity for steps to remedy the oversight of the past. Whatever may be the ultimate future of the profession so far as protective measures are concerned, I am of opinion that it is advisable for the institution to have a fund of its own, devoted especially to this and other allied objects for the mutual benefit of its members. Cases have come before the institution from time to time deserving of the most strenuous efforts of the fund. The severity of some cases have been ameliorated by the tact which has been brought to bear, and by voluntary subscriptions in aiding the disabled.

If we had a protection fund much would be achieved to the advantage of the members of the profession generally. This fund would be free of working expenses, so that the whole of the sum raised would be available for the purpose named. Contributions might be raised among the members at the district and other meetings, while a small annual sum subscribed by each member annually would meet all expenses.

In conclusion, I would refer to a matter of recent legislation, in which the Institution is interesting itself. At the passing of the Finance (1909-10) Act medical practitioners were granted certain remissions in respect to the duty on motor spirit, to the licence on motor cars, in the case of motor cars used by them for the purposes of the profession." Seeing that there are some hundreds of engineers and surveyors to local authorities who have charge of highways and who have, upon quite a moderate salary, to find their own means of locomotion in the discharge of their duties to the Road Board with a view to obtaining the same remissions in respect of duty and licence for municipal surveyors as is provided for the medical profession. The institution have pointed out that many of these officers are practically compelled to provide and maintain a motor vehicle of some kind or another, and the expense of annual licence and of petrol for running purposes presses heavily upon their income.

The PRESIDENT said he had raised a good many points in his address of interest to the district branches, and it was with the object of hearing the views of members on the important questions of superannuation and security of tenure that they had met there that afternoon. There might be advantage to the profession in the proposals, and he could foresee that the question might arise in the minds of some members whether they were not better off as they were. As a Vice-President of the National Association of Local Government Officers, when he attended their meetings he wanted to be able to tell them exactly the feeling which existed throughout the country on these very important topics. No one wished to take a false step, or press for conditions which might not be an advantage. They wanted to clear the air, and to get the best advice and fullest information possible on the matters in question. No one wished to press for security of tenure simply so that a council should not be able to dispense with their services. They did not desire that, but they did want to be recognised as they were in 1847, and that it should not be possible for a man to be dismissed simply for doing his duty. (Hear, hear.) Within the last few years several cases had come before the institution, and with the exception of one, the dismissals had been because the men had carried out their duties straightforwardly and honourably, but in so doing had rendered themselves unpopular. Was it right that a man should be discharged for doing his duty, simply, perhaps, because a ratepayers' association had been started in his district—started perhaps because some man had been interfered with who wanted to carry out certain buildings not in accordance with the by-laws? The surveyor had, of course, to interfere, and that had led to the formation of a ratepayers' association. The aggrieved person got together a lot of his own kind, and succeeded in getting elected as many members of his way of thinking as possible, who never rested satisfied until they had secured the dismissal of the surveyor. It was in order to make such an injustice as that impossible that they wanted protection; that they should be able to do their work honorably and straightforwardly. They wanted to have safeguards that would enable them to carry out their duties in the best possible manner to the satisfaction of the ratepayers and the community generally. (Hear, hear). They had very important matters before them. Parliament was always bringing forward some new Act of Parliament which thrust new duties upon the municipal engineer. They were constantly having these duties increased, and with different Parliaments they got different views, to which they had to conform. Within the last year they had had the Town Planning Act placed upon their shoulders, and there was no Act in existence which raised the dander of a certain class of people more than that Act did, and men from whom they had had sympathy in the past they were now going to call their enemies. In most councils there was a section of the members who had been very kind and considerate towards their officers, but these recent Acts of Parliament affected this class more than anyone else, and they would be sure to "have a go" to make the life of the municipal engineer very unpleasant at times. In the future they would be almost bound to tread on the toes of a certain section of the public, who had very considerable influence, in saying whether a man was doing his duty or not. Therefore he (the speaker) thought they ought to have protective measures, so that it should not be entirely in the hands of a council to say whether they should be dismissed or not. (Hear, hear.) The Town Planning Act was in itself a very excellent one, and one of the most common-sense and rational Acts that had been passed for many years, because it consolidated the whole of the Housing Acts into the one comprehensive Act of 1909, and they now had facilities for carrying out their work such as they had never had before, and in time to come England would become practically a garden city. What a transformation would come about by the efforts of the municipal engineers and surveyors of councils, both rural and urban, he thought the time had come that, as their duties and responsibilities were increased, they should be backed up by Parliament who gave them this work to do, and had thrust these duties upon them. (Hear, hear.) How could the Government expect them to carry out these new duties unless they backed them up? (Hear, hear.) They did not ask for anything excessive, or for anything which militated against the councils—they had the same power as before, but they simply wanted the protection they possessed in 1847, and to show that some respect was due to the surveyor for all the work he had to do. (Hear, hear.) So far as superannuation was concerned, that was a very important matter, but he did not think they ought to have any difficulty in getting it. Steps had been taken which were calculated to get this secured in the near future. The feeling of the council was that they were on the verge of getting it. (Hear, hear.) Returning to the subject of security of tenure, the chairman said he thought the words used were unfortunate, because it gave people the impression that when once a man was appointed nobody could get rid of him. But, of course, it did not mean that at all. It was really a protective clause they wanted, so that they might have some other tribunal to apply to if they got badly used by the local authority. (Hear, hear.)

Mr. H. J. WEAVER (Gloucester) said it appeared to him that what they really wanted was nothing more nor less than the advantages which were enjoyed by the sanitary inspector, who was in the happy position of having part of his salary contributed to by the Local Government Board. If a sanitary inspector were prosecuted for having carried out his duties honourably, and without fear or favour, he had as a second Court of Appeal, as a higher Court, the Local Government Board. The efforts the chairman was prepared to put forward, as mentioned in his paper,

not only for security of tenure but for security from persecution, were efforts in which they were all prepared to assist him in carrying through, and it did not seem to him (Mr. Weaver) a very difficult thing to bring about. If it were necessary for the sanitary inspector of a town to have protection in the way suggested, surely a municipal engineer whose training was superior and cost more ought to have the same protection. (Hear, hear.) With regard to the question of superannuation, that undoubtedly would follow if only they could get a Bill prepared in some form which would satisfy them. But it seemed to him that the only manner in which they could hope to get the matter through was the way foreshadowed by the chairman. They must formulate some scheme and secure united action.

Mr. Henry Hulse (Droitwich) asked whether the N.A.L.G.O. had district associations or committees similar to their own, because, if not, it struck him something in the way of county associations might very reasonably be formed.

Mr. G. J. Elliott (Lydney) said he took it that what Mr. Latham meant when he said: "Parliament has listened very attentively, and granted superannuation to Civil servants, Poor-law officers and school teachers, while medical officers and sanitary inspectors are granted protection," was that these were granted protection by the part salary they were paid. In rural and small urban districts the engineer frequently had to be the sanitary inspector as well.

The President replied that Mr. Weaver had practically answered that question. With regard to sanitary inspectors, the protection they received was practically what surveyors had in 1847—*viz.*, that before the service of a surveyor could be dispensed with the local authority had to obtain the sanction of a higher authority, and that was the case now with sanitary inspectors. In the case of a council wishing to dispense with the services of an officer of that kind, the approval of the Local Government Board must be obtained; and, of course, they made an inquiry into the circumstances, and if the dismissal was unfair he was reinstated, or his services not dispensed with; and that was what surveyors wanted, because if a man did not work the joint office of surveyor and sanitary inspector, he had to superintend a great deal of the latter's work, and also that of the medical officer of health, and it seemed to them, as municipal engineers, very absurd that protected men should be in a position to draw a surveyor into their difficulties, with the result that he might get into hot water while they escaped. It would be very much to the advantage of local authorities if their surveyors had the same privilege as that enjoyed by medical officers and sanitary inspectors. (Hear, hear.)

Mr. Elliott questioned whether from some standpoints the duties of the municipal engineer were as distasteful as those of the sanitary inspector.

Mr. Weaver thought they were. Both the sanitary inspector and the surveyor had to tackle property owners, and, although he agreed that the sanitary inspector was the more often offending someone, yet the surveyor of a town was also a man who was not infrequently treading on somebody's toes, and for the same reason.

Mr. W. Whitehouse (Cinderford) agreed that there were plenty of cases where the two officers had to work together—as, for instance, in the laying of new sewers or water mains—and the surveyor was treading upon the corns of someone almost as often as the sanitary inspector.

The President said that scarcely a day passed but what friction arose between a surveyor and somebody—owners of estates or builders, perhaps—engaged in carrying out extensive alterations, involving considerable expense. Or, again, buildings might be in course of being "rushed up," and there were infringements of the building by-laws, a condition of things which a surveyor was bound to object to, and this got him into "terrible hot water."

Mr. Weaver mentioned a hypothetical case of a man occupying the joint offices of sanitary inspector and surveyor, each office being worth £100 a year. If in the course of his inspectorial duties he trod upon the corns of some speculating builder on his council, he was all right, being protected, but in his capacity as surveyor, and as one who had to see that complaints were remedied, he stood in an entirely different position, and, being unprotected, might have £100 knocked off his salary, and without the opportunity of going to any higher court of appeal.

SUPERANNUATION AND SECURITY OF TENURE.

The meeting next proceeded to discuss Mr. A. Winter Gray's paper on "Superannuation and Security of Tenure," the text of which has already appeared in our columns.

The President said if they could mature a scheme showing how the granting of their demands would benefit the community as well as the municipal engineer, they ought to secure general support. The municipal corporations would naturally oppose it unless they could be shown that it was to the advantage of the community to adopt such a scheme. With regard to superannuation, continued the president, they had certain officers who received superannuation, but the surveyor did not, neither did the sanitary inspector—he had only protection. But the surveyor's duties might be very much more onerous, and would take a great many more years off a man's life than those of a superintendent of the police, who had superannuation as well as protection. It was not so much a question of what a man received in the form of salary while he was in office, as what he would get in the shape of superannuation. If a man served twenty years, and then, perhaps, received two-thirds of his salary by way of superannuation for life, that was equal to several thousands of pounds invested.

Mr. John Brook (Stratford-on-Avon) said in his district members of the rural district council also constituted the board of guardians, and they administered the Poor-law of the district. They had recently pensioned off two of their officers. He thought their pensions amounted to about four-fifths of their salary. A new man was to be appointed to one of the positions with a salary amounting to nearly £300, and he would be entitled to a pension, based upon this £300 a year, directly he completed his term of office. But he (Mr. Brook) had served the same body for over twenty years, and when his time expired there would be no allowance or gratuity to him for his services. Why should that be? He had served the same board of gentlemen faithfully, and had received the same consideration at their hands as the other officers he had referred to, with this one exception, that he would receive no pension. He was sure this body of gentlemen felt very keenly the fact that they were unable to treat all their officers alike. The clerk to the guardians would receive a pension, but as clerk to the rural district council nothing. The medical officer of health to the union would also receive a pension, but as medical officer of health to the rural authority nothing, and he (Mr. Brook) as surveyor got nothing. He strongly appealed to all road surveyors to bring this anomaly to the serious notice of their councils. (Hear, hear.) Their attention ought to be directed to the fact that surveyors were placed in a very different position to other officers who served them under the Poor-law, and he thought it was grossly unfair that they should be expected to do duty on equal lines with Poor-law officers, and yet receive no compensation at the finish. (Hear, hear.)

Mr. Hulse (as chairman of the district), on behalf of the Western District, welcomed the members present. They had met, as the chairman had stated, to discuss a very important subject to members of their profession, and it was one that could be brought to a successful issue by all those who wished to participate in its prospective benefits laying aside—should he say apathy and sluggishness?—and giving every help they could. There were many members of the profession who were content to jog along in their own little circles. Those were the people they wanted to reach, and they cordially invited them to come and join them in this and other good causes they had under consideration for the benefit of the profession. (Hear, hear.) What they were asking for was only their just due, and the reward every one of them had earned in the work they had to do. The president had mentioned that he had personally run the risk of physical danger and death in the undertaking of his duties, and every one of them had had similar experiences, which went to show that the time had arrived when it was really necessary that every effort should be made to secure the protection that was required. (Hear, hear.) He agreed with the president that it was unfortunate that this subject had been started under the name of "security of tenure," because it appeared to the ordinary member of a council that it was too much like asking for a permanency and the right to hold an office under any circumstances contrary to the wish of the council. That, of course, was not the idea, and no member of the profession thought of such a thing for

a moment. It was only, as had been brought out in the discussion, that they might be put in an equal position with those members of other professions connected with other branches of municipal affairs who already enjoyed those advantages. (Hear, hear.) One brother officer had superannuation and security of tenure, and the other had not these benefits. This was not the fault of the council, but simply because they had not the power to grant these privileges, and it was really this they were aiming to achieve, that the councils should be in the happy position of putting all their officers on an absolutely equal footing, so that they could go about their duties feeling that they could carry them out without worrying to think whether they were treading on the toes of some interested party likely to have influence to make things unpleasant for them. (Hear, hear.) It behoved them all to do what they could to help along this question, and it appeared to him that the quickest way to do this was to increase their membership, and also to increase the number of their meetings throughout the Western District. It was true their area was a wide one, but there was no reason why they should not have meetings more frequently, and Mr. Brook and himself would be very happy to receive any assistance members could give them. (Hear, hear.)

The PRESIDENT said he thought the question of superannuation in regard to municipal officers ought to be done from one general fund, to which all corporations should subscribe in proportion to the salaries paid. If such a fund were established councils would not be so anxious to change their officers who were approaching their time for superannuation as they might be if they had to pay superannuation themselves. He did not think a superannuation fund would be satisfactory unless worked in that way—similar to an insurance company. (Hear, hear.)

Mr. HULSE agreed with the president, and said if the fund were not national there would be created a very large number of small funds which in the long run would not prove at all satisfactory; whereas if they had a National Fund they would average the lives in the same way as an insurance company.

Mr. BROOK said, as they were aware, various public bodies had gone in for superannuation, and their funds were practically self-supporting. He believed that 2½ per cent from the salaries of the several officers connected with the Poor-law practically paid the amount of the pension. Therefore, if they could prove that they ought to have very little difficulty in bringing this matter to a satisfactory issue. A contribution of 2½ per cent from the salaries of all officers belonging to the fund would very much improve it, and the fund would be gradually increased as the older members of the profession passed away and young members joined on appointment to office. Therefore, as years went on the fund would be very much stronger financially than at the commencement. Mr. Gray's paper was so thorough that it left very little to discuss. It was one of the finest papers he had ever had the pleasure to read, and it was worth studying by any member present who had already read it. In dealing with the subject of superannuation and security of tenure, the writer of the paper said it was difficult to understand how indifferent members of the profession were to their position to-day. But he (Mr. Brook) did not think, speaking generally, that that could be said of municipal engineers—that they appeared to take little or no interest in the movement. (Hear, hear.) He sincerely hoped every member of the Western District branch would become a member of the N.A.L.G.O., but he hoped at the same time he would not forget their own institution for the sake of becoming a member of that association. He thought for this purpose alone they ought to become members of the N.A.L.G.O., but when they had achieved this point he thought there was little else they could do for them. Beyond generally watching the interests of municipal officers there would not be much left for them to do. One could almost wish they could impart to their members a little of that enthusiasm and energy displayed by the Suffragettes, only they would like them to tone their action with a little more discretion. (Laughter, and Hear, hear.) He was fully in sympathy with the writer of the paper as to the uselessness of any section of the municipal service taking up this movement on their own. It must be done by a joint action, and that joint action could only be taken up by the body who had rightly taken charge of it—namely, the N.A.L.G.O. (Hear, hear.) But it was necessary for that association to have funds to work upon, and they could only be obtained by every municipal officer becoming a member and contributing his quota. It was too bad to think there were men to-day who were prepared to sit down and take any advantage to be derived from a movement of this kind, but they would do nothing themselves to assist it. (Hear, hear.) Some reference had been made to the duties of sanitary inspectors, and he was afraid that many of them to-day held their position only from year to year. Fortunately, however, the Local Government Board had now passed a resolution whereby, he believed, eventually all sanitary inspectors would become permanent officers, but notwithstanding this fact, he thought it behoved all sanitary inspectors to watch their own interests, and, if necessary, to appeal to the Local Government Board to get them to agree to their permanent appointment. The duties of a sanitary inspector were very peculiar. He was constantly asking people to put their hands in their pockets to spend money on their property who were reluctant to do it. It seemed to him that one great weapon with which to fight was tact. If a sanitary inspector displayed tact it helped him immensely in getting through difficulties. (Hear, hear.)

A MUTUAL DEFENCE FUND.

Mr. WHITEHOUSE said the municipal engineer had to manage large spending departments—waterworks, drainage works, &c.—matters which must go on; but it seemed to him that councils did not realise the importance of the work surveyors had to do, and if they were to administer this work without fear or favour they must have something to protect them in the form of security of tenure. (Hear, hear.) With regard to superannuation, he did not see why it was not quite fair to ask for it. Councils tied them down, and would not allow them to earn any more money than their small salary. It seemed to him in these days of National Insurance and Trade Unions, and the like, a man was in a fortunate position if he got £160 or £170 a year, and as they knew there was the greatest difficulty nowadays in getting an increase, notwithstanding they were able to show a fair and reasonable cause for it. (Hear, hear.) He did hope they would not go from that meeting without doing something of a concrete form. One matter Mr. Winter Gray mentioned was that of a mutual defence fund, the object of which would be to enable them to take action against any person who treated them unfairly or who libelled them, either inside or outside a council. He thought such a fund would be found to be very useful. If they could not raise such a fund themselves, they were affiliated with the N.A.L.G.O., and they might see what they were doing. It would certainly be to their advantage, and it would not be necessary for them to pay any further subscription.

Mr. WEAVER said the new point which had been raised by Mr. Whitehouse was a most important one, although he could not see how they could very well apply monies which they might have for this particular purpose. He suggested that they might make a call upon the members. With such a membership as they had, £200 or £300 could easily be got together. He thought it would be such an advantage to the institution that, if put properly before it, he felt sure they would get a ready response. (Hear, hear.)

Mr. BROOK said that the Sanitary Inspectors' Association had a defence fund, and each member who joined it paid 2s. 6d. per year. He suggested they should adopt a similar plan. He was sure the secretary (Mr. Wyand) would give them all particulars. He thought if they worked their fund on the same lines as that of the sanitary inspectors it would be to their advantage. He was told that the teachers' association—the N.U.T.—had a defence fund, and they immediately took up anything to be dealt with on behalf of any member.

Mr. WHITEHOUSE thought people would hesitate to attack them if they knew they had something in the nature of a defence fund behind them. (Hear, hear.)

The PRESIDENT said this matter of a defence fund had been before the council recently, and he thought if they had power in their by-laws to call upon members to pay, say, 3s. or 2s. 6d. a year during the time they were engaged in accumulating a fund until it got up to £400 or £500, then they could drop it again, and at any time could take it up again, and that fund would be used for defending the characters of officers whenever necessity arose. It might also be possible to draw upon the fund should cases of sickness or necessity arise among members.

Mr. BROOK moved: "That this meeting of the

Western Branch of the Institution of Municipal Engineers recommends the council of the institution to take immediate action to form a Mutual Aid Defence Fund, and to make it compulsory upon members of the institution to contribute towards the fund." He said he mentioned "mutual aid" because the president had suggested that they might be able to help members from it in time of distress.

Mr. WHITEHOUSE seconded, and it was carried unanimously.

COUNTY OR DISTRICT ASSOCIATIONS.

Mr. HULSE moved: "That this meeting of the Western branch of the institution is of opinion that the time is ripe for forming county or district associations of the N.A.L.G.O., and requests all members present to use their best endeavours in their respective districts and counties to formulate and carry through schemes with the assistance of the N.A.L.G.O."

Mr. T. ORCHARD (Clutton) seconded, and said he would do all he could to forward the movement in his county; and Mr. C. F. SANDERSON (Martley) said he would do the same in Worcester.

The proposition was carried unanimously.

Mr. BROOK mentioned that arrangements had been made for the next meeting of the branch to take place in Birmingham.

On the proposition of Mr. WHITEHOUSE, seconded by Mr. WEAVER, a hearty vote of thanks was accorded to the president for his conduct in the chair and for his able address.

The PRESIDENT having briefly replied, the members adjourned to another room to tea, at the kind invitation of Mr. Latham.

Tea over, the remainder of the evening was pleasantly passed in social intercourse.

THE EXETER MEETING.

A much fuller programme had been arranged for Exeter, and here also Mr. Winter Gray's paper was presented for discussion, which was again well sustained, and the president delivered a further address, taking housing as his main topic.

PRESIDENT'S ADDRESS.

It is with a great deal of pleasure that I am able to meet the members of the Western and South-Western Districts of the Institution of Municipal Engineers here to-day in my double capacity of president and chairman of the South-Western District.

In being elected president of so important and energetic an institution I feel that a compliment has been paid not only to myself, but to the West Country members, over whose meetings I have had the honour of presiding during the last four years. It signifies to no small degree that the keen interest in municipal matters is shared equally by members of the profession, whether they be situated near or far from the great Metropolis.

How much of this healthy vitality is due to the fact that we have an institution which keeps us in touch with modern progress it would be difficult to say, but we must admit that we cannot overestimate the advantage we all gain in being able to confer together in all parts of the country, either in our respective districts or at the general meetings, and thus gain a well sifted and matured knowledge of the best methods of modern construction and principles. The popularity of the useful work of the institution is evinced by the fact that we have members in all parts of the world, including Africa, South Africa, North and South America, Australia, Canada, China, Egypt, India, and Straits Settlements, while we are well represented in both Scotland and Ireland. Thus we are kept in touch with the achievements of our most distant colleagues, and their knowledge, gained in similar capacities to our own under municipalities across the seas, is brought home to us, while our deliberations are equally shared by them.

I am keenly alive to the great responsibilities which devolve on me as official head of so important a body. I am assured of the heartiest co-operation of not only the council, but of the members in dealing with the affairs which affect the best interest of the profession. That I shall endeavour to increase the usefulness and vitality of this already energetic institution, and zealously watch over its best interests, need scarcely be questioned.

In the course of my presidential address delivered in London last month I endeavoured to impress upon the minds of the members of the institution that a municipal engineer must acquire a sufficient knowledge of architecture, as well as engineering, before he can be considered fully qualified to cope with the business of his profession. He must cultivate the artistic side and avoid the tendency of becoming too mechanical. I endeavoured further to show that civilisation goes hand in hand with the effort of the engineer in bringing about such [illegible] improved means of intercourse and transit as [illegible]

Never in the history of the world have [illegible] artistic and scientific interest of the engineer been called into greater evidence than at the present time. It is these efforts in the betterment of our country which [illegible] and the health of the nation is to be advanced by taking in hand a great and comprehensive scheme for the better housing of the people.

A greater and more enlightened policy has never before been put into operation than that incorporated in the Housing and Town Planning Act as affecting the health of the nation. It must be acknowledged that in every inhabited town there is an artificial existence. The inhabitants are brought into contact one with the other, and by the building of cities and towns thousands of human beings are caused to congregate and share in one another's prosperity. But there is ever a tendency among us to fall into the habits of those around us, and if unfortunately the influence be unclean and neglectful the general health of the neighbourhood must suffer in consequence.

The housing of the wage-earning working class in well lighted, well ventilated dwellings abutting on cleanly streets must have an extremely beneficial effect on the character of those classes. The conditions under which people are housed plays an important part in their lives and has a strong influence on their habits. A familiarity with their surroundings becomes part of their lives, and these conditions—as to whether they be dilapidated, dirty and uncared for, or, on the other hand, sunny and healthy—are reflected in equal relative proportions in both the character and the health of the inhabitants.

It is equally as important to preserve the health of the poor as of the rich in every community, as, if disease breaks out among the poor, it will probably spread through every class of the inhabitants. Besides the poor man's wealth is his health. It must be acknowledged that a physically unfit man is a burden. Health forms the basis of a man's value, and therefore it is most economical for all concerned that the labouring and working classes should be well and healthily housed. Such a course must needs decrease sickness, and in so doing pauperism, crime and mortality will be reduced, and as a corollary the charge on the rates must also be reduced; in fact, the money value of the lives saved, and the sickness averted throughout the country would be incalculable.

It must be remembered that sanitary laws are enacted for the purpose of giving sanitary authorities powers to promote measures to secure improvements in the public health. In the instance of housing these laws are not permissive; they are rigidly enforced on communities.

The necessity of the Town Planning Act proper was brought about by the rapid growth of towns. The advent of mechanical traction, which has done so much to afford rapid means of transit, has rendered it possible to dispense the population over wider areas than was previously the case. By this means the further overcrowding of towns could, to an extent, be avoided. The more rapid means of transit opened out a demand for residences on the outskirts of towns, and so rapidly were suburbs springing into existence that it was found necessary to establish laws to regulate the laying out and development of estates and so prevent the overcrowding of areas and the erection of unsuitable houses. As demand controls the market, so it set the price for land. Land which could be had for agricultural purposes at comparatively low rents was being developed for building purposes, and abnormal ground rents demanded, so much so that it became necessary to empower the community [illegible] to control the ownership in their own hands.

The community could acquire the land and prepare its own plan by which it should be laid out, providing where necessary open spaces, wide thoroughfares, and other advantages for the public benefit.

besides having the distribution and class of buildings to be erected thereon under their own control and jurisdiction. By its powers the public are protected against being unduly burdened by excessive ground rents, &c. The people get greater advantages, live in better houses and streets than their means would otherwise allow. But, apart from all this, the district is once and for all laid out to the best advantage of the community.

This Act takes a step far in advance of anything previously enacted in this respect, that it must be heartily welcomed by municipal authorities, the officers and the community generally. Municipal engineers who have experienced the laying out of private estates under the Public Health Acts and local by-laws—by which the majority of matters affecting the best welfare of the town and the inhabitants were settled by the owners of the land—know fully well that no authority could under their by-laws even insist on a plan showing the whole of an estate, and how it was intended to be laid out.

Every surveyor has at one time or another been faced with the question "What constitutes a street?" and "When does a street become a street within the meaning of the Act?" In the future, however, developments will be carried out in quite a different manner. Plans can now be enforced for schemes for "any land likely to be used for building purposes, and of any neighbouring land," and in those schemes, whether put forward by the council or by private enterprise, provision shall be made for open spaces, roads, streets, pleasure grounds, public buildings, &c., while provision is made by which any original plan can be modified or extended at any future time.

As I have previously stated, the Act applies rather to extensive than to restricted areas; the latter cases come under the term "site planning," which deals with the planning of specific areas of land within existing towns

Before a plan can be enforced it is necessary to obtain the sanction of the Local Government Board, after which the fact is published in the *London Gazette*. If any objections are lodged against the plan within twenty-one days a draft order confirming the scheme is laid before both Houses of Parliament for thirty days, and should no address against the draft be presented by either House, then the scheme becomes finally approved. In formulating a scheme for town planning in any district, the knowledge of the local surveyor in matters appertaining to the conditions and requirements of his district is indispensable. He will be acquainted with the prospects of future developments in one direction and another, and be best able to advise as to the width of roads necessary, taking into consideration the question as to whether there is or is not a probability of considerable future extensions beyond the area to be at once treated. He will give attention to the advisability of improving the direction of existing thoroughfares, for which purpose powers are given under the Act.

The municipal engineer must determine also the size of sewers to be laid, taking into full consideration all future developments. The owner of a private estate would be content with sewers of sufficient capacity to drain only that area in which he is personally interested, but in town planning the engineer must calculate the capacity from the point of view of the entire district, and allow for the development of land beyond. The same remarks equally apply to water mains, gas mains, &c.

In the planning of streets it is most important to allow for direct communication between industrial centres and the chief places of business—such as railways, docks, &c. The chief routes should be laid down, and these main thoroughfares should be sufficiently wide and well constructed to carry the heavy traffic. The residential areas should be laid out radial in plan, taking into consideration the best and healthiest aspects. For this purpose the engineer must give his attention to light and air, the geological formation of the district, and the question of subsoil water and land drainage. These matters are of vital importance to the healthiness of a district. Such conditions may exist as would be unforeseen by the casual observer, but which would influence the engineer in laying down a plan to take advantage of the healthiest aspects in formulating his scheme.

It should be observed that any area reserved for the erection of workmen's dwellings should be fully considered on all points, and perhaps first and foremost from a health point of view. My opinion is that the buildings should be constructed on an area as near as possible to the main street, which will afford the shortest route to the busy centres of industry along which trams will run, and that they be situated in a healthy housing area, not necessarily near to the factories and works. Health must be the first consideration, and in reality workpeople will prefer to live in a different atmosphere and neighbourhood to that of their place of daily toil.

The engineer must appreciate the fact that in the Town Planning Act he has scope for exercising his all-important talents of common sense and tact. He will have a variety of conflicting interests to overcome, and it is only by patient plodding and careful persuasion that his work can be achieved. Landowners will welcome the adoption of the Act as time goes on, and they will readily fall in line with the ideas of authorities. It is to their advantage that their land should be developed, and it is evident that those landlords whose land is treated under the Act will be the first to see their land built upon. It behoves every municipality to take advantage of the opportunities afforded them to extend their town on modern lines, and for those towns whose boundaries are limited to extend them and so bring in lands on the outskirts over which they at present have no jurisdiction. These outskirts may be under the province of perhaps a rural authority who may have little or no interest in the development of the adjacent town, and will take no measures to provide for a planning scheme, which will enable a town to be extended in future years to its best advantages.

An important feature of the Town Planning Act is that part relating to the housing of the working classes. The Housing of the Working Classes Act, 1890, with the subsequent amendment Acts of 1893, 1894, 1896, 1900 and 1903, empower urban authorities to condemn and re-plan insanitary areas, to obtain powers to erect houses for re-housing the classes displaced, and to maintain existing dwellings in a sanitary and healthy state of repair.

Up to as recent a date as 1909, when the whole of the Housing Acts were consolidated into one practical measure, the housing question, especially in rural districts, was beset with many difficulties, but with the passing of the Housing and Town Planning Act these difficulties were removed, and extreme activity is being manifested in every part of the country, in taking advantage of the powers given to communities, to see their working classes better housed.

In the past the question of housing has been much hampered by the law bearing on the subject, and many schemes have been abandoned on account of their likelihood to be a burden on the rates. Although such a condition may have existed up to quite recently, these arguments can no longer be put forward in sincerity, either in urban or rural districts. Authorities are now enabled to obtain great facilities for carrying out schemes of houses for the working classes. Land can be obtained either by compulsory purchase or by agreement, and the Local Government Board do not necessarily enforce that the land shall be immediately built upon. The course by which land can be obtained by compulsory purchase has been considerably simplified. In the past it has been necessary to obtain a Provisional Order which had to receive the confirmation of Parliament.

In the place of the costly procedure the new Act provides that an Order shall be made and advertised and served on the owner of the land, this Order being in due course submitted to the Local Government Board. If within the stipulated time the owner does not object the Local Government Board confirm the Order without any further enquiry. But in the event of an objection being raised then the Local Government Board will hold a public enquiry into the circumstances. This excellent course is sufficient to protect all parties, and economical expeditious and advantageous in every respect.

With reference to rural housing, there has been little or no activity under the old Housing Acts. The high rate of interest, the short period allowed for repayment, together with the costly procedure in acquiring land, causing the annual amounts for repayment to be so great that it became practically impossible for the houses to be self-supporting.

The period recently allowed for repayment of capital is fifty to sixty years for buildings, and eighty years for land, while the rate of interest at which money can be obtained from the Public Works Loan Commissioners is at the minimum rate allowed for the time being.

On account of the attention which is being given

to this important question by all progressive communities, it has been found in some instances that the building by-laws in force are too binding and severe when applied to the carrying out of streets and buildings of this description. The result of this has been that the Local Government Board has authorised local authorities to amend their by-laws.

Opinions are hazarded as to whether workmen's dwellings can be made to pay. As a matter of fact, workmen's dwellings, including repayment of capital, can be made self-supporting; but supposing that the whole or part of the sinking funds were contributed from the rates, it would only mean that the community were purchasing a right to the property, and at the same time their workpeople would have healthier homes, and much distress, sickness and pauperism would be averted thereby.

As my address at the joint meeting held at Gloucester yesterday treated on the subject of "Superannuation and Security of Tenure," it is scarcely necessary for me to traverse that ground over again at this meeting. Suffice it to say that the institution's council are fully alive to the best interests of the profession in this respect, and, in conjunction with that wonderfully successful society the National Association of Local Government Officers, whose membership roll exceeds 30,000, and with which this institution is affiliated, every possible effort is being made to bring about in the near future a satisfactory solution of this all-important question.

(To be concluded.)

NORTH-WESTERN DISTRICT.

At the dinner which was held by this district of the institution at the Mitre Hotel, Manchester, on Saturday last there was an attendance of some thirty members and friends. The chair was taken by Mr. A. R. Bleazard, the district chairman, who was supported by Mr. Arthur Bowes, ASSOC.M.INST.C.E., vice-president of the institution. The dinner was followed by a "social," to which a number of excellent musical items were contributed by members and others. Especially encored were the pianoforte and violin duets of Messrs. Bleazard and Shaw, and the songs rendered by Mr. Tom Fogg. Mr. Patterson contributed to the humorous portion of the programme, and his powers as a raconteur were at their best in his "North Country" dialogues and anecdotes.

The toasts of the evening included "The Institution," "The Council," and the "North-Western District," proposed and seconded respectively by Messrs. Arthur Bowes and B. Wyand, F. W. Platt and A. R. Bleazard, and Edward Walker and J. W. Cleave. The strike on the North-Eastern Railway was responsible for quite a number of non-attendances.

Sao Paulo's Town Planning Scheme.—In Sao Paulo, the capital of the Brazilian State of that name, a vast scheme of city improvements has been inaugurated, under the advice of M. Bonvard, architect for the City of Paris. It will include splendid boulevards and viaducts, asphalted streets, and a public garden, the estimated total cost being £4,000,000, towards which the State Government has already appropriated £700,000. The city has an estimated population of 380,000, and 4,000 new houses were erected in it last year.

Merryweather Fire Engine for Newport Pagnell.—The Newport Pagnell Fire Brigade are now the possessors of an up-to-date steam fire engine, the cost of which has been met chiefly by public subscription. The new machine is of the Merryweather "Gem" pattern, as extensively adopted by fire brigades in all parts of the kingdom, but with latest improvements, by which the weight has been reduced without in any way impairing the strength. It has a pumping capacity of 250 gallons per minute, and can be readily drawn at a gallop by a pair of horses. The fire door is situated at the rear of the boiler, thus permitting stoking to be carried out *en route*, a very serviceable feature in the case of a country brigade, which may frequently have to travel long distances. The trial of the engine at Newport Pagnell took place by the banks of the river Lovat, when it satisfactorily answered every test, sending jets of water to heights of 120 ft., 140 ft. and 160 ft. It was stated by the superintendent that the engine was absolutely satisfactory in all respects, and answered all the conditions and specification of the makers.

ROAD IMPROVEMENTS IN THE METROPOLITAN AREA.

ACTION BY THE ROAD BOARD.

The Road Board have addressed to the highway authorities of Greater London a circular letter stating that they are prepared to consider applications from those bodies for grants, or short loans, for terms not exceeding five years, towards works of road improvement.

In order to assist the highway authorities in the selection of the proposals to be put forward, the Board think it is desirable to give the following indication of their views as to the character of works to which they will be disposed to give most favourable consideration:—

(1) They do not encourage proposals relating to the widening of streets in fully built areas which are crowded and congested mainly with local traffic, as they do not consider that such works are fairly within the scope of the Road Improvement Fund.

(2) They will give special consideration to proposals for the reconstruction of road crusts, especially in cases where these require immediate reconstruction owing to injury caused by motor omnibuses and heavy motors. But they are of opinion that grants should not be sought from them for the more expensive forms of road construction for which it is customary to borrow the initial cost on long-term loans. The money available for grants can, they suggest, be spent more usefully and more beneficially in the interest of existing ratepayers on reconstruction work, for which there is an immediate need, but for which the highway authority cannot get sanction to borrow for a term which would spread the initial cost over a large number of years.

(3) In selecting the roads the reconstruction of which they will assist they will give prior consideration to those roads which form part of important through routes, carrying a considerable volume of long distance traffic, and also those roads which, although not strong enough for the purpose, are now being used for regular motor-omnibus services.

(4) They will favourably consider proposals which will facilitate the execution of town planning schemes, so far as these contain provision for the improvement of through road communications.

(5) They will give special consideration to proposals for the acquisition of vacant land required, or likely to be required, for widenings of important roads in cases where it can be shown that the prospect of building is imminent.

(6) Having regard to the amount available for grants and the amount for which applications are likely to be made by highway authorities on which the burden of road expenditure is exceptionally heavy in relation to assessable value, the grants will probably, in most cases, range from 10 to 50 per cent of the cost of works proposed.

(7) The works selected for applications to the board should not include any that have been commenced, or for which financial provision has been made.

The aggregate amount which the board are prepared to treat as available at the present time for grants or short loans to highway authorities in the Metropolitan Police area is £250 000.

Applications should be accompanied by—

(1) Statistics of the expenditure of the authority on the maintenance and improvement of roads and bridges during the past ten years on form marked "A."

(2) A map of the district marked to show—

(1) Roads on which there is a regular service of motor omnibuses.

(2) The road or roads in respect of which an application for a grant or a short-term loan is made.

(3) Statistics of traffic taken for seven consecutive days between the hours of 6 a.m. and 10 p.m.

(4) A brief description of the proposed work of road improvement, accompanied where necessary by plans and estimates. Form No. 11 should be used, where applicable, in the case of applications for grants to road crust improvement work.

Roads Improvement Association: New Headquarters. On and after December 20th the headquarters of the Roads Improvement Association (Incorporated) will be transferred to 15 Dartmouth-street, Westminster, London, S.W.

Some Recent Publications.*

The Properties and Design of Reinforced Concrete. Translated and abridged by N. Martin, B.Sc., Assoc.M.Inst.C.E., &c. Price 8s. nett. London: Constable & Co., Limited.

The present work is founded upon the report of the Commission appointed in 1900 by the French Minister of Public Works to study the question of reinforced concrete construction from the point of view of his administration. It is common knowledge that the French engineers were pioneers in this class of work, and the members of the commission comprised a group of men whose experience was unrivalled. Their labours extended over a period of six years, and their report, which is unique in the literature of the subject, contains the results of various important tests and experiments, together with much other valuable matter. Mr. Martin has rendered a real service to British engineers by his abridged translation of the report, which contains all the important results, and forms an admirable guide to the work of the commission. The work is specially commended to those who wish to make a systematic study of the properties and applications of reinforced concrete.

A Primer of Scientific Management. By Frank B. Gilbreth. Price 4s. nett. London: Constable & Co., Limited.

The author of this interesting little book has devoted his life to the problem of the elimination of unnecessary waste and fatigue in the operations of human labour. Scientific management may be defined as that management which secures the greatest production with the least effort. It is evident, therefore, that a study of its main principles will enable the engineer who is responsible for the management of works of any magnitude to effect considerable economies. Such a study may be made from Mr. Gilbreth's primer, which consists of a collection of questions and answers which followed upon a series of articles which recently appeared in the *American Magazine*. A good knowledge of the rudiments of the science of management can be easily obtained from the clear and simple instructions contained in these answers, and the perusal of Mr. Gilbreth's work can hardly fail to prove of direct profit to the reader.

The Practical Mechanic's Hand-book. By Franklin E. Smith. Price 4s. 6d. nett. London: Constable & Co., Limited.

It should be carefully observed that this is a hand-book for the mechanic, and not a hand-book on mechanics, a point which the printed title page (which omits the necessary apostrophe) leaves rather in doubt. The author has kept in view the requirements of the artisan who has not had educational advantages, but who needs a clear explanation of the more ordinary technical calculations. The subjects dealt with include arithmetic, formulæ, mensuration, weight and specific gravity, simple machines, and stresses in materials. These matters receive fuller consideration than in the ordinary text-book with a view to rendering them absolutely clear to the reader of limited attainments, no previous mathematical knowledge being assumed.

DIARIES AND YEAR-BOOKS

Messrs. Charles Letts & Co., of Southwark Bridge Buildings, London, S.E., and 3 Royal Exchange, E.C., issue a most appealing series of diaries for 1913, and it is difficult to imagine that it does not include something to suit not only all tastes, but all pockets. Several new editions have been added to their "specialised" diaries of last season, and this acceptable section now includes the "Poultry Keepers' Diary" (price 1s.) and the "Girl Guides' Diary" (price 6d.). "Christmas-card Diaries" are another distinctly happy innovation, and we have no doubt they would be infinitely more appreciated by the adult recipient than the customary conventional Christmas card. As usual, all the diaries of this world-known firm are distinguished by their "self-opening" tablet, and by the insurance coupon for £1,000, which each contains, and in this connection we note that on these coupons no less than £20,000 has been paid in claims, two of them arising from the last two railway accidents—those at Ditton Junction and Preston Station. Among the firm's publications which we have had an opportunity of inspecting personally we might instance "The Boy Scouts' Note-book and Diary," bound in khaki cloth, and "The Scribbling Diary and Memorandum-book" (No. 103), with a page for a week's notes, and interleaved with good blotting paper, which cost only 6d. each; the "Post-octavo Diary" (No. 84), with three days to a page (price 8d.); and the "Self-opening Pocket Diary and Cash-book" (No. 9), bound in "pluviusin," a new and perfect imitation of leather, which looks well and wears excellently (price 9d.). Among the shilling publications there are an "Office Diary," a remarkably cheap and practical octavo volume, bound in cloth and interleaved with blotting paper; the "Waistcoat Pocket" diary, No. 25 T; the "School Boy's" pocket diary, bound in art linen, and with a back-loop pencil; the "'R. H. S.' Gardeners'" pocket diary, edited by the Rev. W. Wilks, M.A., late vicar of Shirley; the "Pocket Diary," No. 24, bound in leather; the "Waistcoat Pocket" diary, No. 25, daintily cased in red leather; the little oblong "Thumb Diary" (No. 28), in leather; the "Small Octavo" diary (No. 384), in cloth, gilt lettered; and the "Popular Shilling Diary" (No. 64), with a week in each opening, and interleaved with blotting paper—a most serviceable book for the office desk. At 1s. 6d. there are the "Peerless Pocket Diary" (No. 600 F), bound in French morocco, beautifully finished and fitted with a metal-capped back-loop pencil, and enclosed in a box; the "Self- opening" diaries, Nos. 1 and 29, the former a roomy note-book, with cash-ruled pages, one of each of which is allotted to a single day; and the "Popular One-day Diary," of the handy size for desk use of 12¼ in. by 4⅝ in. At 2s. there are "The Peerless" pocket diary, handsomely bound in green padded-roan and fitted with a dainty back-loop pencil; and the "Self-opening" diary, No. 22, leather bound. Finally, we take space to note briefly "The *Daily Mirror* Ladies' Year-book for 1913," also published by Messrs. Letts, a cheap volume at 1s., which has already attained unbounded popularity. It combines in one volume a diary, cash-book, house-keeping account-book, and a register of addresses, servants, books, letters and other things.

Messrs. Thomas de la Rue & Co., Limited, issue, as usual, a delightful series of diaries, date cases, and other dainty and practical reminders of engagements and notable days for 1913. Perhaps their name recalls particularly the "Onoto" diary, now as familiar as the proverbial "household word." It is even better than in previous years, and now includes the times of sunrise and sunset for each day, the changes of the moon as they occur, and extended general information, though the last-mentioned is still limited to that which is of real use. The outstanding feature is the provision of two indexes, one enabling the user to turn immediately to any month, the other alphabetically arranged for recording or reference to addresses and other notanda. The prices range from 6d. for the waistcoat-pocket size, to 18s. 6d. for more elaborate diaries. De la Rue date cases, for standing on a desk at home or office, are also admirable in their tasteful execution, and can be bought at from 1s. up to (in leather cases) 3s. 6d. each.

The "Mechanical World" Pocket Diary and Year-book for 1913 (Manchester: Emmott & Co., Limited; price 6d. nett) is a wonderful compilation at the price, containing not only a diary, showing two weeks at an opening, but also a complete pocket-book of formulæ, &c., for mechanical engineers, which runs to upwards of 300 pages. The large mass of information is very easy of reference, being well arranged and provided with a copious index. The book will prove to be an excellent investment for every mechanical engineer.

The "Mechanical World" Electrical Pocket-book for 1913 has been enlarged by the addition of sixteen pages, and some of the sections have been re-written and expanded. In particular is this the case with the sections dealing with dynamos and motors, and with electrical measuring instruments. The book generally has been thoroughly revised and many new illustrations introduced. Its price is 6d.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

SCHOOL BUILDINGS.

QUESTIONS OF COST AND EQUIPMENT.

In the rolling village of Maltby, near Doncaster, in the area under the West Riding Education Committee, a new elementary school has been erected which seems to possess all possible amenities both for teachers and taught. The building, which gives accommodation for over 1,000 children, has been built round four sides of a square, with a large central plot of lawn which will be used for open-air classes. All the class-rooms open on to the quadrangle, and flat roofs to be used also for open-air instruction are a feature of the building. The school is fitted with an excellent system of ventilation, and the class-rooms are provided with heating apparatus to enable the children to be there in wet weather. The building is to serve as a model for others to be erected in neighbouring villages, and the West Riding may be congratulated on having built a fine school. At the same time due regard has been had for economy, as the cost works out at £10 2s. per head, exclusive of the site of £11 3s., inclusive of the site.

A NEW BRIGHTON SCHOOL.

Another new school on modern lines which has lately been opened is one built by the Brighton Education Committee, with accommodation for 310 boys and 310 girls. The class-rooms are arranged to accommodate fifty children only, instead of sixty, as has hitherto been the rule, in accordance with the new regulations on lessening the size of classes. A special feature has been made of the ventilation and lighting; each class-room has an external wall and windows on either side, so that there is an abundance of fresh air and light. There are no internal corridors, but open verandahs connect the class-rooms. The playgrounds have been made as attractive as possible, and classes will be held out of doors wherever the weather permits. The building contains a large hall, 45 ft. by 26 ft., and there are shower baths supplied with hot and cold water, and rooms for the medical inspection of the children. The school is warmed by means of a low-pressure hot water system, and it is lighted throughout by electricity. The cost of the building was £8,732, which works out at £14 1s. 8d. per head, exclusive of the site of 7,200 sq. yds. It is the first school of this type to be built in the South of England.

THE COST IN OTHER DISTRICTS.

The cost of these better and more elaborate schools compares favourably with that of buildings of older types. For instance, in Bedfordshire the schools recently erected have cost from £9 5s. to £14 per head, with accommodation for 176 and 80 children respectively, exclusive of site, or £13 to £21 10s. including site. In West Hartlepool the newest schools, which have accommodation for 1,508 children, cost £23 4s. 7d. per head including, and £21 10s. excluding site. In Middlesex the cost ranges from £11 4s. 7d. per head for a school for 160 children to £16 10s. per head for one with accommodation for 1,143, both exclusive of site. Of the schools opened in Durham during the years 1910 and 1911 one built for 900 children cost £10 5s. 3d. per head and another for 950 children £17 0s. 7d. per head, while the average cost per head of all schools built in this county during the last few years has been £12 13s. 10d., the cost of the site being included. Thus it is evident that the schools built on more hygienic modern plans need not necessarily involve any additional expense, while a considerable increase in efficiency, both on the part of teachers and taught, may reasonably be expected. From the *Times Educational Supplement* of December 3rd.

SEA-COAST EROSION. For a very complete and inexpensive library on the cause, prevention and repair of coast erosion the following three works are recommended: "Coast Erosion and Foreshore Protection," by John S. Owens, M.D., Assoc.M.Inst.C.E., F.R.G.S., and Gerald O. Case (price 7s. 6d., post free 7s. 10d.), with numerous illustrations and diagrams; "Sea-Coast Erosion and Remedial Works," by R. C. Allanson-Winn, M.Inst.C.E.I. (price 1s., post free 1s. 1d.); and "Erosion of the Coast and its Prevention," by F. W. S. Stanton, Assoc.M.Inst.C.E., F.S.I. (price 3s., post free 3s. 2d.), with numerous maps and other illustrations. The publishers are the St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, London, E.C.

SEWAGE DISPOSAL IN SHEFFIELD.

RESULTS OF BACTERIAL WORKING.

The effect upon the river Don as the result of the gradual bringing into operation of the new works of sewage disposal on bacterial lines in place of the lime precipitation process at Sheffield is referred to in the report of the city engineer, Mr. C. F. Wike, M.INST.C.E., for the year ended March 31st last. An improvement had, at the time the report was compiled, already become apparent.

Treatment under the new scheme is by means of detritus and screening chambers, followed by sedimentation tanks and contact beds. As originally designed, the works were estimated to cost £270,000, but, later, owing to economies in carrying out the undertaking, it was found that £250,370 would probably meet the cost, and the estimates were revised to this extent. Although the latter sum may eventually be slightly exceeded, the original estimated cost will not be reached.

Shortly, the scheme provides for a new main valve chamber to receive an existing 5 ft. and a new 7 ft. barrel sewers, fitted with new storm-water overflow; two new catchpits and the remodelling of the existing catchpits; nine new settling tanks and the conversion of the present tank area into eight additional tanks, having a total capacity of approximately 15,000,000 gallons; deepening the existing sludge wells and remodelling the pumping plant; sixty contact beds, each half an acre in area; sixteen storm beds, each approximately one acre in area; a bridge and four syphon tubes across the river Don; and roads and railways, including the diversion of a public footpath which divided the site and a footpath over the Great Central Railway.

The firm of Logan & Hemingway have been responsible for the carrying out of a large portion of the work, but it appears from the report that many important sections have been executed by men directly employed by the corporation. During the year a volume of sewage averaging 15,888,000 gallons per day has been treated on contact beds, and, in addition, storm water has received tank treatment. The average flow of sewage treated has been 21,110,000 gallons per day, the total volume treated during the year being 7,726,567,000 gallons. Notwithstanding the increased flow of sewage which has been dealt with, and the large extension of the sewage, the capacity having been increased from 10,000,000 to 64,400,000 gallons per day, no addition to the working costs has yet been necessary, and it is not anticipated that any very large increase in this respect will occur, apart from capital charges. Including the district of Tinsley and outside areas drained under agreements, a total population of approximately 470,000 are served by the works.

As regards sludge, the quantity produced during the year with which the report deals was 54,045 tons, or 6·99 tons per 1,000,000 gallons. It is mentioned that the strength of the sewage delivered at the works shows signs of increasing, owing to the addition of water-closets and an increase in trade wastes; likewise the quantity of road detritus and other solid matters passing to the works is stated to be growing larger.

The Henley Wiring System.—The W. T. Henley's Telegraph Works Company, Limited, Bloomfield-street, London Wall, E.C., have issued a booklet descriptive of their new wiring system and its possibilities. The essential feature of the system is the outer metal covering. This is composed of a special alloy, which is the outcome of experiments carried out to devise a sheathing possessing all the good qualities of lead sheathing, but without the advantages incidental to its use. This sheathing is formed on the cable in a seamless tube, it is impervious to moisture, and there is no danger of trouble due to condensation. It is mechanically strong without being hard or stiff, so that any bends that are required can be made by hand as the wire is erected, no special tools being required. The letterpress of the booklet is free from technical phrases, and is written so as to be of interest to the layman as well as the electrical engineer. It fully describes the system, and is illustrated with interior and exterior photographs of installations recently carried out. The system is now well established, and reported to be an unqualified success. It has been taken up by many of the largest contractors in the country, and is accepted by the leading fire offices. Copies of the booklet can be obtained on application to the company.

SELF-STARTERS FOR MOTORS.

CHISWICK SURVEYOR'S REPORT.

In view of the number of motor appliances now being employed in connection with municipal work, a report which Mr. Edward Willis, ASSOC.M.INST.C.E., F.S.I., A.M.I.MECH.E., engineer and surveyor to the Chiswick Urban District Council, has presented to a committee of that authority is of considerable interest. The report was called for owing to a 60-horse power fire escape chassis being occasionally somewhat slow in starting during very cold weather.

After detailing the principle which obtains in the starting of motors, and explaining how self-starters assist the operation, Mr. Willis follows with descriptions of a number of the latter devices which he has recently examined. After a full consideration of the merits of these, however, he finds himself unable to recommend the adoption of any of them. He adds:—

"If the desire still exists in the committee for some device to be employed in starting up the engine at night and other times, especially during cold weather, I would suggest that a small electric motor be attached to the chassis and be connected by means of a portable plug with the electric lighting wires at the fire station. This would avoid the use of batteries, which are always liable to run down and fail at the crucial moment, or be inefficient when most required, while the electricity supply for the district must be maintained by law in an efficient state, and a portable connection thereto might be considered as always reliable. When the appliance is actually at the scene of a fire and is about to return to the fire station, it really does not matter in practice if, through any unforeseen cause, the starting of the motor should take a few seconds longer than usual. The rapid starting at the station should be considered a *sine qua non*, and it is with a view of improving, if possible, the facilities which already exist that I make the above suggestion. I believe on only one occasion that the motor escape has been in use has there been any material delay in starting the engine, and there is no question that, even though this appliance was never built for the purpose to which it has been applied, it has been obtained at a very reasonable price, including the necessary alterations, and is cheaper in respect of maintenance than a pair of horses, which were contemplated in lieu of it. I am also of opinion that in every case, with the one exception mentioned, the motor escape has been at the scene of the fire before the steam fire engine, which is drawn by two of the best horses available."

REPAIR OF MACADAMISED ROADS.

USE OF "ROCMAC" IN GLASGOW.

In his report for the year ended May 31st last, Mr. Thos. Nisbet, Master of Works, Glasgow, refers to the treatment with "Rocmac" solution of a number of macadamised roads in that city during the previous year.

"This method of repairing ordinary macadamised roads," he says, "has been found to be a big improvement over the old system of water-bound road. The amount of mud during wet weather has been considerably reduced, and there has been a corresponding decrease in dust during the summer months. The roads so treated will last a longer period without requiring to be repaired. This will make up for the extra first cost of this system, which is about from 6d. to 8d. per square yard over the cost of ordinary macadamising. One of the great advantages of the 'Rocmac' method is that the work can be carried out during wet weather."

Mr. Nisbet adds that the system has since been greatly extended.

SURVEYORS' INSTITUTION.

AFTERNOON MEETING.

The next ordinary general meeting, the first of the two afternoon meetings arranged for the convenience of country members, will be held in the lecture hall of the institution on Monday next, when a paper, entitled "The Value and Marketing of English Timber," will be read by Mr. M. C. Duchesne (Fellow). The chair will be taken at five o'clock.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. THOMAS, M.INST.C.E., County Surveyor, Buckinghamshire.

SCOTTISH DISTRICT MEETING.

A meeting of the Scottish District will be held at Falkirk on Saturday, December 21st.

SOUTH-EASTERN DISTRICT.

A meeting of members of the above district will take place at Sidcup at 2.30 p.m. on Wednesday, January 8th, when the road sections will be inspected.

Mr. Maybury has kindly consented to supply the revised cost of the trial lengths up to December 31st; the meeting will be followed by a dinner at Frascati's Restaurant, Oxford-street, at 6.30 p.m.

MEETING AT SWANSEA.

A meeting of the institution will be held at Swansea on Saturday, January 11, 1913.

THOMAS COLE,
11 Victoria-street, S.W. *Secretary.*

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. FRANK LATHAM, M.INST.C.E.I., F.S.E., Borough Engineer and Surveyor, Penzance.

NORTHERN DISTRICT.

A meeting of the above will be held in the Town Hall, Newcastle-on-Tyne, to-morrow (Saturday), at 3 o'clock, when a paper on "Light Mechanical Haulage," by the hon. district secretary, will be read.

Arrangements have been made at the Turk's Head Hotel, Newcastle-on-Tyne, to hold the third annual dinner, following the above meeting, at 6.30 o'clock. Tickets, 4s. each.

JOHN ROBINSON,
Union Offices, *Hon. District Secretary.*
Darlington.
December 3, 1912.

INSTITUTION OF WATER ENGINEERS.

President—Mr. J. S. PICKERING, M.INST.C.E., borough surveyor and water engineer, Cheltenham.

WINTER GENERAL MEETING.

The seventeenth Winter General Meeting of the Institution of Water Engineers will be held at the apartments of the Geological Society, Burlington House, W., to-morrow (Saturday). The proceedings will commence at 10.30 a.m., or as soon as the business of the special general meeting called for 10 o'clock is completed. The usual informal dinner will be held this (Friday) evening.

The following papers have been promised for reading and discussion:—

(1) "Some Recent Examples of Pollution of Public Water Supplies," by J. C. Thresh, D.SC., M.D., &c.

(2) "The Valuation of Water Undertakings on Transfer to Local Authorities," by E. J. Silcock, M.INST.C.E., F.S.I.

(3) "Recent Advances in the Science of Water Purification," by Adolph Kemna, D.SC.

PROGRAMME.

10.30 a.m.—The minutes of the seventeenth ordinary general meeting and of the special general meeting will be read and submitted for confirmation; ballots will be taken for council for the year 1913-14, and for new members; reading of papers and discussions thereon.

The meeting will be adjourned for luncheon or otherwise as circumstances may require.

PERCY GRIFFITH,
20 Victoria-street, S.W. *Secretary.*

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

OUTDOOR ENGINEERING ASSISTANT.—December 14th.—Rivers Committee of the Manchester Corporation. £200 per annum.—Mr. Thomas Hudson, town clerk.

INSPECTOR OF NUISANCES AND SURVEYOR.—December 16th.—Thurnscoe Urban District Council. £140.—Mr. J. Ledger Hawksworth, clerk.

SANITARY INSPECTOR. — December 16th.—Corporation of Merthyr. £100—£120.—Mr. T. A. Rees, town clerk.

SURVEYOR'S ASSISTANT. — December 17th. — Bridgwater Rural District Council. £50—£60.—Mr. W. Alexr. Collins, engineer and surveyor. Applications to be endorsed "Assistant."

BOROUGH SURVEYOR AND INSPECTOR OF NUISANCES.—December 21st.—Corporation of Ludlow. £200 per annum.—Mr. John H. Williams, town clerk.

SURVEYOR.—December 21st.—St. Bartholomew's Hospital.—Mr. Thomas Hayes, clerk to the governors.

CLERK OF WORKS.—December 21st.—East Suffolk County Council. — Mr. W. Jervis, chief surveyor of main roads, County Hall, Ipswich.

TEMPORARY ASSISTANT.—December 21st.—Corporation of Rotherham. £2 10s. per week.—Mr. Ernest B. Martin, borough engineer.

DEPUTY BOROUGH ENGINEER AND SURVEYOR.—December 23rd.—Corporation of Warrington. £200 per annum.—Mr. Andrew M. Ker, borough engineer and surveyor.

SURVEYOR.—December 27th.—Consett Urban District Council. £175—£205.—Mr. H. Jackson, clerk.

SURVEYOR'S ASSISTANT.—December 27th.—Consett Urban District Council. £52—£67.—Mr. H. Jackson, clerk.

ENGINEER-IN-CHIEF.—December 31st.—Mersey Docks and Harbour Board.—Mr. Alfred Chandler, general manager and secretary.

SECOND ASSISTANT SURVEYOR.—January 3rd. —Cannock Urban District Council. £52 per annum.—Mr. C. A. Loxton, clerk.

ASSISTANT IN SURVEYOR'S OFFICE.—Blackwell Rural District Council. £75 per annum.—Mr. Henry Silcock, surveyor.

MUNICIPAL COMPETITIONS OPEN.

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BELFAST.—January 1st.—Designs for 126 houses of two apartments each, and 126 houses of three apartments each, for the corporation. Premiums are offered of £25, £15, and £10.—Mr. R. Meyer, town clerk.

ORSETT (Essex).—January 1st.—For the construction of a sewerage and sewage disposal scheme in the parish of South Ockendon, for the Orsett Rural District Council. Premiums of £50 and £25 are offered.—Mr. James Beck, clerk, 2 Orsett-road, Grays.

HARROGATE.—February 3rd.—Designs for a council school, for 675 children.—Mr. C. E. Rivers, ASSOC.M. INST.C.E., borough engineer.

DUBLIN.—February 6th.—Designs for municipal buildings for the corporation. The proposed expenditure is £50,000, and the author of the design placed first will be appointed to carry out the scheme on a 5 per cent basis. Premiums of £150 and £100 are offered. The assessor is Mr. Albert E. Murray, F.R.I.B.A. —The Town Clerk.

RANGOON.—March 1st.—Designs for municipal buildings. Premiums are offered of £300, £200, and £100.—The Clerk to the Rangoon Municipality.

WINNIPEG.—March 1st.—Designs for city hall. Limited to British architects in Canada. Premiums are offered of 5000 dols., 3000 dols., and 2000 dols. The Clerk.

DURSLEY.—(No date.)—Designs for thirty workmen's dwellings, for the rural district council.—The Clerk.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

Buildings.

DOVER.—December 14th.—For additions and alterations to a school, for the corporation. — Mr. R. E. Knocker, town clerk.

ABERAVON.—December 14th.—For the construction of offices and boundary wall, for the corporation.—Mr. James Roderick, borough surveyor.

BLACKBURN.—December 14th.—For alterations to public baths, for the corporation.—Mr. W. Stubbs, borough engineer.

KENT.—December 16th.—For alterations at the Beckenham Technical Institute, for the Education Committee.—Mr. F. Stevens, Urban Council Offices, Beckenham.

CHELMSFORD.—December 16th.—For sinking a borehole, for the corporation.—Mr. George Melvin, town clerk.

ABERDARE.—December 16th.—For the erection of twenty-three playsheds at council schools, for the Education Committee.—Mr. T. Botting, Education Offices, Aberdare.

STOCKPORT.—December 16th.—For extensions to technical school, for the Education Committee.—Mr. A. Lawton, secretary, Town Hall.

MONMOUTHSHIRE. — December 16th. — For the erection of a higher elementary school, for the Education Committee.—Mr. C. Dauncey, secretary, County Council Offices, Newport.

ABERTILLERY.—December 16th.—For extensions to the generating station, for the urban district council.—Mr. W. Gait, clerk.

FELIXSTOWE.—December 16th.—For the enlargement of a public convenience, for the urban district council.—Mr. H. Clegg, surveyor.

BIRKENHEAD.—December 16th.—For the construction of a roof at the abattoirs, for the corporation.—Mr. J. Fearnley, town clerk.

WILTS.—December 16th.—For alterations and repairs to a school, for the Education Committee.—Mr. J. G. Powell, county surveyor, Trowbridge.

GLOUCESTERSHIRE.—December 17th — January 17th.—For alterations to a school, for the Education Committee. Applications for particulars must be made not later than December 17th.—Mr. R. S. Phillips, architect, Shire Hall, Gloucester.

FARNHAM.—December 17th.—For the erection of five cottages, for the urban district council.—Mr. J. W. Wright, clerk.

WELLINGBOROUGH.—December 17th.—For the erection of a cart shed, for the urban district council. —Mr. E. Y. Harrison, surveyor.

WEST RIDING.—December 18th.—For the removal of temporary buildings, for the Education Committee. —Clerk to the County Council, County Hall, Wakefield.

KENT.—December 19th.—For the erection of a school at Tonbridge, for the Education Committee.—Mr. F. W. Crook, secretary, Caxton House, Westminster.

DERBYSHIRE.—December 19th.—For the erection of lock-up court-house and deputy chief constable's residence, for the Standing Joint Committee.—Mr. N. J. Hughes-Hallett, clerk, County Offices, Derby.

NORFOLK.—December 20th—January 8th. — For the erection of a school, for the Education Committee. Names to be sent by December 20th.—Mr. T. A. Cox, Education Office, Shire Hall, Norwich.

BRAINTREE.—December 21st.—For the erection of caretaker's lodge, and dressing boxes at public baths, for the urban district council.—Mr. H. H. Nankivell, surveyor.

STAFFS.—December 21st.—For the erection of an institute, for the Education Committee.—Mr. G. Balfour, director of education, County Education Offices, Stafford.

EXETER.—December 23rd.—For the extension of the isolation hospital, for the corporation.—Mr. H. Lloyd Parry, town clerk.

PRESTWICH.—December 23rd.—For the erection of buildings and walls in connection with the extension of the town's yard, for the urban district council. —Mr. Lewis A. Orford, clerk.

HAMBLEDON.—December 23rd.—For the construction of a reservoir, for the rural district council.—Mr. F. Smallpiece, clerk, 138 High-street, Guildford.

TWICKENHAM.—December 27th.—For the construction of a stone-pitched inclined embankment along the river frontage, for the urban district council. —Mr. H. Jason Sanders, clerk.

SOUTHAMPTON.—December 30th.—For the reconstruction of Fore Bridge, for the county council.—Mr. H. Barber, clerk, The Castle, Winchester.

ALTRINCHAM.—December 30th.—For the erection of a shelter and conveniences, for the urban district council.—Mr. H. E. Brown, surveyor.

Iron and Steel.

LONDON.—December 16th.—For the supply of fencing, for the county council.—The Parks Department, 11 Regent-street, S.W.

HARROGATE.—December 17th.—For the supply of 85 tons of 3-in. diameter cast-iron pipes and special castings, for the corporation.—Mr. A. S. West, waterworks engineer and manager.

GUILDFORD.—December 18th.—For the construction of surface-water drain, manholes, gullies and connections, for the corporation.—Mr. A. D. Jenkins, town clerk.

BRADFIELD.—December 21st.—For the supply of engines and pumps for waterworks at Stratfield Mortimer, near Reading, for the rural district council.—Mr. R. E. Rawstorne, clerk, 4 Bridge-street, Caversham, Reading.

Roads.

GODSTONE.—December 14th.—For tar-washing the surface of certain highways, for the rural district council.—Mr. Geo. E. Crowter, surveyor of highways.

FINCHLEY.—December 14th.—For the coating of 2,000 super. yds. of carriage way with bituminised macadam, asphalt or concrete, and creosoted deal blocks on concrete, for the urban district council.—Mr. E. H. Lister, clerk.

MAIDENHEAD.—December 16th.—For work of making up, for the corporation.—Mr. P. Johns, borough surveyor.

PLYMOUTH.—December 16th.—For making up certain streets, for the corporation.—Mr. J. Paton, borough surveyor.

WILLESDEN.—December 17th.—For road making and paving works, for the urban district council.—Mr. O. C. Robson, engineer, Municipal Offices, Dyne-road, Kilburn.

MARGATE.—December 18th.—For making up certain highways, for the corporation.—Mr. E. Brooks, town clerk.

LUTON.—December 19th.—For private street improvement works, for the corporation.—Mr. W. Smith, town clerk.

CROYDON.—December 19th.—For making up part of a road, for the rural district council.—Mr. R. M. Chart, surveyor.

SOUTHAMPTON.—December 20th.—For the supply of tools for use on the main roads, for the county council.—Mr. H. Barber, clerk.

SOUTHAMPTON.—December 20th.—For the supply of surface-tarring machines, for the county council.—Mr. H. Barber, clerk.

HAMPSHIRE.—December 23rd.—For the formation of a gravelled footway, for the county council.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

SOUTHALL-NORWOOD.—December 24th.—For making up and channelling work, for the urban district council.—Mr. R. Brown, engineer and surveyor.

ELGIN.—December 24th.—For the supply of road metal for the county council.—Mr. A. Hogg, county road surveyor, 24 Academy-street, Elgin.

MERTON.—December 27th.—For making up a road, for the urban district council.—Mr. G. Jerram, surveyor.

EXMOUTH.—December 28th.—For excavation, sand filling making concrete footpaths, foundations of carriageways, and supply of tar-macadam for finishing coat of carriageways, for the urban district council. —Mr. Samuel Hutton, engineer.

DERBYSHIRE.—December 30th.—For the supply of granite, basalt, slag, limestone, tarred macadam, and tarred chippings, for the county council.—Mr. J. W. Horton, county surveyor, St. Mary's Gate, Derby.

LLANTRISANT AND LLANTWIT FARDRE.—January 1st.—For the completion of the new Ely Valley-road, and branch roads, about 3 miles in length, for the rural district council.—Messrs. Gomer S. Morgan & Thomas Saunders, engineers, School-street, Pontyclun, Glam.

SEVENOAKS.—January 1st.—For the supply of chert, flints and ragstone, granite, quartz, basalt, steam rolling, team labour, cartage and hauling, for the rural district council.—Mr. F. H. Vibert, clerk.

DORSET.—January 4th.—For steam rolling on 458 miles of main roads for three years, for the county council.—Mr. W. Townshend Fletcher, county surveyor, Dorchester.

DORSET.—January 4th.—For the supply of granites, basalts, quartzites, limestones and tar-macadam, for the county council.—Mr. W. Townshend Fletcher, county surveyor, Dorchester.

SUNBURY-ON-THAMES.—January 6th.—For the supply of 4,000 gallons of refined tar, for the urban district council.—Mr. H. F. Coales, surveyor.

EASTHAMPSTEAD.—January 7th.—For the supply of broken or unbroken granite, slag, limestone and flints, for the rural district council.—Mr. C. B. Wilson, clerk.

EAST GRINSTEAD.—January 8th.—For the supply of 20,000 gallons of tar, prepared in accordance with the Road Board's specification for tar No. 1, for the rural district council.—Mr. Francis S. White, clerk.

Sanitary.

NANTWICH.—December 14th.—For the construction of sewage disposal works, comprising detritus, settling, storm-water and stand-by tanks, filter-beds, humus tanks, and laying sewers and manholes, for the rural district council.—Mr. Charles E. Davenport, engineer.

YEOVIL.—December 14th.—For laying stoneware-pipe sewer, and constructing manholes, tanks, and sludge well, and digging irrigation channels, for the rural district council.—Mr. J. E. Rodber, clerk.

RUNCORN.—December 14th.—For the conversion of privies into water-closets, for the urban district council.—Mr. James Wilding, surveyor.

MANCHESTER.—December 16th.—For the construction of new intercepting sewer from Winslow-road to Crowcroft Park, for the corporation.—Mr. Thomas Hudson, town clerk.

ABERGELE.—December 16th.—For carrying out sewerage work, for the urban district council.—Mr. Edward A. Crabbe, clerk.

DENTON.—December 17th.—For alterations to existing tanks, construction of new sludge tanks, and erection of engine and sludge-pressing house, for the urban district council.—Mr. W. Richards, clerk, Town Hall, Denton, near Manchester.

EPSOM.—December 17th.—For the collection of house refuse, for the rural district council.—Mr. Arthur R. Cotton, clerk.

GUILDFORD.—December 18th.—For the construction of 972 yds. of 18-in. and 12-in. surface-water drain, manholes, gullies, and connections, for the corporation.—Mr. A. D. Jenkins, town clerk.

SOYLAND.—December 18th.—For the construction of stoneware pipe sewers, manholes and ventilators, for the urban district council.—Mr. L. H. Longbotham, clerk, Carlton-street, Halifax.

KNARESBOROUGH.—December 18th.—For the removal of house refuse, for the rural district council.—Mr. J. Smith, clerk.

BARNSTAPLE.—December 18th.—For draining Loxhore glebe quarry, for the rural district council.—Mr. E. E. C. Balsdon, clerk.

PRESTWICH.—December 18th. For work of sewering, for the urban district council.—Mr. Lewis A. Ortord, clerk.

EASTHAMPSTEAD.—December 18th. For work of scavenging, for the rural district council.—Mr. C. B. Wilson, clerk, Council Offices, Bracknell.

RADCLIFFE.—December 19th.—For the construction of sewerage works, for the urban district council. —Mr. S. Mills, clerk.

LLANTRISANT AND LLANTWIT FARDRE.—December 19th.—For laying stoneware sewers, for the rural district council.—Mr. W. Spickett, clerk, Pontypridd.

HARROGATE.—December 21st.—For the supply of disinfectants, for the corporation.—Mr. James Mair, medical officer of health, 33 Swan-road, Harrogate.

MIDHURST.—December 23rd.—For the removal of house refuse and street scavenging, for the rural district council.—The Clerk.

BOSMERE AND CLAYDON.—December 26th.—For scavenging work, for the rural district council. Mr. R. M. Cook, clerk, 6 Providence-street, Ipswich.

FRIMLEY.—December 28th.—For the removal of house refuse for three years, for the urban district council.—Mr. F. T. S. Marsh, clerk, Municipal Buildings, Camberley.

WOKING.—December 30th.—For the construction of sewers and manholes, for the urban district council.—The Clerk.

LEYTON.—December 31st.—For laying stoneware sewers, for the urban district council.—Mr. E. H. Essex, Town Hall.

Stores.

WILLESDEN.—December 17th. For the supply of jobbing works in sewer construction, mason's and pavior's work, artificial slab paving, tar paving and execution of tar-paving works, gravel, flints, burnt ballast, broken granite, lime, cement, stoneware pipes, lamp columns and fittings, oils, chandlery, coal, coke, barging of road slop, horse provender, ironmongery, tools, timber, maintenance of telephones and wires, and wood-paving works, for the urban district council. —Mr. Stanley W. Ball, clerk.

MANCHESTER.—December 17th.—For the supply of Portland cement, steel bolts, and nuts for fishplates, self-acting sliding lathe, and cleaning and dyeing of car curtains, for the Tramways Committee. —Mr. Thomas Hudson, town clerk.

GILLINGHAM.—December 19th.—For the supply of road materials, Portland cement and lime, requisites for precipitation works, stoneware pipes, timber, sewer ironwork, coal and coke, bricks, paints, oils, varnish, general stores, ironmongery and disinfectants, for the corporation.—Mr. F. C. Boucher, town clerk.

Miscellaneous.

BIRKENHEAD.—December 16th. For forming paths, fixing entrance gates, and erection of convenience and shelter in recreation ground, for the corporation. Mr. James Beardsley, town clerk.

CHORLEY.—December 18th.—For the supply of galvanised steel ashbins, for the corporation.—Mr. J. Mills, town clerk.

CLACTON.—December 18th.—For the construction of a 9-in. lined deep well, for the urban district council. Mr. G. T. L. Wix, clerk.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ALDENSHAW.—Accepted for the removal of night-soil, for the urban district council.—

W. Phillips, Aldenshaw.

CLACTON.—Accepted for the supply of Ernest Ward granite for the urban district council.—Mr. D. J. Bowe, surveyor:—

Granite.—John Hall Granite Company, Markfield, 14s. 6d. per ton.
Facers.—E. R. Antoft, Wymondham, 6s. 9d. per ton.

GREENWICH.—For building work at Rangehill-place School, Greenwich, for the London County Council:—

G. Parker & Sons, Peckham	£17,887
J. Appleton, Sons, Son & Neave, Ltd.	16,886
Thomas & Edge, Woolwich	16,742
F. & H. E. Burge, Herne-hill	16,447
G. E. Wallis & Sons, Limited, Maidstone	16,242
J. Scott, Bowyer, Limited, Upper Norwood	16,227
T. D. Long, Deptford	16,136
W. Johnson & Son, Limited, Wandsworth-common †	16,097

Architect's estimate, £18,000.

ISLINGTON.—For the erection of a school for physically defective children at Elthorne road, for the London County Council:—

W. E. Blake, Limited, Bloomsbury	£5,501
A. E. Symes, Stratford	5,491
Lole & Co., Chelsea	5,475
McLaughlin & Harvey, Limited, Brecknock-road	5,377
C. P. Roberts & Co., Limited, Dalston	5,377
L. H. & R. Roberts, Islington	5,259
W. Lawrence & Son, Finsbury-circus	5,234
Patman & Fotheringham, Limited, Islington	5,233
Brand, Pettit & Co., Tottenham	5,219
McCormick & Sons, Limited, Essex-road	5,197
J. Chessum & Sons, South-place	5,182
E. Lawrance & Sons, Limited, City-road	5,107
J. Willmott & Sons, Hornsey and Hitchin †	4,950

Architect's estimate, £5,300.

LONDON.—For the supply of centrifugal pumps required in connection with the enlargement of the Crossness pumping station, for the London County Council:—

Thames Iron Works, Shipbuilding and Engineering Company, Limited, Greenwich	£6,640
Rees Roturbo Manufacturing Company, Limited, Wolverhampton	5,820
Fullerton, Hodgart & Barclay, Limited, Paisley	5,700
Marshall, Osborne & Co., Birmingham	5,416
Boving & Co., Limited, Union-court	5,250
J. Cochrane, Barrhead	5,050
Hathorn, Davey & Co., Limited, Leeds	4,770
Vauxhall and West Hydraulic Engineering Company, Limited, Leadenhall street	4,737

The tender of Boving & Co., Limited, included the cost of a small condenser, which was not specified, and the reduction on this account is £70, bringing the amount of this tender to £5,180. The first three firms on the list tendered for pumps built to the council's designs, but the fourth, Boving & Co., Limited, have offered, provided that they are allowed to alter the design of certain parts, to supply pumps with a guaranteed efficiency of 75 per cent plus or minus 1 per cent to allow for errors in measurements. The proposed standard of efficiency is considered to be above that of pumps made to the council's design, which without these alterations would, it is estimated, not exceed 67 per cent.

SEAFORD.—For the supply of granite flake and broken granite, for the urban district council:—

	Flake.	Broken.
	s. d.	*s. d.*
Croft Granite Company, Leicester	9 9	12 3
Manuelle, London	9 6	14 6
Penlee, Bristol	8 6	12 0
Granite Company, London	11 0	15 0
Johnstone Brothers, London	11 2	13 3
Griffiths & Co., London	9 8	14 2
White & Co., London	11 2	12 2
Rowe & Mitchell, London	10 0	15 0
Fry Brothers, Greenwich	9 11	14 8
Brooks, Limited, London	—	14 3
J. Mowlem & Co., London	9 2	13 11
United Stone Firms, Bristol	10 3	12 9

SOUTHAMPTON.—For the erection of Regent's park school, for the corporation:—

Playfair & Toole, Southampton	£15,898
H. Stevens & Co., Southampton	15,561
Jenkins & Sons, Limited, Southampton	15,164
C. J. Lear & Son, Alverstoke *	14,576

Borough engineer's estimate, £15,500.

STAFFORD.—For making up portions of two streets, for the corporation:—

Espley & Sons, Stafford	£360
R. Thorpe, Birmingham	364
C. J. Nevitt, Limited, Stafford *	298

TAUNTON.—For making up Gordon road, for the corporation.—Mr. D. Edwards, borough surveyor:—

F. & E. Small, Taunton	£121
E. G. Coles, Taunton	119
Pollard & Co., Taunton	106
J. V. Coles & Sons, Taunton	98

TIPTON.—Accepted for the supply of 13,500 tons of Welsh granite setts and two traction wagons, for the urban district council:—

Granite Setts.—Penmaenmawr and Welsh Granite Company, Limited, Penmaenmawr.
Traction Wagons.—W. Smith & Sons, Wolverhampton.

TWICKENHAM.—The following tenders have been accepted by the urban council:—

Supply and delivery of 5,000 creosoted deal paving blocks.—T. Gabriel & Sons, and Barton, at £5 9s. 8d. per 1,000.
Supply and delivery at the sewage disposal works of 70 tons of Tamworth slack coal.—S. Bowyer, at 13s. 6d. per ton.
Repairs to six street watering vans.—G. & T. Gravestock, £9 15s. 6d.
Repairs to seven street watering vans.—W. Stops & Sons, £9 0s. 6d.
Repairs to five street watering vans.—C. H. Palmer, £10 8s. 6d.

WALTON UPON THAMES.—Accepted for the supply of broken granite and broken flints, for the urban district council.—Mr. R. Wilds, surveyor:—

Broken Granite.—J. Mowlem & Co., Westminster, 11s. 11d. and 12s. 11d.; London Granite Company, Great Tower street, 15s. and 14s. 1d.
Flints.—Wills & Packham, Sittingbourne, 6s.

YORK.—For the erection of thirty cottages, for the corporation.—Mr. F. W. Spurr, city engineer:—

G. Lough & Co., Blyth, £6,[illegible].

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

DECEMBER.

13.—Institution of Municipal Engineers: Northern District Meeting and Annual Dinner, Turk's Head Hotel, Newcastle-on-Tyne.
14. Institution of Water Engineers: Seventeenth Winter General Meeting, Burlington House, W. 10.30 p.m.

The Surveyor

And Municipal and County Engineer.

Vol. XLII. DECEMBER 20, 1912. No. 1,092.

Minutes of Proceedings.

To our Readers.

To wish at this period of the year all friends of THE SURVEYOR the compliments of the season may be conventional, but it is none the less cordial and sincere. Success in a world of competition is not attained without outside goodwill and assistance, and the more helpers one can rally to one's cause the sooner a measure of success is achieved, and the more lasting is its character. We acknowledge, with the keenest appreciation, that we have many and willing helpers whose only reward has been the knowledge that they have made our journal of real use to those concerned with the practice of municipal engineering. To all such we wish a sanely merry Christmas time, and a New Year of satisfactory health, happiness, and prosperity.

* * *

Tanks and other Matters.

A paper announced under this title was read by Mr. A. J. Martin, M.INST.C.E., president of the Institute of Sanitary Engineers, at the annual general meeting of the Association of Managers of Sewage Disposal Works on December 11th, and although the paper was cut short after dealing with "Tanks," the "other matters," in the shape of filters and standards, were brought before the meeting in two other papers by Lt.-Col. Jones, V.C., and Mr. W. H. Makepeace respectively. It will thus be seen that the whole process of sewage purification in its modern form, from preliminary treatment to final effluent, was considered by this meeting of practical men. In discussing the question of tanks, their relative efficiency as regards shape and form, the tendency of the sludge from different types of tanks to cause a nuisance, and the desirability of providing additional tanks of special construction, or upward filters, for the purpose of settling out the finely divided matters in suspension which frequently come away in tank effluents, were all dwelt upon. In fact everyone appeared to be desirous of reducing the suspended matters in the tank effluent to the minimum before distributing it upon the filters. Now this is very praiseworthy, and in some cases necessary, but it is obvious that the greater the amount of suspended solids removed from sewage in tanks the greater the amount of sludge which has to be dealt with, and all these efforts to produce a clear liquid for discharge to the filters must naturally increase the difficulties of solving the sludge problem. It was possible to gather from the discussion and from members of the association at the meeting that many are still in the fortunate position of being able to get rid of their sludge without much difficulty; but while the facilities for doing this must become less from year to year, the amount of sludge will become greater and greater as the population increases, and if we continue to work on these lines, the possibility of solving the sludge problem would appear to become more and more remote as time passes.

There appear to be two possible alternative methods of procedure in dealing with sewage. One is to endeavour to *make the sewage suit the process of purification* and the other is to *make the process of purification suit the sewage*. Anyone having experience of the difficulties which are encountered in carrying out the first alternative would think that greater efforts would have been made in the past to adopt the second; but as a matter of fact, when the original coarse contact bed was found to become choked when fed with crude sewage, nearly everyone adopted the first of the two alternatives mentioned above, and instead of attempting to modify the contact bed to suit the sewage, all efforts were directed to devising means by which the sewage would be made suitable for the contact bed. At first the septic tank was hailed as the saviour of the situation, then recourse was had to a modified form of septic tank in which the process of septicisation was largely reduced, and later still the hydrolytic tank, the Emscher tank and numerous other types were brought forward—even the old Dortmund type of tank came into vogue again—until at present the number of different types of tanks used in the preliminary treatment of sewage is legion. As these came into use the sludge problem became more and more difficult, particularly after percolating filters came into general use, as it was found that these required an exceptionally clear tank effluent if trouble with distributors and fine material was to be avoided. Another factor in the devotion of so much energy to the design of improved types of tanks was the generally accepted idea that preliminary treatment of sewage involving putrefaction under anaërobic conditions was a *sine quâ non*. It is now some years since we first raised this point in these columns and ventured to express a doubt as to the correctness of this contention. Since then others, better qualified than ourselves to express an opinion, have definitely stated that preliminary putrefaction under anaërobic conditions is not necessarily essential to the proper purification of sewage, but in spite of this there is evidence from all quarters that much energy is still being spent in devising new or improved forms of tanks; latterly even additional tanks of various kinds are being proposed for arresting the fine suspended solids which come away in the effluent from the first tanks. As a natural consequence the disposal of sludge has become more and more difficult, and numerous new methods of treating or disposing of this troublesome by-product are being introduced from time to time.

In our opinion the solution of these problems on the lines generally adopted in the past seems to be as far off as ever, and the time has come when some of the energy devoted to the subject might usefully be turned in the direction of endeavouring to ascertain whether more satisfactory results could not be secured by adopting our second alternative and attempting to *make the process of purification suit the sewage*. It is only fair to those concerned to add here that one man, at least, has followed this method of procedure consistently ever since the first coarse contact beds were constructed, with the result that this process has developed into the Dibdin

slate bed as the result of gradually modifying the original coarse contact bed to suit the sewage. We have described the slate-bed system and the results obtained by its use on various occasions during the past few years, so that there is no need to give details on the present occasion; but it has been recognised by a number of engineers privately and by the Royal Commission on Sewage Disposal officially, that as compared with preliminary treatment in tanks the slate-bed system has solved the sludge problem so far as the question of nuisance is concerned, and has certainly minimised the difficulties very considerably so far as quantity and ease of handling is concerned. The material in the original coarse contact bed rapidly choked and retained its humus and sooner or later became disintegrated, but by utilising experience to adapt it to suit the sewage instead of introducing elaborate means to make the sewage suit the contact bed, we now have the slate bed in which the material does not choke or disintegrate, but unloads its humus and all without creating a nuisance. It would be rash to assume that finality has been reached even with the slate bed in its present form, but we believe that greater success will attend future efforts at improvement in methods of sewage (and sludge) disposal if they are carried out in the direction laid down in our second alternative method of procedure.

* * *

The Pitting of Steel Pipes.

A paper read before the Eighth International Congress of Applied Chemistry by Messrs. George and Melville C. Whipple, of New York, is dealt with elsewhere in these pages. It describes a series of valuable experiments made in order to ascertain the causes of pitting in steel pipes. As is well known, there have been some very serious cases where large pipe lines have become unsound through the metal corroding at many small points. Unlike the cast-iron main, the steel pipe does not break or burst, but fails by leaking at a number of points where pits occur. The fear that this form of corrosion may take place has prevented the steel pipe from being used to the extent that would otherwise have been the case, seeing that for large mains steel pipe is cheaper and more easily handled than the cast-iron pipe, and possesses other advantages. Any information, therefore, that may lead to the discovery of the causes leading to this trouble and to their prevention is likely to be of great value to the engineer, and particularly to the manufacturer. The wrought-iron main, unlike the steel pipe, is found to rust generally over its entire surface, and it is not altogether clear from what is said in the paper why this difference should exist. The ordinary tests made with plates of iron or steel in water or in a dilute acid solution were too slow to be useful, while those made with stronger solutions were not comparable with ordinary working conditions. The experimenters therefore induced corrosion, by passing an electric current through water between two plates of iron or steel, without the use of strong acids. The manner of this electrolytic corrosion as distinguished from its rate is similar to that likely to take place under ordinary working conditions. It is no new theory that the corrosion of steel is due largely to electrolytic action set up owing to the differences in potential of the particles of the material at different points, but the idea that the difference in potential between the scale covering the steel and the metal underneath may set up an electrolytic action does not appear to have been seriously considered hitherto. The authors of the paper prove conclusively that if a wire is attached to the mill scale and a second wire is attached to the metal beneath the mill scale, and that if these two wires are coupled to a galvanometer an appreciable current can generally be measured, and thus they have shown that there is every likelihood of electrolytic corrosion taking place when the water comes in contact with the metal and with the scale. Further, seeing that the scale is full of cracks and is liable to be chipped off in the course of handling, the possibility of corrosion is greatly increased. These tests, however, would not be convincing were it not for the fact that the authors have proved that where all scale has been removed from the steel plate by grinding on an emery wheel absolutely no pitting takes place. We are told that there was not a single instance of pitting when the scale had been removed from the samples before testing, which seems to do away with the idea that this particular form of corrosion is due to lack of uniformity in the composition of the steel. It seems that the lack of uniformity in particles producing electrolytic action exists between the scale and the metal solely, or did so in the samples, and that this is the whole cause of the pitting of steel pipes. This being so, it remains for the metal urgist and manufacturer to find some way of producing steel plates so as to alter the character of the scale in making it of better electrical condition or of removing it entirely. The present methods of removing mill scale from pipes are probably too costly to be practicable, and in the immediate present we can do little, if anything, more than see that the pipes are thoroughly coated with some material that will prevent corrosion taking place; but it is to be hoped that in the future the difficulty will be overcome by some better means in the ordinary process of manufacture.

* * *

The Chlorine Method of Water Sterilisation.

The papers read respectively by Dr. Adolph Kemna and by Dr Thresh before the Institution of Water Engineers in London on Saturday last have one point in common—they both show how extremely important is the chlorine method of water sterilisation. Dr. Kemna's words are: "There is not the slightest doubt that the chloride of lime process constitutes the greatest advance which has been made in water purification during recent years. The proofs of its hygienical efficiency are overwhelming." Elsewhere he tells us that the efficiency of the process has been "effectively demonstrated by the fact of its having stopped epidemics of typhoid. In one case, exactly ten days after starting the application of chloride, an epidemic was suddenly arrested and the diagram showing the number of new cases fell abruptly to zero." Dr. Thresh, on the other hand, gives two instances in which chlorine sterilisation was recommended and adopted at his suggestion. In one case a stream badly fouled by cattle was the source of a polluted supply. The "De Chlor" method was adopted, since when coli have been absent from 100 c.c. at all tests. Still more remarkable is the second case, in which water was drawn for a town supply from a river into which another town discharged its crude sewage ten miles above the intake. When an epidemic of typhoid of some magnitude occurred in the town above the intake, the Local Government Board called on the water authority to take immediate steps to improve the condition of the supply. Dr. Thresh tells us that he "was able so to improve the filtering arrangements that within a period of two days the authority was supplying a perfectly safe water." One of the existing sand filters was made into a chlorinating chamber, and the water was dosed with 1 part of chlorine per million. "The water has been absolutely free from the bacillus coli since the chlorination commenced, and the town has not had a single case of typhoid fever."

Again, to refer to Dr. Kemna's paper, "the application of chloride of lime is simplicity itself: a solution of the required quantities is made and regularly run into the water, and the plant can be started in a few hours." It is to be observed how closely this agrees with the facts recorded by Dr. Thresh. There is nothing in the opinions of the two authors of the papers referred to as regards the merits of hypochlorite sterilisation of water which has not been enforced in these pages for years past. It is, however, gratifying to note that even in this country the great merits of this simple,

economical and valuable process are at last being recognised. The case with which the worst polluted waters, including even sewage effluents, can be sterilised by means of hypochlorite ought to be better understood, and the remarks made by Dr. Kemna and Dr. Thresh are therefore extremely valuable. There are in these papers many other matters of interest which will be dealt with in a later issue.

* * *

The Training of Engineers.

The list of past presidents of the Junior Institution of Engineers contains the names of many distinguished men, and the council and members are to be congratulated on the readiness with which men of great scientific attainment are willing to serve them in that capacity. This year the position is occupied by Sir A. Trevor Dawson, R.N., M.INST. C.E., who delivered his presidential address last week, taking as his subject "Staff Officers in Industrial Works: their Scientific and Practical Training and Duties." Although such a topic may at first sight appear to be rather outside the sphere of the municipal engineer, Sir Trevor Dawson's treatment of it included much that was of general application in regard to the importance of associating scientific knowledge with practical experience in engineering training, and we are therefore led to make a few observations on his address. He pointed out the very wide nature of the training which is required by the engineer who is to be fit to occupy a position of responsibility, and drew as a lesson the wisdom of placing experience before salary in early years. There can be no doubt as to the soundness of this advice in the realm of municipal engineering. The highly-paid posts of to-morrow will be reserved for the men who are acquiring a wide and varied experience of the work of to-day. Another matter emphasised by Sir Trevor Dawson was the necessity for the development of the creative faculty by engineers. The danger of getting into a rut should be avoided at all costs, as nothing is so effective in barring the path of progress as the type of mind which is always content to accept that which exists because it has been considered satisfactory hitherto. The address concluded with a plea for some assistance by the State in providing facilities for the kind of training indicated in the case of men who may have great ability, but no means to enable them to turn their faculties to the best economic advantage. The president in making this appeal was considering only the interest of commercial engineering from the national point of view. As pointed out above, however, the earlier part of his address was in many respects applicable to municipal engineers, who well merit his support.

Ex-Pupils and Assistants Advertisements

A correspondent has drawn our attention to the fact that he replied last month to three advertisements in the "Ex-pupils and Assistants" section of our advertising pages. To one of his letters, addressed to "R. W.," he received a reply informing him that the advertiser had obtained an appointment; to the other two of his letters, addressed to "Desideratum" and "Solicitus" respectively, he did not receive even the courtesy of an acknowledgment. At the date (December 2nd) of the communication to us of our correspondent, the engineer and surveyor to an urban district council, the three advertisements were still appearing in THE SURVEYOR, and our correspondent adds: "I think these men might have replied to my letters. Also, if they have got appointments they should have instructed you to discontinue their advertisements." We cordially agree, and think that the advertisers have acted with grave discourtesy to our correspondent, and with a remarkable lack of consideration to ourselves in view of the fact that we instituted the section of announcements referred to solely in the interest of juniors seeking appointments. On December 2nd the vacancy our correspondent was seeking to fill was still open, a circumstance which is difficult to reconcile with the periodical outcries one hears as to the difficulty of getting berths in the municipal-engineering world. Apparently the more real difficulty is that of helping those who will not help themselves.

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The Institution of Municipal and County Engineers.

At a Metropolitan District meeting of this Institution, which was held last week, a very interesting debate on "The Influence of Motor Traffic on Metropolitan Roads" was inaugurated by Mr. J. Patten Barber. The readiness of the members present to take part in the discussion was sufficient indication of the great interest which this subject arouses at the present time. A variety of points were raised, and ultimately the discussion had to be adjourned, to be resumed at the next meeting of the District.

A meeting of the Council of the Institution was held on December 7th, when twenty new members, eight associate members, and seven students were elected. Among the matters considered was a report of the New Offices Committee recommending the acquisition of a suite of offices in Victoria-street, which, it was stated, would provide the accommodation rendered necessary by the extension of the work and growth of the Institution. This recommendation was adopted. Among other matters which were discussed were the affiliation of the Association of County Surveyors of Ireland, and the mutual defence fund. A report of the proceedings will be found in another column.

* * *

A Building Line Dispute.

In a case recently heard by Mr. Justice Joyce, the Attorney-General, at the relation of the Lye and Wollescote Urban District Council, sought an injunction against a building owner, requiring him to pull down and remove so much of his house as was in front of a building line which the Council had prescribed. The street in which the house in question was situated was not a new one, and two questions of interest to local authorities were discussed in the course of the hearing. The first was as to the power of the Council to prescribe a building line at all, and the other was as to the necessity of their offering compensation to the building owner for the land he was called upon to give up before they could successfully proceed against him. It was contended for the local authority that the correspondence that had passed between the parties showed that the defendant regarded the requirements of the Council as well founded except as regards the building line. He continued to build because he believed that under the Act the Council had no right to prescribe the building line, and that even if they had such a right compensation should have been paid. His lordship said that he would have to consider his judgment.

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Works Projected for 1913.

Those of our readers who propose to comply with our request for particulars of works projected in their districts during the coming year will greatly oblige us and facilitate the production of the forthcoming special annual issue of THE SURVEYOR by forwarding their returns without delay. The form which these should take is now generally understood, but the exact nature of the information sought can be seen by reference to our previous special issue (January 26th last), some thirty-two pages of which were devoted to the publication of these official forecasts. We would repeat what we said last year—that any other material which readers may consider sufficiently interesting for inclusion in the issue will be welcomed; but this matter also—particularly if its use involves the reproduction of drawings or photographs—should likewise reach us at the earliest possible moment.

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New Central Fire Station at Barrow-in-Furness.

NEW CENTRAL FIRE STATION, BARROW-IN-FURNESS.

The opening ceremony in connection with a new central fire station which has been erected at Barrow-in-Furness, designed and carried out by the borough engineer and surveyor's department, under the superintendence of Mr. Arthur Rees, was performed on Thursday of last week by Mr. T. F. Butler, wife of the chairman of the Watch Committee.

It was in May, 1910, that the proposal was decided, owing to the unsatisfactory and dangerous condition of the temporary buildings used by the brigade, to take steps to provide a new station. Several pro-

MR. ARTHUR REES,
Borough Engineer and Surveyor, Barrow-in-Furness.

posed sites were considered, and ultimately land was purchased from the Furness Railway Company, at a cost of 17s. 6d. per square yard. The position is central, abutting on an 80 ft. street at a point where there is comparatively little traffic and the surrounding streets are practically level. The area of the land utilised is 1,653 sq. yds., and 1,030 sq. yds. at the northern end are still available for future requirements.

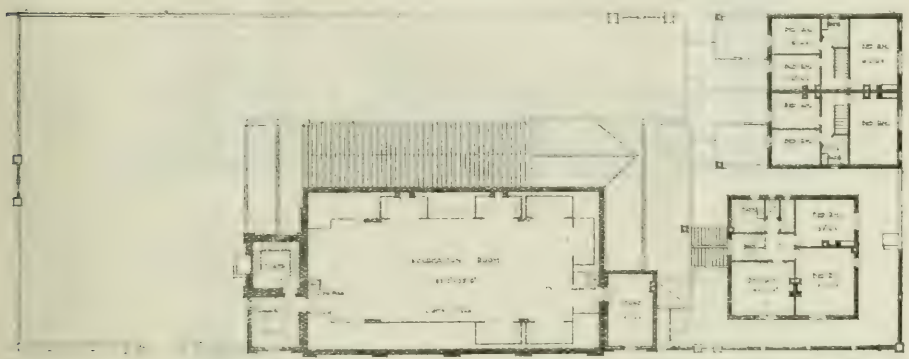
Before the preparation of plans for the new building was commenced the council decided to send a deputation to visit the towns of Bolton, Blackpool, Stockport, Salford and Lancaster, where there are fire stations of comparatively recent erection. As a result of the information furnished by the fire authorities of the towns named, plans were prepared by the borough engineer and surveyor's department, and were subsequently approved by the council in December, 1910. When preparing the plans for the new buildings, it was felt that, while they should be compact for economic and administrative purposes, the situation and the purpose for which they were intended—viz., the housing of men and appliances for the saving of life and property—demanded buildings of some architectural pretensions. In view of the probability that all future fire appliances would be self-propelled—one vehicle comprising several appliances—it was not thought necessary to include stables, but greater width and length in the engine-house than is usually provided.

The accommodation provided, as illustrated by the plans and photographs, is as follows: An engine-house, 65 ft. by 35 ft., with accommodation for four engines, fire escape, hose carrier and ambulance van, the external doors to the engine house being arranged to open and fold back automatically. Behind the engine-house is provided a washing space 48 ft. by 15 ft., covered with a glass roof, supported by cantilever brackets, thus dispensing with the necessity for pillars. Conveniently arranged on the west side of the engine-house, and with separate access from the street, is a duty-room, 14 ft. by 12 ft., in which the telephonic apparatus is placed, this room being arranged so as to overlook the engine-house and to be adjacent to the superintendent's office, 18 ft. by 12 ft. A work-shop, 22 ft. 6 in. by 18 ft., and a store-room are also provided. On the east side of the engine-house is the hose tower, a bath-room, and lavatory accommodation. The whole forms a square and compact block. Without increasing the height of the buildings a comfortable recreation-room has been ingeniously and economically provided in the roof, this room being entered from a separate staircase having access from the street and engine-house. This feature commended itself favourably to the Local Government Board inspector at the public inquiry. Automatic opening manhole doors are fitted in the

floor of the recreation-room, and sliding poles connect this room and the engine-house.

Detached from the station, but connected by a covered passage, there is a house for the superintendent, containing sitting-room, dining-room, kitchen, pantry, bath-room and three bedrooms, and fronting upon the side street are two cottages for the whole-time engineers. Another house has been purchased for the motor driver, in Clifford-street, which abuts upon the rear of the station. The apparatus which has been installed in the telephone-room has had considerable attention, with a view to obtaining an expeditious turn-out.

A switchboard has been constructed, upon which are placed eleven telephone callbells from the various works in the town that have been connected, and from all licensed places of amusement. Upon receipt of a call the officer on duty can instantaneously ring up the whole of the men at their houses, and



First Floor Plan.

Ground Plan.

Scale, 32 ft. to 1 in.

Borough of Dudley.—CENTRAL FIRE STATION.

Ottway" instrument, to which the central buildings of the Brierley Consolidated Colliery Company only are at present connected.

blacksmith's hearth, lathe and drilling machine, for

efficient undertaking with reduced maintenance charges, rather than cheapness in the original cost, as the deputation found when visiting other stations that cheap methods of construction proved ultimately to be far from satisfactory. The endeavour has been to put up a building that would adequately serve the purpose for which it is intended, and be a credit to the town, at the same time studiously avoiding anything in the nature of extravagance.

drainer, concretor, bricklayer and terra-cotta setter—

slater and plasterer—Mr. W. H. Paul; ironfounder—Messrs. T. Blackburn & Sons, Preston; plumber, painter and glazier—Mr. M. A. Ross; mason—Mr. G. Varley; heating installation—Messrs. J. Birrell, Son & Co.; electrical work, under control and supervision of Mr. H. R. Burnett, borough electrical engineer—Mr. C. Armstrong-Lamb, Carlisle. The terra-cotta work was supplied by Messrs. Burmantofts, of Leeds. Mr. T. P. Tyson acted as clerk of works.

"The Surveyor" Book Department.—A selected classified list of technical and scientific books has just been issued, and a copy will be forwarded post free to any applicant. Address the Manager, The Surveyor Book Department, 24 Bride-lane, Fleet-street, E.C.

Messrs. W. F. Stanley & Co., Limited.—Owing to the continued expansion of their business, Messrs. W. F. Stanley & Co., Limited, have been compelled to provide much larger office accommodation, and they will now occupy the whole of the upper part of the premises at 286 High Holborn, where their showrooms have been on the ground floor for some time, retaining their old premises at 4 and 5 Great Turnstile for export only.

DEVON COUNTY COUNCIL.

A THIRD SURVEYOR TO BE APPOINTED.

The Bridges and Main Roads Committee of the Devon County Council presented a report at the council meeting last week recommending that an additional surveyor be appointed, and that the county be divided into three divisions; that the salary and allowances of the additional officer be the same as that of each of the other surveyors; and that the annual allowance for travelling of each surveyor be increased from £160 to £200 each officer to use a motor car in the discharge of his duties. The committee asked that they be delegated the power to make the appointment.

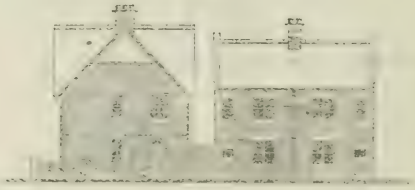
Though some objection was taken to the proposal to increase the annual allowance for travelling, the recommendation was carried by a majority of ten.

A Canadian Concrete Bridge.—The city of Calgary proposes to provide nearly £250,000 for erecting a high-level concrete bridge over the Bow River and two smaller concrete bridges.

Front Elevation.

Back Elevation.

End Elevation.



Elevation to Houses.

(Scale, 32 ft. to 1 in.)

Barrow-in-Furness Central Fire Station

Institution of Water Engineers.

WINTER GENERAL MEETING IN LONDON.

Mr. J. S. Pickering, M.Inst.C.E., borough and water engineer of Cheltenham (president), took the chair on Saturday last at the seventeenth winter general meeting of the Institution of Water Engineers, held, as usual, at the apartments of the Geological Society, Burlington House, W., the attendance including: Messrs. H. C. Adams (Westminster), A. Andrew (Oldham), R. Ashworth (Wolsingham-on-Wear), N. McBarron (Lincoln), W. F. Bird (Midsomer Norton), A. B. E. Blackburn (Sunderland), A. Blakiston (Weybridge), R. Blakiston (Liverpool), F. H. Brunt (Rochdale), W. T. Burgess (London), F. Pullen Candy (Westminster), S. Chapman (Torquay), C. Clegg (Westminster), A. H. Cooper (Farnham), J. Dewhirst (Chelmsford), F. J. Dixon (Ashton-under-Lyne), Percy Griffith (Westminster), secretary, G. Greenslade (Southampton), E. Y. Harrison (Wellingborough), P. T. Harrison (Chelmsford), H. C. Head (Winchester), F. W. Hodson (Loughborough), F. E. Howard (London), W. H. Humphreys (York), J. A. Hutchinson (Paignton), Ad. Kemna (Antwerp), C. P. King (Bexhill-on-Sea), D. Kitchingman (Southampton), G. O. H. Klopp (London), H. Lapworth (Westminster), W. R. Locke (Hemel Hempstead), F. W. McCullough (Belfast), W. Matthews (Westminster), W. Millhouse (Scarborough), T. Molyneux (Stockport), C. B. Newton (Hull), W. G. Peirce (Richmond, Surrey), H. Preston (Grantham), C. H. Priestley (Cardiff), J. Richardson (Birkenhead), R. B. Rigby (Bury), H. Robinson (London), C. Sainty (Windsor), E. Sandeman (Westminster), J. H. Secker (London), E. J. Silcock (Westminster), C. Clemesha Smith (Wakefield), T. Smith (Newcastle-on-Tyne), C. G. Stewart (Westminster), W. Osborne Thorp (Malvern), J. C. Thresh (London), A. Towler (Leeds), L. C. Walker (Reading), W. Whitaker (Croydon), R. H. Wyrill (Swansea), and G. N. Yourdi (Westminster).

The meeting was preceded by a special meeting, at which a number of alterations in the Articles of Association were agreed to, and at the close of the discussion of papers Mr. C. Clemesha Smith (Wakefield) was elected to succeed Mr. Pickering as president of the institution. Messrs. T. Molyneux (Stockport) and F. W. McCullough (Belfast) were elected vice-presidents, and the following as ordinary members of council: Messrs. F. J. Bancroft (Barnet), A. B. E. Blackburn (Sunderland), S. C. Chapman (Torquay), W. Matthews (Westminster), H. Preston (Grantham), C. H. Priestley (Cardiff), H. W. Woodall (Bournemouth), R. H. Wyrill (Swansea), F. J. Dixon (Ashton-under-Lyne), and F. W. Davies (Nottingham).

Two papers, "Some Recent Examples of Pollution of Public Water Supplies," by J. C. Thresh, D.Sc., M.D., and "Recent Advances in the Science of Water Purification," by Adolph Kemna, D.Sc., came before the meeting for consideration, and it was agreed that the two contributions should be discussed together.

SOME RECENT EXAMPLES OF THE POLLUTION OF PUBLIC WATER SUPPLIES.

By John C. Thresh, D.Sc., M.D.,
Lecturer on Public Health, London Hospital Medical College.

During the past year the author has met with an unusual number of cases in which water authorities have required assistance to elucidate the causes of contamination of their water supplies; in some cases advice has been sought on account of the complaints of consumers of the water, and in others on account of analysts having detected the bacillus coli in the water supply, and consequently giving more or less unfavourable reports. Such complaints and reports are not invariably substantiated, and in the cases mentioned in this paper the allegations were not always well founded.

CASE 1. POLLUTION OF DEEP WELL WATER.

The water from a deep well in the new red sandstone began to show signs of contamination, the bacillus coli being found in about 10 c.c. of the water, whereas previously it had not been found in much larger quantities.

The directors were certain that no contamination could arise at the works, and the author, contrary to his usual custom, commenced by examining the neighbourhood around the outcrop of the sandstone, but found nothing which in his opinion could affect the well. This was a great relief to the directors, some of whom held curious views on how well water could become contaminated. On inspecting the works, however, the author found that the water was first raised to an iron tank, of 2,000 or 3,000 gallons capacity, under the engine-house floor, and was then forced to the service reservoirs some distance away. The water in this tank was covered with dust and appeared greasy, and the sides were decidedly slimy, and the author naturally concluded that this was the most likely source of contamination. The engines were stopped, and, the tank being emptied, the sides and bottom were found to be in a very offensive condition. The slime was afterwards examined bacteriologically, and had its source not been known one would have concluded that it had been taken from a tank at some sewage works. It was a mass of bacteria of objectionable type, and contained myriads of bacillus coli. The tank was thoroughly cleaned and properly covered in, and the water at once regained its pristine purity.

CASE 2. CONTAMINATION OF A SPRING SUPPLY.

The spring water supplied a population of about 5,000. The periodical analyses made by the county analyst showed that it was of excellent quality until early this year, when a sample was found to contain the bacillus coli. Another sample was taken and the result confirmed. As another source was available, the spring supply was cut off, and the author was asked to investigate. The corporation owned only a few yards of land around the spring, so that there was really no protective area, but the water came from a bed of sand under a layer of boulder-clay, and this boulder-clay apparently sufficed to prevent pollution, although there were many houses near and above the spring. There had been no known change in the drainage of these houses to account for the pollution of the water; moreover, the water was always beautifully bright, and even when containing the bacillus coli the chemical quality had remained unchanged. The spring and its immediate surroundings were then examined. The spring arises at the bottom of a large reservoir having a semi-circular galvanised-iron roof. The water boils up in three different places, but a little oozing was found near a side wall, where the sand was mixed with a little clay, and appeared to be discoloured. Samples were taken from these different points, and were all found to be of the greatest purity, except that from the point near the side wall. This sample was grossly polluted and contained the bacillus coli in abundance. Round the outside of the reservoir or collecting tank the earth was soft, especially near where the polluted water entered, and a sample was found on examination to be contaminated with manurial matter. Inquiry elicited the fact that during a long spell of dry weather the roof of the reservoir had become almost covered with bird droppings from the trees which surrounded the reservoir, and that the water was first found to be contaminated two or three days after a heavy rainfall, which, as the roof had no gutters or spouting, had washed all the filth from the roof on to the ground around. At the point where the ground was soft, near the source of pollution, the author made a hole with a walking-stick, poured in a little strong solution of fluorescin, and then added two or three pails of water. Within an hour the fluorescin was visible in the reservoir, the coloured water entering at the point of discoloration. There was no doubt, therefore, that the filth from the roof had gained access to the reservoir and given rise to the bacillus coli found in the water.

The soft earth around the reservoir was removed and a broad concrete channel constructed; the discoloured sandy clay at the bottom of the reservoir was also removed, and a load or two of clean sand substituted for it. The reservoir was then allowed to fill again, and the water being found to be quite free from any signs of contamination, its use for the purposes of a public supply was then resumed.

CASE 3. CONTAMINATION OF ANOTHER SPRING SUPPLY.

In another county a spring water went wrong exactly as in the preceding case, but here the spring was in the centre of a huge meadow, in a depression, with a wire fence round the reservoir, which was covered. The fence was only a few yards from the spring and from the fence at the top of the slope were quantities

of cow-dung. Apparently the cows were attracted to this spot by the shelter afforded by a few trees. With every rainfall some of the manure must have been washed down the slope, and as the difference between the level of the water in the reservoir and of the ground outside was only a few inches, there was no doubt that the bacillus coli got washed through the soil and entered the spring. The author recommended the construction of a concrete channel round the reservoir, and the pushing back of the fencing so as to keep the cattle a greater distance away. When this is done the water will no doubt be perfectly satisfactory.

CASE 4.—WORMS IN A PUBLIC WATER SUPPLY.

During last summer a water authority began to receive complaints about worms appearing in the water at the house-taps, and their meter examiner reported the finding of worms in the water meters. Specimens were submitted to the author and proved to be the lava of a fly. Flushing the mains not having ridded the district of the pest, the author was asked to investigate the whole matter. The water entering the reservoir was found to be free from "worms," and there were none in the water leaving the reservoir. The author, however, ascertained that on certain lengths of main there were no complaints, and that on one long main all the complaints came from consumers living beyond a certain point. Samples were drawn from taps throughout the area which confirmed these statements, and the author came to the conclusion that the larvæ or the ova were gaining access to the mains at the ball-hydrants. These were said to be well looked after and to be kept clean, but the first visited, situated just below where the complaints commenced, showed that they were anything but clean. This and others contained quantities of road scrapings and washings. The author, of course, recommended the thorough cleansing of all the boxes and the thorough flushing of all the infected mains, and after this was done the "worms" disappeared. The author would strongly urge the necessity for a new statute or clause in the Public Health Acts forbidding the use of these old-fashioned ball-hydrants; they are a constant source of danger to water supplies.

CASE 5.—ALLEGED POLLUTION OF A SUBSOIL SUPPLY.

A sample of water taken from a house tap was submitted to an analyst and condemned by him, causing great alarm and excitement. After examining the works and taking samples of water for examination, the author was satisfied that no source of supply could be less liable to pollution, and found that the samples of water examined were of excellent quality. Subsequent inquiry indicated that a portion of the mains had not been efficiently flushed, and that the sample of water condemned was taken from this piece of main. To condemn a whole water supply and create a panic merely because of such an incident as this is, in the author's opinion, entirely unjustifiable, but it is not at all an uncommon occurrence. Not long ago such a sample taken from the mains of an important water company was submitted to the author, who, after inquiries, found that the inspector had gone to a fire hydrant, turned on the tap gently and filled the bottle with the water as it escaped. Another sample was taken from the same spot after opening the valve and allowing the water which had stagnated in the pipe to escape, and this was of unexceptional quality. Sufficient care is not taken, as a rule, in collecting samples for analysis. The following experience is a further confirmation of this statement.

CASE 6.—ALLEGED POLLUTION OF A TOWN SUPPLY.

A case of typhoid fever having occurred in a large house connected with the public supply, the owner sent a sample of water for analysis. It proved to contain far too many bacteria, including the bacillus coli. The owner was informed of the results of the examination, but was warned that it would be unsafe for him to accuse the sanitary authority of supplying a contaminated water unless he could prove (1) that the water came direct from the main, and (2) that the sample had been properly taken. On visiting the house, the author found that the pipe from which the sample had been taken terminated at a tap over the kitchen sink, and was undoubtedly a branch direct from the main. The tap was a large one, and upon inserting the little finger into the nozzle it brought away a slimy mass of filth, resembling dirty boiled sago. This proved to consist almost entirely of bacteria, and the water taken after the tap had been cleaned and flamed was perfectly satisfactory in character.

CASE 7.—INTERMITTENT POLLUTION OF A TOWN SUPPLY.

The water supplied to this town was very variable in character, sometimes excellent, at others showing undoubted signs of contamination, notwithstanding that it was sand-filtered. On examining the works, the author found the whole supply drained from a brook, the water from which was passed through small sand filters and then pumped to a reservoir supplying the town. The houses near the brook were kept under supervision, but upon tracing up the stream it was found to run across a road where it was forded by every vehicle which passed. It also drained meadows in which cows were pastured, and there was no difficulty in finding places in which the cows stood in the water and defecated and micturated as nature demanded. To obtain another source of supply was impracticable, and the directors, on learning the facts, were ready to acknowledge that some system of purification was absolutely necessary. Having speedily made up their minds, a chlorination system was adopted, the sand-filtered water being passed through a "De Chlor" apparatus. The arrangement has been installed over six months, and the water is examined twice and sometimes three times a month, and invariably with satisfactory results. Whereas previously the water often contained hundreds of bacteria per c.c., and the bacillus coli in 1 to 5 c.c., it now contains on an average about 4 bacteria per c.c., and no bacillus coli has ever been found in 100 c.c.

CASE 8.—INTERMITTENT POLLUTION OF ANOTHER TOWN SUPPLY.

This town derives water from a river, which, after sand filtration, is supplied to the town. Upon occasions the water had been unsatisfactory, and when an outbreak of typhoid fever of some magnitude occurred in a small town about 10 miles above which discharged all its sewage in an absolutely crude state into the river, the condition became so alarming that the Local Government Board called upon the water authority to take immediate steps to improve the condition of the supply. The author was able to so improve the filtering arrangements that within a period of two days the authority was supplying a perfectly safe water. One of the small sand filters was emptied of its content and made into a chlorinating chamber and an adjoining tank was filled with layers of sand and charcoal. A smaller tank was used for making the solution of chlorine and a man superintended the flow, dosing the filtered water with 1 part of chlorine per 1,000,000. The treated water takes about half an hour to traverse the chlorinating tank, and then passes through the sand and charcoal filters direct into the mains. The water has been absolutely free from the bacillus coli since the chlorination commenced, and the town has not had a single case of typhoid fever. Why in the twentieth century a town should be permitted to cast its raw sewage into a river which, a few miles below, supplies many thousands of people with water passes the author's comprehension. The fact that it is possible is a disgrace to our boasted civilisation.

CASE 9.—CONTAMINATION OF A LARGE PUBLIC SUPPLY DERIVED FROM DEEP WELLS.

The water from this supply acquired a peculiar and very faint odour which was especially observable when a large quantity was drawn to fill a bath, and complaints began to be received. The water was examined and, comparing it with waters from similar wells in the locality, it was found that it differed from them in containing more free ammonia and sulphates and in absorbing more iodine. Upon going down the well to investigate, a smell of coal gas was noted and as there was a gas-works about 100 yds. away, some connection between these works and the well was suggested. A sample of water obtained from a large gasholder was found to contain not only a quantity of free ammonia, but also millions of bacteria per c.c., one of which proved to be the same as one isolated from the well water. There was no doubt about the connection, and the gasholder was thrown out of use; on the tank being examined, it was found to leak badly. After the use of the gasholder had been abandoned the ammonia gradually disappeared from the well water, the sulphates decreased, and the water became practically normal.

CASE 10.—ALLEGED POLLUTION OF A WATER SUPPLY FROM THE HASTINGS SANDS.

Quite recently the author was called upon to examine a public water supply on account of the bacillus coli being found in the water taken from the mains. The inhabitants of the district had been

advised to boil the water before using, though the local officials declared that they could not see how the water could become polluted. The well is shallow, and situated in the centre of a level area of uncultivated land, of which about 12 acres are fenced off for protective purposes. There is only about one house in the area fenced, that occupied by the waterworks engine driver, where the closet is provided with a pan, and all excremental matter is mixed with combustible material and burnt in the furnace. The soil around is very light sand, and it was noted that rabbits abounded and burrowed near the well. Pollution from any dangerous source is impossible, and the author, having concluded that the occasional bacillus coli come from the excrement of these small animals, has advised that steps be taken to keep them at a respectful distance.

CASE II.—POLLUTION OF A SPRING SUPPLY.

In this case the water supplies a population of about 5,000, and is derived from a spring in superficial gravel. The surroundings are unfavourable, there being quite a large population on the gravel above the spring. Notwithstanding this, the water is always absolutely bright and of excellent quality chemically. It is also most satisfactory bacteriologically save after a heavy rainfall. Within twenty-four hours of such a rainfall the B. coli could be found in the water, but in a very short time the water was found to regain its purity. The source of the contamination took many months to discover. Fluorescin tests made at a number of trial holes above the spring all gave negative results, and many had been put down when it showed that the water came from below a bed of clay intercalated in the bed of gravel, and that this bed [illegible] in the adjoining field on the side from which the water flowed, the water was not affected until the lip of the bed of clay was pierced. When the fluorescin got into the gravel below the clay the water entering the reservoir was coloured within twenty-four hours, and remained so for two or three days. Fortunately [illegible] otherwise it would have been impossible to make such [illegible] trol of this field was obtained, and a careful watch has been kept upon the water since. Heavy rainfalls still increase the number of bacteria, but the bacillus [illegible] not an ideal source from which to obtain a public [illegible] ing and guarding if they must continue to be used.

CASE 12.—ALLEGED POLLUTION OF RESERVOIR WATER.

As many of you are doubtless aware, the presence of nitrites in potable waters causes such a water to be regarded with suspicion, and on occasions has led analysts to condemn a water as being sewage polluted. The author has known more than one undoubtedly good water condemned for this reason. There is, however, a possibility of water being said to be contaminated on the ground of its containing nitrites when it is absolutely free from nitrites, the reaction causing the mistake being due to something entirely different and of no significance.

Recently the water supplied by a large public company was adversely reported upon by a chemist, owing to the alleged presence of nitrites. The company's analyst found no nitrites in the water, and I was called in to investigate. The springs and reservoirs were examined, and a large number of samples taken. Employing one test the nitrite reaction was obtained with all, but it was particularly marked in [illegible] the reservoirs, and which was covered with an active confervoid growth. When these waters were filtered, only the pool water gave the reaction, and when confirmatory tests were applied it was found that the pool water alone contained nitrites. Evidently they were being formed by the reducing action of the confervoid growth on the nitrates present. A further investigation showed that the reaction first obtained (with acid and potassium iodide) was due to a trace [illegible] and that a little [illegible] part of manganous [illegible] is sufficient to give the [illegible] in a few minutes. The [illegible] grain of manganese made it 900 gallons of water. Upon testing the water residues, all were found to contain more than this quantity. This [illegible] nitrites [illegible] mistaken for nitrites. The water was of the highest degree of purity.

I obtained a little of the confervoid growth and put it in some of the company's water and exposed it to bright sunlight, but no nitrites were found. I then added a little of Warrington's solution (solution of ammonium phosphate, &c.), and again exposed it to the sunlight. In a few hours nitrites were easily detected. There can be no doubt, therefore, that nitrites may occur in stored waters which are not sewage polluted.

It should be remembered also that nitrites are given off in smoke from burning fuel, and that traces are found in the products of the combustion of gas and in tobacco smoke. Distilled water in laboratories often contains traces of nitrites due to these causes, and I have known traces found in reservoir water attributed to the smoke from the pumping station, but I was unable to confirm this.

The author sincerely hopes that these notes may not only prove of interest, but also be useful. The mere analysis of a water is without interest unless the results can be correctly interpreted, and by studying examples of this kind we gain experience which enables us to interpret other results more or less correctly.

TESTING ELECTRICAL CONDUCTIVITY OF WATER AS A GAUGE OF PURITY.

It will no doubt have been noticed that most of the cases of contamination noted above were discovered by the results of one analysis differing from those of previous analyses, thus showing that some change had occurred in the water. In some instances it is possible to obtain indications of such a change without resorting to either a chemical or bacteriological examination, and at the conclusion of the meeting the author will demonstrate to the members present a method of determining the electrical conductivity of a water. This process is especially delicate with certain waters of low conductivity, a very slight change in character affecting the reading on the index of the machine when a current of electricity is being passed through the water.

SOFTENING BY "PERMUTIT."

The author will also exhibit a sample of artificial zeolite, called "Permutit," and will demonstrate its remarkable property of softening water by merely passing a hard water through it. This action is Nature's way of softening water. The Thanet sand under London and the adjacent counties possesses the same properties, hence the chalk water from Hertfordshire, for example, which is very hard, filters through the Thanet sand, and where pumped up in London is found to have become very soft and to contain [illegible] of soda instead of carbonate of lime. This system of softening is being installed by a large water company, and the author has recently had to go into the medical aspect of the question and give an opinion as to the effect of such a softened water upon health. Sooner or later, therefore, this subject will become of interest to waterworks engineers, hence my desire to make you practically acquainted with it.

ADVANCES IN THE SCIENCE OF WATER PURIFICATION.

The paper read by Dr. Adolph Kemna draws attention to the fact that although underground waters have been preferred to surface waters they are not always abundant, chemically pure, or fit for drinking purposes, and that there are many examples of springs which have become dangerous owing to contamination, and have caused epidemics of typhoid fever. A comparison between the health statistics of spring supplied and surface supplied towns in France showed that those towns which derived their supply from surface sources were the healthiest, with a result that in that country there has been a change of opinion as to the superiority of underground waters. In Germany, on the other hand, the belief in the greater purity of underground waters has been so strong that considerable trouble has been caused. For instance, Breslau, the capital of Silesia, which formerly used filtered water drawn from the river Oder, abandoned the supply and sank 300 wells in a district where there was believed to be an inexhaustible underground supply. Only two-thirds of the quantity expected was obtained and considerable trouble has been experienced.

Dr. Kemna is of the opinion that ordinary filtration is a sufficient safeguard against water-borne disease

the best proof being the health statistics of millions of human beings during the last three-quarters of a century. The author points out that, although ozone sterilisation has been adopted on the Continent, the English-speaking countries, which include more than half the civilised world, do not seem at all inclined to adopt the method. He points out that the ozone people at St. Petersburg felt so sure of being able to destroy the coli that they agreed to pay a fine of 1,000 roubles for each detection, with a result that in June last they had to pay 26,000 roubles. On the other hand, the author is greatly in favour of chlorine sterilisation, its efficiency having been demonstrated by the fact of its having stopped epidemics of typhoid. In one case, exactly ten days after starting the application of the chloride, an epidemic was suddenly stopped, the number of new cases falling abruptly to zero, and the author observes that in experimenting thus with a population of 300,000 persons the effect of any individual peculiarities, which might have obscured the results in the case of a small population, would be lost by being blended with a mass of normal cases.

Within a period of five years the use of this system has spread all over America, and its efficiency is no longer questioned. No trouble has been experienced in the matter of taste. The taste, if any, only exists just after the introduction of the reagent, and rapidly disappears. The author further states that there is not the slightest doubt that the chloride of lime process constitutes the greatest advance made in water purification during recent years, that the proofs of its hygienical efficiency are overwhelming.

The advantages of coagulation by means of sulphate of alumina are also dealt with at some length, especially in connection with the mechanical filter. The treatment is described as cheap and easily applied without being open to any reasonable objection whatever.

The method of maintaining the quantity of underground water in low-lying areas by means of irrigation on the surface is referred to. The method was adopted at Breslau, in order to increase the yield of the wells, but owing to the gradual choking up of the irrigation channels, the supply soon failed. Further, it appears that the quality of the water was adversely affected by the presence of iron and manganese sulphate. It is essential that the subsoil in such a case should be of a nature to facilitate the percolation of the water. Very fine sand is an obstacle to circulation, as has been often proved in the case of deep wells sunk into sand containing an abundance of water which is held back by capillarity due to the fineness of the sand.

Although Dr. Kemna considers that treatment by means of ultra-violet rays is suitable for waters such as those coming from chalk springs, he thinks that the process is not yet out of the experimental stage. Dr. Houston's proposal to use lime as a sterilising agent is also referred to, and the author states, in conclusion, that it is rather by the improvement of existing methods than by the introduction of new processes that the science of water purification should be advanced.

(To be continued.)

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

Deptford Municipal Dispensary.—The first municipal dispensary in London for the treatment of consumption was opened at Deptford on Monday. This institution, "Hilary House," in Amersham-vale, is situated practically in the centre of the borough. The freehold of the house and land have been presented to Deptford as a permanent memorial of his year of office as mayor by Mr. E. Mumford Preston, who has also fitted up the institution in the most modern and hygienic manner. It contains eight rooms, furnished as doctors', nurses', waiting and dressing rooms: there are also a laboratory and a dispensary. The institution will be maintained out of municipal funds.

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister at Law, A.M.I.C.E., &c. London: St. Bride's Press, Ltd. Price 10s. 6d.

SOCIETY OF ENGINEERS.

ANNUAL GENERAL MEETING.

The third annual general meeting of the Society of Engineers (Incorporated) was held at the society's offices, 17 Victoria-street, Westminster, on Monday, the 9th inst., at 5.30 p.m., Mr. John Kennedy, president, being in the chair.

The report of the scrutineers of the postal ballot for the election of council and officers for 1912 showed that the following had been duly elected: President, Arthur Valon; vice-presidents, H. C. H. Shenton, Norman Scorgie, T. E. Bower; members of council, Henry Adams, C. T. Walrond, Percy Griffith, H. C. Adams, J. R. Bell, S. Cowper-Coles, H. P. Maybury, B. H. M. Hewett, F. H. Hummel, G. A. Becks; associate member of council, R J. Simpson; hon. secretary and treasurer, D. B. Butler.

It was announced that premiums for papers read at meetings and published in the *Journal* during 1912 had been awarded as follows:—

The President's Gold Medal to Mr. W. P. Durtnall, for his paper on "The Generation and Electrical Transmission of Power for Marine Transportation."

The Bessemer Premium, value £5 5s., to Prof Herbert Chatley, for his paper on "Resistance to Rolling."

The Clarke Premium, value £5 5s., to Mr. Gerald O. Case, for his paper on "Ligno-Concrete."

The Bernays Premium, value £2 2s., to Mr. J. P. Harris, for his paper on "The Construction of a London County Council Low Level Sewer from Battersea to Deptford."

A Society's Premium, value £2 2s., to Mr. P. J. Waldram, for his paper entitled "Test Deflections in Reinforced Concrete."

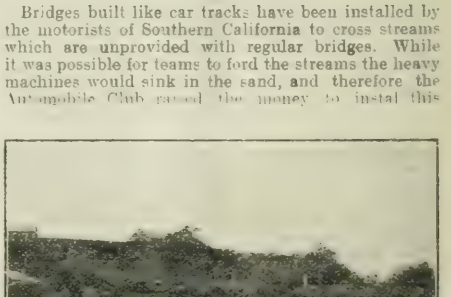
A resolution was passed thanking the other gentlemen who had presented papers during the year, some of whom, being members of the council, were not eligible to receive premiums.

Messrs. W. B. Keen & Co. were appointed as auditors to the society for the ensuing twelve months.

Votes of thanks were passed to the retiring council and officers, and to the scrutineers of the ballot papers for the election of council for their services.

SPECIAL BRIDGES FOR MOTOR VEHICLES.

Bridges built like car tracks have been installed by the motorists of Southern California to cross streams which are unprovided with regular bridges. While it was possible for teams to ford the streams the heavy machines would sink in the sand, and therefore the Automobile Club raised the money to instal this



Bridge for Motor Vehicles

unique type of bridge. As there is no roadway between the channels in which the wheels run, no horse-drawn vehicle can make use of the bridges; and this is just, inasmuch as the motorists paid the entire cost. The construction is light and inexpensive.—*Scientific American.*

THE CHRISTMAS HOLIDAYS.

Owing to the necessity for going to press earlier than usual, news and advertisement matter intended for insertion in the Christmas-week issue of "The Surveyor" must reach us not later than Tuesday morning, December 24th.

Tanks.*

By ARTHUR J. MARTIN, M.INST.C.E., F.G.S., F.R.SAN.I., M.CONS.E.

It is scarcely possible nowadays to speak on tanks without exposing oneself to the criticism which was pronounced on a well-known book. "It contains," said the reviewer, "a great deal that is new, and a great deal that is true. But the things that are true are not new; and the things that are new are not true." . . . What do we understand by a "tank," and what do we use it for? I propose to employ the word "tank" in its broadest sense, to indicate a receptacle through which sewage is passed for the purpose of preparing it for further treatment, whether by filtration, irrigation, dilution, or otherwise, such preparation consisting essentially in the removal of suspended, and in some cases of colloidal, matter, with or without the breaking down of the more complex organic substances in solution. This definition, it will be noted, covers coarse contact beds and slate beds, as well as the innumerable receptacles to which the term "tank" is more commonly applied. I lay stress on this primary function of a tank—namely, that of preparing sewage for further treatment, because it is so often lost sight of, attention being concentrated instead on other and less important sides of its work, more particularly the digestion of the sludge. Thus we hear of septic tanks which have been deliberately allowed to sludge up in an attempt to obtain a maximum amount of digestion, with the result of sending on to the filters an effluent heavily charged with suspended solids. In a case of the kind which came under my own notice some years ago, I called attention to what was going on, and urged that the tanks should be cleared out before the filters were ruined. Nothing, however, was done, and the works were allowed to drift, with the results which might have been expected.

An occurrence of this kind is often referred to as "a failure of the septic tank." It would be fairer to call it "a failure of the sewage works manager." I have heard it gravely argued that it is not fair to blame a manager who sits still and allows his tanks to sludge up. I am sure that members of this association take a higher view of their responsibilities, and will not condone the conduct of a man who shuts his eyes to what is going on in his works, or neglects to take timely precautions to safeguard their efficiency. Occurrences of this kind furnish a strong argument for the existence of such an association as this.

The engineer who is charged with the design of a sewage works has a bewildering variety of tanks to choose from—sedimentation and precipitation tanks (quiescent or continuous), septic tanks, Dortmund tanks, hydrolytic tanks, Emscher tanks, and, more recently, the Fieldhouse tank.

I am sorry that Mr. Dibdin will not allow me to add slate beds to the list, for no one who heard Mr. Tyndale's thoughtful speech to the Society of Chemical Industry last week can fail to recognise in the slate bed a sedimentation tank of a peculiarly attractive type. The distinctive features of the slate bed, viz., the reduction of the downward travel of the depositing solids from 6 ft. to 2 in., and the large increase in the area of the surface exposed to air, while undoubtedly important, involve no essential departure from the ordinary sedimentation tank, and the subjection of the sludge to biological action is not a novelty.

It would be superfluous in such a gathering as this to describe the various tanks which I have enumerated, so I will confine myself to a consideration of a few of the vexed questions in connection with the tank treatment of sewage.

The Hampton doctrine was very fully discussed at our last annual meeting, so I will not now reopen the controversy to which it has given rise.

It is interesting to note the successive views which have prevailed with regard to the utility of a preliminary anaërobic treatment. The scientific witnesses who testified before the Royal Commission on Sewage Disposal at its earlier sittings were on the whole strongly in favour of anaërobic treatment. In their fifth report, however, the commissioners take the opposite view, and characterise as unfounded the opinion that septic sewage is more amenable to filtration than fresh sewage. In this they are supported by Dr. Dunbar, of Hamburg, and many other authorities. The older belief in the value of anaërobic treatment finds strong support in two of the latest and most important papers on sewage disposal, the one by Dr. Fowler, read at this year's International Congress on Hygiene and Demography at Washington, and the other a most interesting description of the Birmingham sewage works by your president. Mr. Watson's experience of the extreme difficulty of filtering a merely sedimented sewage in cold weather, and the clogging of the bacteria beds receiving such sewage, is especially interesting, while his observations as to the risk of over-septicisation and consequent nuisance in warm weather bear out the experience of many sewage works managers. The practical conclusion at which he arrives is that the beds should be fed with septic sewage in the winter and non-septic sewage in the summer.

An important section of Dr. Fowler's paper is that dealing with the Emscher tank, which he finds very efficient for the rapid separation of the solid and liquid portions of the sewage, and free from offensive odours. He points out, however, certain difficulties inherent in the working of this tank, one of these (which is also referred to by Mr. Watson) being the absence of any considerable smoothing effect on the composition of the sewage, and another its failure to break down the organic matter in solution—in other words, the absence of septic action.

Dr. Fowler accounts for the conflict between the advocates of aërobic and anaërobic methods by pointing out that sewage which has travelled long distances in the sewers has generally undergone during its progress changes which render further anaërobic treatment superfluous, while a strong, fresh sewage, not having undergone these changes, requires anaërobic treatment at the outfall. In dealing with such sewage at Calcutta, Dr. Fowler and Mr. Clemesha found it desirable to keep the sewage in the septic tank for no less a period than three days.

The old controversy as to the relative merits of open and covered septic tanks has now died away, and Mr. Cameron's observation that either would give good results is now generally accepted.

As regards the amount of sludge which can be digested, it is remarkable, bearing in mind the wide variation which there is in the composition of different sewages, that Mr. Cameron's early experience at Exeter should have been so closely borne out by the findings of the Royal Commission. Mr. Cameron, in his evidence before the commission, accounted for the suspended solids in the St. Leonards sewage as follows:—

	Grains per gall.	Percentage of total.
Suspended particles in tank effluent ...	10·8	44.1
Residuum and scum in tank	4·5	18·4
Loss by treatment ...	9·2	37·5
Total	24·5	100·0

Mr. Cameron's digestion figure of 37·5 per cent may be compared with the following typical cases cited by the Royal Commission:—

Place.	Authority.	Suspended matter digested or converted into gas.
Huddersfield ...	Mr. Campbell ..	38%
Leeds ...	Mr. Harrison	about 30%
Manchester ..	Dr. Fowler ...	possibly about 25%
Sheffield	Mr. Haworth	32·9%
Birmingham	Messrs. Watson and O'Shaughnessy ...	not more than 16%

Very discordant accounts have been given of the final solid residuum from a septic tank. The impression is general, and it has been sedulously fostered by the advocates of rival processes, that septic sludge is extremely malodorous. On the other hand, a number of well-known authorities, including your president, Dr. Reid (of Staffordshire) and Dr. Calmotte (of Paris), have testified to its inoffensive character. Here, again, the conflict of evidence is explained, if we consider the facts. An imperfectly digested sludge, whether from a septic tank or any other form of tank or bed, is often extremely offensive, but the reverse

* Paper read on the 12th inst. at the Annual General Meeting of the Association of Managers of Sewage Disposal Works.

is the case where digestion has been carried to its utmost limit.

Much value is sometimes claimed for tanks of particular shapes, and so far as the retention of suspended matter is concerned, the form of the tank is doubtless important. But it is also stated that certain tanks are less liable than others to yield an offensive effluent. It is necessary to distinguish between effects which are due to the form of the tank, and those which merely arise from differences in the tank capacity. Given two tanks of equal capacity through which sewage passes in the same time, it is not easy to see how any difference in the form of the tank can so profoundly modify the conditions therein as materially to affect the changes undergone by the sewage, and if it is desired to avoid a septic condition of the effluent, it would seem to be more important to reduce the size of the tank than to change its form.

A somewhat extensive experience of the varying conditions met with in practice has led me to the conclusion that no one type of tank is the best in all cases. The situation of the works, and questions of fall, level, and nature of foundation, are generally far more important than the abstract merits of particular tanks. Where the fall is ample, quiescent sedimentation or precipitation tanks or slate beds may be used; but where this is not the case the advantages of any given tank will rarely be so great as to justify the cost of pumping the sewage in order to furnish the fall which the tank requires.

Near houses it will generally be advisable to subordinate the question of sludge digestion to that of the avoidance of smell.

Where the top-water level in the tanks is much above that of the ground, a deep circular tank will often be the most economical.

My own experience inclines me to the belief that in ordinary cases the best results may be obtained by carrying on the preliminary treatment in successive stages, corresponding to the different conditions in which the solid matter exists in the sewage. The works would then comprise:—

(1) Detritus chambers, for the interception of actual grit.

(2) Chambers for the reception of large and heavy sewage solids.

(3) Septic or sedimentation tanks.

(4) Means for the interception of colloidal matter, and the fine suspended matter which comes away from the tanks.

In small works, unless the sewage has to be pumped, or contains an exceptional amount of large or intractable solids, screening is of doubtful utility, and the chokage of the screens may easily give rise to serious trouble.

(1) Of the detritus chambers it is only necessary to say that they should be shallow, and that the minimum capacity recommended by the Royal Commission—viz., one-fiftieth part of the day's dry-weather flow—is more than ample in ordinary cases.

(2) For the interception of the larger sewage solids I prefer to use two superposed chambers, the upper one having a sloping floor, with an opening at the far end through which the deposited solids are drawn into the lower chamber by a circulation induced by the flow of sewage.

(3) The choice between sedimentation tanks and septic tanks will depend mainly upon the condition in which the sewage reaches the works, the facility for disposing of sludge, and the extent to which it is necessary to guard against smell. At the same time it should be borne in mind that, if the effluent is not unduly expected or sprinkled about, septic tanks may generally be operated without nuisance.

I cannot help thinking that the very general adoption of rectangular tanks is due rather to habit and the engineer's innate love of a right-angle than to any more substantial reason. In tanks in which the sewage is brought to complete rest the question of form is of minor importance, but where the sewage is allowed to pass through the tank continuously, with the object of depositing its solids, it is hard to justify the abrupt transition from the restricted area of the inlet pipe or pipes to the full cross-sectional area of the tank. Such an arrangement is bound to result in eddy currents which tend to destroy the velocity of the sewage for some distance from the inlet.

The detritus chambers in these circular tanks are fitted with scrapers to clear the sludge to the centre and discharge it through the outlet pipe, and where economy of space is of importance and where the sludge is to be dealt with frequently, the cost of such scrapers is not a serious matter.

There is no advantage, however, in allowing the tanks to occupy the whole area of a circle, and the same result may be obtained by making them wedge-shaped on plan, with an inlet at the pointed end and a weir outlet at the wide end.

(4) There are many works, in other respects well designed, in which no opportunity whatever is afforded for the settlement of the suspended matter in the tank effluent; in fact, had it been desired to send a maximum amount of suspended matter on to the filters, the works could not have been better arranged for the purpose. The natural result is to sludge up the filter, and the unfortunate tank has to bear the blame.

I have always made a point of putting in one or more small chambers for the deposition of the suspended matter which comes away from a tank with the effluent, and latterly I have provided also for arresting as much as possible of the colloidal matter. This two-fold purpose is served by what, for want of a better name, I have called a "cellular upward filter," consisting of a chamber, usually from 6 ft. to 8 ft. deep, fitted with octagonal pipes of ordinary brick earth, 2 in. in internal diameter, set on end. The tank effluent flows in an upward direction through these pipes, at a velocity so slow that the liquid is practically at rest. This gives the best facilities for the deposition of suspended particles, while the ample surface presented by the pipes, generally from ½ to 1 square foot per gallon of daily dry-weather flow, forms a base for the attachment of the colloidal matter which would otherwise settle out in the filter proper. The pipes can readily be flushed out, or rodded from the top. Where a dosing chamber is required, the upper part of the cellular filter can be used for the purpose, for which it has the advantage that any suspended matter which may be deposited from the effluent drops at once down the pipes out of the way. A number of these upward filters are now in course of construction, and the one which is already in use appears to serve its purpose. Where the liquid part of the sewage does not require septic treatment the combination of a small tank or tanks with one or more upward filters, or their equivalent, appears to offer advantages.

One frequently notices a tendency to restrict the number of tank units to the minimum recommended by the Royal Commission. In small installations the limitation of the number of units may perhaps be justified on the score of expense, but in larger works the cost of a few extra dividing walls and inlet and outlet valves is not a serious matter, and is far outweighed by the convenience of being able to cut out a small fraction of the tank capacity, instead of having to lose one-half of it, as must be done when only two tanks are provided.

It is impossible in so short a time to attempt to deal adequately with so large a subject. There are many interesting points in connection with tanks on which I have been unable to touch. In particular I have said nothing about the chemical treatment of sewage. This omission, however, is the less important seeing that Dr. Fowler, in his Washington paper already referred to, has indicated the conditions under which precipitation may be usefully employed.

Having dwelt so long on tanks, I can only deal briefly with the "other matters" referred to in the title of my paper as announced. On these I have only one observation to make—and I am sure it will fill you with the liveliest satisfaction—it is that I will defer what I have to say to some future occasion.

DISCUSSION OF MR. MARTIN'S PAPER.

Dr. Bostock Hill, county medical officer of health, Warwickshire, president, occupied the chair at the annual meeting of the Association of Managers of Sewage Disposal Works at which the foregoing paper was presented. The discussion on the contribution was opened by

Mr. T. Hennie Hampson, who said he agreed with practically everything which the author had said with regard to the use of tanks. At one time the treatment of sewage by septic tanks was considered to be very offensive. At the present time, however, there was a good deal to be said for treatment by septic action, because the sludge could be removed without nuisance and disposed of quite easily and cheaply.

Mr. J. Fairhouse (Walthamstow) stated that, from his observations of the working of septic tanks, the shape of the tanks was of considerable importance.

Mr. W. H. Makepeace (Stoke-on-Trent) said his experience was that the rectangular tank provided

with proper inlets and outlets, served its purpose better than any other form, chiefly for the reason that if the inlet of the tank were spread over the whole width of it, and the volume from the tank was withdrawn in a similar way, the velocity was easily controlled. With square tanks he had found that they got a very bad settlement of the sewage, entirely due to the arrangement of the inlet and outlet. The conical shape circular tank gave better results than the flat bottom circular tank, and he attributed that to the extra depth and the velocity with which the sewage was discharged. He was confident that some improvement was both necessary and possible of attainment, and his own impression was that improvement would come on the lines of the Emscher tank, to which allusion had been made in the paper.

Dr. GEORGE REID said he was unable to agree with the suggestion of Dr. Fowler—quoted in the paper—that it was desirable to have a septic action in dissolving organic matters prior to final treatment. It was possible to deal with an absolutely fresh sewage if the suspended solids were taken out of it, and by filtering to get nitrification as quickly as if the dissolved solids had been in a tank and undergone a certain amount of septic action.

Mr. W. H. DUCKWORTH (Salford) said he had always had a fear of anything in the way of upward filtration, and he would be glad if Mr. Martin could give any figures showing any reduction in suspended matter between his tank effluent and his filter effluent. They had at Salford some 2,000 yds. of roughing filters between the tank effluent and the ordinary aërating filters, and they obtained a tank effluent with 2·5 more of suspended matter per gallon after everything had gone through the filters. They found a total reduction in the solids, but the suspended matters were more.

Mr. C. TERRY (Canterbury) submitted that the value of septic tanks had been entirely disproved, and the proof of that lay in their total failure. Sewage should be dealt with without delay.

The PRESIDENT said he had long come to the opinion that the tendency of the majority of sewage works was to over-septicise. He strongly believed that, while under certain conditions septic action was valuable, one thing they wanted to do before they put sewage on their filters was to remove the suspended matters.

Mr. MARTIN, in the course of a brief reply, observed that if, after twenty years of biological treatment, they had not arrived at more definite views on such a matter, it showed that there was something wrong in their way of handling the question. One of the other matters which he should like to have dealt with was the need for definite scientific research work in regard to the treatment of sewage, his view being that they were spending far too much money in the absence of definite scientific fact.

STONEWARE PIPES WANTED.

AN IMPORTANT CONTRACT.

Mr. J. W. Madeley, M.A., M.INST.C.E., M.AM.SOC.C.E., special engineer to the Corporation of Madras, as will be seen in our advertisement columns, inviting tenders for the supply of about £50,000 worth of English stoneware pipes and specials, the second instalment required for the Madras main drainage scheme. Tenders must be delivered to the agents of the corporation, Messrs. James Mansergh & Sons, 5 Victoria-street, London, S.W., on or before noon of Wednesday, January 22, 1913. The total estimated cost of the drainage scheme is, it may be noted, about £800,000.

The Use of Waterways.—Mr. Neville Chamberlain presided at a meeting recently at Birmingham of the Waterways Association. Representatives were present from Hull, Nottingham, Derby, Stoke, Wolverhampton and Gloucester. The Secretary, Mr. Frank Impey, reported that he had not received any definite reply from the President of the Board of Trade since the deputation waited upon him in July, and a subcommittee was appointed to confer with various members of Parliament with the view of forming a non-political party in the House of Commons pledged to bring pressure on the Government to give effect by legislation to the recommendations of the Royal Commission.

WIMBLEDON COMMON EXTENSION.

PROPOSED LOAN OF £10,000.

A Local Government Board inquiry was held at Wimbledon on Tuesday by Mr. Edgar Dudley, F.S.I., one of the board's inspectors, with regard to an application for sanction to a loan of £10,000 for the extension of Wimbledon Common.

The great beauty of the common, which already has an area of over 1,000 acres, lies in the fact that, owing to the large expanse of woodland scenery comprised by Coombe Woods and Richmond Park, houses, over a considerable part of the area, form no part of the general view. Ground on the west of Beverley Brook, extending over some 2 miles, came into the market on the death of the Duke of Cambridge, and it occurred to Mr. Richardson Evans, the promoter of the scheme, and Dr. Longstaff, a member of the London County Council, who has been most active in securing additions to existing open spaces of the Metropolis, that the valley of the Beverley Brook should be secured so as to prevent it being built over and the view from the common destroyed. These gentlemen, with the aid of the John Evelyn Club, Wimbledon, having secured options for the purchase of the ground, set to work to collect funds for the object named, and they have been so far successful that 13 acres fronting the Portsmouth-road, opposite the entrance to Richmond Park, and having a length of ¾ mile along the Beverley Brook, have been secured, together with the remainder of the west bank of the brook to Coombe-lane, a total distance of 2 miles. The latter piece of ground has been vested in the Coombes and Malden Urban District Council, who subscribed £3,500.

The loan of £10,000 is required for the specific object of purchasing a section comprising 33 acres, the promoters being under promise that if this is acquired by Wimbledon they will purchase a further section of 39 acres. The promoters are confident that if the £10,000 asked is subscribed by Wimbledon, they will be able to obtain, principally from other local authorities, sufficient funds to secure a third section, having an area of 69 acres—*i.e.*, a total area to be added to the open spaces of Wimbledon Common of 154 acres, at a cost of £52,770, or, roughly, £340 an acre—which is considered very moderate, in view of the price that has been paid for land in the immediate neighbourhood.

The scheme was opposed by several members of the Wimbledon Council, but there were few opponents from the outside public. The great point of the opposition was that Wimbledon has, in addition to 600 acres of common within the borough, an area of 57½ acres of recreation grounds. The fact that Wimbledon has not lost by having these open spaces is shown by the financial state of the borough—during the past four years the general district rate having been maintained at an average of 3s. 4½d. in the £. The policy adopted, especially in Germany, of the acquisition by municipal authorities of large areas of open ground surrounding their towns is no doubt a sound one, and Wimbledon may fairly claim to have adopted such a policy.

It may be stated that the main arterial road, 100 ft. in width, suggested by the Traffic Board of the Board of Trade, will pass the entire length of the extension of Wimbledon Common.

Bridging the Mersey.—Before the Liverpool Engineering Society, on Wednesday, Mr. L. H. Chase, M.INST.C.E., read a paper on the subject of a bridge over the river Mersey, in the course of which he made several unusual proposals. The principle underlying the treatment of the approaches was distinctly novel. Instead of making these extend over a distance of 1 mile from each side of the river, Mr. Chase proposed a spiral roadway up which motors and trams would run by their own power to the level of the bridge, some 200 ft. above the high-water level of the river Mersey, and thus clear of such vessels as the "Mauretania." The spiral roadway was to be built in reinforced concrete, and would look not unlike the Roman Colosseum. The bridge would be of the suspension type, and its span of 2,700 ft. would make it easily the largest span in the world. The main towers would be placed near the Prince's Landing Stage on the Cheshire side, and would be 500 ft. high. The total cost, exclusive of land and legal expenses, was estimated at about £825,000. Mr. Chase (says the *Times*) also mentioned a new design for dealing with passenger traffic only on a similar bridge.

A Motor Vacuum Street Sweeper.

DEMONSTRATIONS AT SOUTHPORT.

The attention of municipal and other local governing authorities was, during Wednesday, Thursday and Friday of last week, directed to Southport, in which town were given the first public demonstrations in the United Kingdom of a machine which, it is claimed, will revolutionise the scavenging of streets and roads. The invention is the "Patent Motor Vacuum Road-cleaning Machine" (sweeper and gatherer), of which Messrs. J. & P. Hill, Ordnance Works, Sheffield, whose London office is Caxton House, Westminster, S.W., hold the exclusive patent rights. Representatives from some seventy authorities visited Southport to test the claims of the newcomer, among the municipalities which sent representatives being London, Manchester, Glasgow, Bristol, Derby, Oldham, Bolton and Blackburn.

From interviews with and speeches made by the engineers and representatives of sanitary authorities attending the working trials, there seemed to be a consensus of opinion that the machine had justified the claims made, and that a new era for street cleansing had been inaugurated. It is well known that one of the chief complaints of sanitary authorities has been directed to our past methods of sweeping streets as tending to the spread of disease through the dissominating of the germ-laden dust; the new vacuum cleaner allows no particle of dirt or dust to escape into the air. During the three days of the trials the streets and roads over which it worked were damp, and the "no escape of dust" claim could not be conclusively tested, but one could readily believe from the way it swept up fine sand and automatically deposited it in the bins attached to the machine that it would satisfactorily answer all tests in the driest of weather.

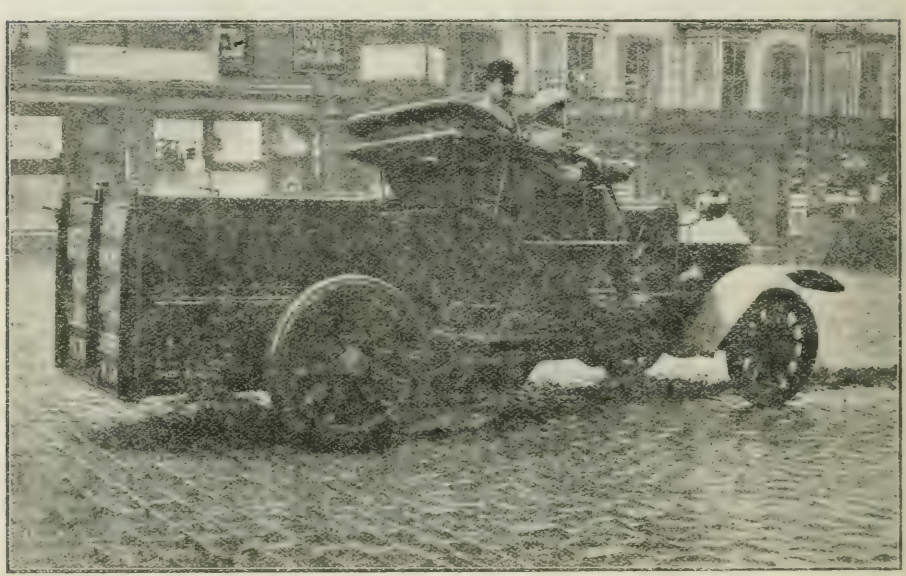
The first run was made over a wood-pavement road strewn with cinders and small stones. The machine picked up everything, including the small particles of slush, leaving a track thoroughly clean. Next a run was made over a road laid with sand, gravel, clay and stones, the latter as large as half-bricks, and all this was gathered up by the machine when travelling at a rate of about 5 miles an hour, and deposited in the steel bins, a speed of about 8 miles an hour being occasionally attained.

A run was also made over setts, where the results were equally satisfactory, the vacuum cleaner sweeping up the dirt, and even confetti, which lay adhesively in the crevices of the damp road.

On Friday a special test was made over a water-bound macadam road and over asphalt. Here also the working was considered eminently successful, sticky and greasy mud being swept up with almost amazing completeness.

The adoption of this sweeper would appear to render possible the solution of one of the most difficult problems which has so long confronted road authorities in large towns, for it would seem that the desired end can be achieved by the machine, no matter how crowded the streets are with vehicular traffic.

This new motor vacuum sweeper consists of the following three main components: (1) A complete 20-30 h.p. four-cylinder motor chassis; (2) a cylindrical sweeping roller and shell fitted to the chassis; and (3) a large receiver, fitted behind the sweeping cylinder, for collecting the sweepings.



From Photo by W. Rose, Ainsdale.

Messrs. J. & P. Hill's Patent Motor Vacuum Road Cleansing Machine.

(This view shows the machine at the Southport trials sweeping up very heavy materials laid on the road specially to test its power of lifting.)

The sweeping mechanism consists of a cylindrical brush, composed of a series of small brushes, which revolve in an airtight sheet-iron shell in the opposite direction from the wheels of the car. Running at a speed of 120 revolutions per minute, it raises the sweepings two-thirds of a revolution and passes them through a specially contrived opening into the receiver behind. This receiver contains two or three separate boxes, which can be easily and quickly emptied into a dustproof vehicle trailing behind.

The circumferential speed of the great brush is 4,950 ft. per minute, sufficient to throw the refuse into the receiver and compress it well. The speed at which the brush rotates creates sufficient draught to collect by suction all dust and to deposit it in the receiver. It may be mentioned that the machine, at each run sweeps a track of 5 ft., and, by means of a side-attached spiral brush, the refuse can be thrown from the channels in front of the great brush, and sucked up in the same way. Similarly, the mechanism can be applied to a tramcar for sweeping a snow-covered track.

THE COST OF SWEEPING COMPARED.

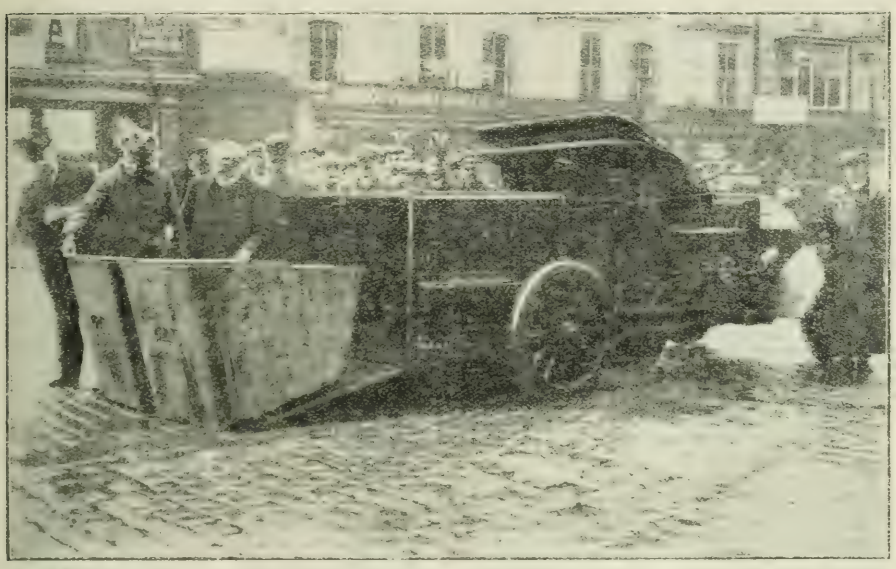
In the course of last week's proceedings it was stated by Alderman Trounson that the average cost of the patent vacuum cleaner per 100,000 sq. ft. was 7s. 8d., and that the average cost of a horse sweeper was 13s. 10d. for 33,000 sq. ft. Thus the increase in the area cleansed was 66 per cent, while the decrease in the cost of cleansing was 30 per cent. A London engineer who was among the company present said the size of the machine seemed to show that the petrol consumption would not be great, and another speaker pointed out that its use would obviate the necessity for Sunday labour by enabling the sweeping of streets to be done quickly on a Saturday night. A Scottish visitor added that he along with others from the North would take back to their corporations a very favourable account of the cleaner, and subsequent speakers eulogised the valuable hygienic properties of the machine, remarking particularly on its labour-saving possibilities.

It may be added that the machine, which is the invention of an Italian engineer, will shortly be seen in London. Messrs. Hill will turn out an "all-British" machine, with developments and improvements to meet the varying circumstances of different towns.

LIGHT AND POWER FROM LIGNITE.

Mr. R. O. Wynne-Roberts, M.Inst.C.E., has sent in to the Government his report on the question of developing at the lignite coal mines power for distribution in the Canadian province of Saskatchewan. The report will have a special interest and value, as it is the first publication in the English language on the subject of utilising lignite in the direction under consideration, and it has entailed many weeks of labour in collecting data from all parts of the world. We understand it covers over 223 pages.

We notice from the *Regina Evening Leader* of November 26th that a proposal has been submitted to the civic authorities by Mr. G. D. Casson, secretary-treasurer of the Estevan Board of Trade, for the purchase of a lignite coal mine in the vicinity of Estevan. He maintains that by the manufacture of lignite briquettes and the production of gas within the city twelve-thirteenths of the heating power of anthracite could be secured at about one-third the cost, and that the sale and use of the by-products would nearly cover the cost of manufacture, thus enabling the city to supply fuel and power at a very cheap rate. He states that 1 ton of lignite would produce 12,000 cub. ft. of gas and one-third of a ton of lignite briquettes. The resultant by-product would be about 15 lb. of sulphate ammonium, and the same quantity of first-class pitch. The latter, with the addition of wheat screenings or other material, could be used as a binder in the making of the briquettes.



Press Photo. W. Rees, Ammanford.

Motor Vacuum Road Cleansing Machine, showing Bins Withdrawn.

Subway under St. Paul's.—The Highways Committee of the London County Council do not see their way to withdraw the tramway scheme involving a subway under St. Paul's Churchyard, but a conference is to be held between the Parliamentary and Highways Committees and the Dean and Chapter of St. Paul's. The Highways Committee state that they are advised that there is no ground for any fears of risk to the fabric of the cathedral.

Cesspool Emptying Plant.—The Poole Rural District Council has just purchased a new machine for the emptying of the cesspools in the parishes under its control. It is worked on the vacuum principle, and comprises a cylindrical tank to hold 350 gallons, mounted on a four-wheeled carriage for horse draught, which also carries an air pump. The air in the cylinder being exhausted by means of the air pump, the contents of the cesspool are forced through suction hose into the tank by atmospheric pressure, with an entire absence of nuisance. It is claimed that this improved plant, which has been made by Messrs. Merryweather & Sons, of London, enables cesspools to be emptied in a perfectly satisfactory manner, and a great consideration also is the economy of working, which is calculated to save 50 to 75 per cent. as compared with old methods.

Road Making in Egypt. Lord Kitchener some time ago ordered a road to be made between Cairo and Alexandria, and now it is announced that he is studying a plan for covering Egypt with a complete series of main roads. These will be undertaken by the Government itself, while the auxiliary ones will be laid by the Provincial Councils.

Explosion at York.—Corporation workmen were engaged in repairing the roadway at the approach to Layerthorpe Bridge, York, on Thursday of last week, when one of the men struck with his pickaxe an electric power cable. There was an immediate explosion, which scattered the party right and left, but fortunately caused no injury to the men. One result of the occurrence, however, was that the machinery at Messrs. Adams-Hydraulics, Limited, whose works are in the immediate vicinity, was brought to a stand-still until the necessary repairs were effected.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

292. Foundations.—Sheet piling is required round the foundations of a warehouse to hold in the soil, which is of a loose, sandy nature. Give neat sketches showing how this would be carried out. (T. R.)

293. Road Making.—State the advantages claimed for the parabolic camber over the circular camber in road construction, and give a sketch with figured dimensions of a camber which produces the best results. (A. S. C., *Hove.*)

294. Traction.—Compare the tractive force required for heavy vehicles over roads of various surfaces and grades, and show how this affects the cost of transport. (H. V. O., *West Bromwich.*)

295. Air Compressors and Ejectors.—Of what horse-power will an electric motor require to be to work an air compressing plant and ejectors to raise 100,000 gallons of sewage a height of 15 ft. in six hours? Show stages of calculations, and state the probable mechanical efficiency of air compressors and ejectors. (D. G. B., *Darlington.*)

296. Tides. Please explain clearly what is meant by "H.W. of ordinary spring tides" and "L.W. of ordinary spring tides." Also state how the height of ordinary spring tides is arrived at, and over what period the observations or calculations are made. In what respect does an ordinary spring tide differ from an equinoctial spring tide? (Perplexed.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

290. Design of Struts.—Explain why the resistance of a long strut depends more on the stiffness of the material than on its strength. ("Designer.")

If a load P be applied at the end of a strut, the area at the mid point of which is a square inches. As long as the load remains axial, and the strut does not bend, the stress at the mid point will be $\frac{P}{a}$ lb. per square inch, so that the resistance of the strut will be proportional to the compressive strength of the material of which it is constructed.

But if for any reason the strut bends a little, so that the load acts x inches out of centre as regards the mid point, the section at the mid point will be subjected to a bending moment P.x, as well as a thrust P. The same condition could be obtained by means of a horizontal force at the mid point, so that in this case the strut will also be acting as a beam.

As is well known, the resistance of a beam depends not so much on the area of its cross section as on the arrangement of the section so as to give stiffness.

For instance, a solid circular beam is not so economical as an I beam of the same sectional area, because in the latter case the metal is arranged so as to give stiffness rather than purely tensile or compressive strength. Now, the longer the strut the more likely is it to become bent, either from unequal loading or lateral strains, so that it is therefore very important to arrange for stiffness, as well as to keep the compressive stress within proper limits.

As a matter of fact, in a long strut it will be found that if the value of the compressive stress is calculated it is very low indeed, as all the formulas in common use give a very high factor of safety, so as to prevent bending. (H. M. W., *Worcester.*)

In the theory of struts the majority of formulæ obtained do not hold true under natural conditions. An example is Euler's theorem, $W = \frac{\pi^2 EI}{L^2}$

Where E=elasticity. I=moment of inertia.
L=length of strut.

In this formula the load is presumed to be axial, and the base supposed to rest on knife edges. But in practice it is found that the load can never be completely axial, and consequently a great reduction in strength occurs due to bending; and as in all substances used as struts the resistance to compression is considerably greater than that due to bending, the stiffness of the material is more important than its strength.

It follows that the longer the strut the greater the stress due to bending, although the stress due to direct compression remains the same. Gordon's formula is the best for designing struts, being based upon both theory and practice:—

$$W = \frac{f A}{1 + n\frac{l^2}{d^2}}$$

Where W = safe load.
f = safe stress in material.
A = area of cross-section
a = constant (shown in table below)
l = length.
d = least dimension.
n = a constant (shown below).

Material.	f tons per square inch.	a.
Timber	$\frac{1}{2}$	$\frac{1}{750}$
Wrought iron L.T.I.	4	$\frac{1}{3600}$
Cast iron, circular solid... ...	8	$\frac{1}{1600}$
Cast iron, circular hollow ...	8	$\frac{1}{2400}$
Steel	$6\frac{1}{2}$	$\frac{1}{12000}$

When both ends of strut are fixed in position and direction $n=1$.

When one end only is fixed in direction and the other in position only $n=2$.

When both ends are only fixed in position $n=4$. (J. S., *Middlesex.*)

291. Hydrostatics.—Calculate the total and resultant pressures on the interior curved surface of a hemispherical bowl of radius r placed with its diametral plane horizontal and just filled with water. (W. H. B., *Bocking.*)

If the internal surface of the bowl be considered divided into a large number of very small areas, each small area will have a force acting perpendicularly upon it proportional to its depth below the surface. The sum of all these forces, irrespective of their effect upon one another, is the total pressure on the surface of the bowl.

Still considering the small areas, each force can be resolved into vertical and horizontal components, and, from the symmetry of the solid, each horizontal force will be balanced by the horizontal component on an area similarly situated on the opposite side of the bowl. This leaves as the resultant pressure the sum of all the vertical components.

Let r = radius of bowl.
w = weight of contents per unit volume.
p = intensity of pressure per unit area at a depth h.
a = any small area at a depth h.
A = total curved area of bowl.

$p = wh$, and

pressure acting on area $a = pa = wh.a$, and

total pressure on A is W.A × the average depth of the surface A from the top.

The superficial area of a hemisphere = $2\pi r^2$, and this is the same as that of the curved surface of a circumscribing cylinder. Also, a horizontal projection of any zone of the hemisphere has an equal superficies on the cylinder, so that the average dis-

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
Advances in the Science of Water Purification	861
Appointments Vacant	882
Assistants' and Students' Section	868
Association of Managers of Sewage Disposal Works Annual Dinner	880
Bituminous Materials	869
Building Line Dispute	855
Chlorine Method of Water Sterilisation	851
Ex-Pupils and Assistants' Advertisements	875
Intercepting Traps in House Drains	870
Institute of Sanitary Engineers: Election of Council	870
Institution of Municipal and County Engineers:—	
Council Meeting	875
Metropolitan District Meeting	876
North-Eastern Committee Meeting at York	876
Notices	882
Institution of Municipal Engineers:—	
Joint Western and South-Western District Meeting	877
Southern District Meeting	878
Institution of Water Engineers:—	
Winter General Meeting in London	859
Local Government Board Inquiries	872
Motor Vacuum Street Sweeper	866
Municipal Competitions Open	882
Municipal Contracts Open	882
Municipal Work at Tiverton	879
Municipal Work in Progress and Projected	873
Mutual Defence Fund	877
New Central Fire Station at Barrow-in-Furness	856
Personal	875
Pitting of Steel Pipes	871, 871
Recent Publications	881
Scottish Roads	879
Society of Engineers: Annual General Meeting	862
Some Recent Examples of the Pollution of Public Water Supplies	859
Superannuation and Security of Tenure	877
Tanks and other Matters	853, 863
Tenders for Municipal Works or Supplies	881
To our Readers	853
Training of Engineers	855
Working Class Housing	878
Works Projected for Pitlochry	856

force of the hemispherical surface from the top is the same as that of the cylinder—*i.e.*, $\frac{1}{2}r$.

$$\therefore \text{Total pressure} = w.2\pi r^2 \times \tfrac{1}{2}r$$
$$= \pi r^3 w.$$

The resultant pressure, due to the vertical components of the elements of the total pressure, is that due to a head equal to the average depth of the bowl on the horizontally projected area—*i.e.*,

$$w \cdot \tfrac{1}{2}r \cdot \pi r^2 = \tfrac{1}{2}\pi r^3 w.$$

The average depth of the bowl is not the same thing as the average distance from the top of the curved surface of the bowl.

The one is the volume divided by the base, or projected area—*i.e.*,

$$\frac{\frac{2}{3}\pi r^3}{\pi r^2} = \frac{2}{3}r,$$

while the other may be obtained as before, and is $\frac{1}{2}r$.

Without the above reasoning, the resultant pressure is obviously the weight of the contained fluid—

$$i.e., \ \pi r^3 w.$$

A mathematical treatment applicable to a general case is as follows:

Consider a narrow horizontal ring of the curved surface, of vertical width dh, at a depth h and radius r.

Slant side of ring $= \frac{r}{r_1}.dh.$

Circumference do. $= 2\pi r_1.$

$\therefore$ area do. $= 2\pi r_1 \cdot \frac{r}{r_1}.dh = 2\pi r.dh$

and total pressure do. $= w.h.2\pi r.dh.$

$\therefore$ total pressure on curved surface $= \int_{h=0}^{h=r} 2\pi w.h.r.h.dh$

$$= \pi r^3 w.$$

Similarly, the total vertical pressure on the elementary ring

$$= w.h.2\pi r.dh \times \frac{h}{r}$$
$$= 2\pi w.h^2.dh.$$

$\therefore$ resultant pressure on curved surface

$$= \int_{h=0}^{h=r} 2\pi w.h^2.dh$$
$$= \tfrac{2}{3}\pi r^3 w.$$

(H. E. L., *Islington.*)

CORRESPONDENCE.

'Be calm in arguing; for fierceness makes
Error a fault and truth discourteous.'
— GEO. HERBERT, "*The Temple.*"

BITUMINOUS MATERIALS.

To the Editor of THE SURVEYOR.

SIR, I have been greatly interested in the correspondence on the above subject appearing in your valued paper, and write to suggest that the misunderstanding which exists as to the correct meaning of the terms now applied to bituminous materials in road engineering would be easily cleared up by a close consideration of their original meaning and derivation. As an illustration of my argument, and for the sake of brevity, I will confine myself to the following questions which have arisen in the correspondence: (1) What is bitumen? (2) What is asphalt? (3) What is asphaltum?

(1) Bitumen is the chemical term which covers the hydro-carbon group or compounds of hydrogen and carbon. The word "bitumen" is derived from the Latin "tumesco," which means literally to swell up, and doubtless this has reference either to its occurrence in Nature or to its behaviour when heated. "Bitumen" in its many forms occurs all over the world, varying from a gaseous condition to solid structure. As found in Nature, bitumen is frequently combined with impurities, and just as iron, silver and other ore deposits are described as iron or silver, so bitumen is referred to without regard to its strict chemical purity. Only a certain series of the hydro-carbons enters into the questions of bitumen as applied to road engineering, and these are found both in Nature and in the artificial product obtained from the destructive distillation of coal, &c. Mr. Nathan's interpretation of the word "pure" as applied to natural asphalt or bitumen is altogether too loose, for his expression "unadulterated hydro-carbon," if meaning anything, would imply actual chemical purity, whereas it is agreed that bitumen seldom occurs in total chemical purity, and asphalt never. Purity in this connection should be taken to mean freedom from any admixture or adulterant beyond such as is strictly necessary to adapt the material to its particular process. For the engineer is concerned not so much in the natural occurrence of the material as the quality in which he obtains it for usage. For example, pure Trinidad bitumen does not imply chemical purity ("unadulterated hydro-carbon"), but freedom from adulteration.

Here it is necessary to explain that bitumen and asphalt are quite distinct substances. If the derivation of the latter word be followed up this difference will be apparent. Asphalt is derived from the Greek word $\sigma\phi\alpha\lambda\lambda\omega$, which means to break, &c. The prefix α in Greek is represented by the English "un," and so asphalt comes to mean "difficult to break," "unbreakable," and so "any hard substance." Asphalt is mentioned by the Latin writer Pliny as being used in the construction of the walls of Babylon, and was undoubtedly a mixture of materials (aggregate) with the bitumen which was in those days, and still is, found on the shores of the Dead Sea. I regard it, therefore, as due to the fact that bitumen was the only cementitious substance available for concrete purposes in those days that it has since come to be associated always with asphalt as now used in roadway work, &c.

Coming to later times, the word asphalte is used on the Continent to mean the hard, naturally impregnated limestones which were found when pulverised and heated to have the wonderfully durable properties as a material for roadways which we now see in the best class of this work in the City of London. So I come to this point, that asphalt means nothing more than a hard substance, of which bitumen, by early and subsequent usage, is the matrix or binding agent. In a word, there is no strictly literal connection between the two substances.

Still later we find asphalt used to describe the material obtained from artificially combining bitumen with an aggregate of sand, granite, &c., for street paving, roof and other applications. This use of the word appears to me a logical and fair one in view of my interpretation of the word "asphalt." It would, however, not be correct to class this latter group as natural asphalt.

In my opinion Mr. Hutchinson is right in saying that the only natural asphalt is that known as Seyssel, Val de Travers, &c., because this substance can be used for asphalt purposes as found in Nature. On the other hand, Trinidad asphalt means the asphalt

formed by the artificial admixture of sand, &c., with Trinidad bitumen, which is used for roadways, as in the case, for example, of the Victoria Embankment. And so, in answer to the three questions I began with, I would suggest a satisfactory grouping of bituminous materials as used for road purposes as under:

(1) Bitumen (solid or liquid).
  (a) Natural, as found in Nature. Trinidad, Bermudez, &c.
  (b) Artificial, as obtained from ordinary distillation or destructive distillation. Texas, Mexican, coal-tar, pitch, &c.
(2) Asphalt (solid always).
  (a) Natural. Rock asphalt.
  (b) Artificial. All compositions solid when set formed from artificial mixtures of aggregate with any form of bitumen, as in above examples.
(3) Asphaltum.

This, to my mind, is capable of the simplest explanation. While it is true that the use of this word has come to imply some special form of either of the two foregoing substances, bitumen and asphalt, it is in fact nothing more or less than the Latin of asphalt, and so, whether you spell it as in English "asphalt," or the French "asphalte," or Latin "asphaltuum," it is just the same in meaning—*i.e.*, a hard substance. If in reality there were a difference between "asphalt" and "asphaltum," we should have to find a difference in the meaning of residue and residuum, which is obviously impossible.

It is impossible to cover the ground of this discussion adequately in a letter, but I trust I have made myself clear on some of the points of this very important matter. Briefly, what I urge is this: Consider closely the derivation of these words, and the solution of their meaning is simple. "Asphalt" is, in fact, the concrete of bitumen, however you may spell the former word, and all asphalts and all bitumens are either natural or artificial. A distinction is easily drawn, and this should be done without delay in the interests of road engineering. In my opinion, great importance attaches to this question of nomenclature, as it is to the artificial asphalt made with a natural bitumen that engineers must look for a cheap and effective solution of the road problem.—Yours, &c.,

"Original."

December 17, 1912.

To the Editor of The Surveyor.

Sir,—Although the pamphlet I propose to issue may not, in Mr. Nathan's opinion, carry the same weight as one issued by or under the auspices of the Road Board, it will at least place at the service of surveyors and engineers the views of my copartners in the Dussek Bitumen Company, who have been connected with the manufacture of bitumen for nearly thirty years. I notice that Mr. Nathan, in reply to Mr. Bastian, enquires—(1) Where "pure" natural asphalt is found, (2) what difference there is between asphalt without an "e" and asphalte with an "e," (3) why asphaltum should be described as "the residuum obtained from the distillation of asphaltic or semi-asphaltic base petroleums"—does not give the explanations asked for. Mr. Nathan says that by "pure" asphalt he "meant the unadulterated natural article." The word "pure" is at present being applied to petroleum residuums; "pure" meaning here a material containing a high percentage of bituminous matter and practically no mineral matter. Seeing that natural bitumen contains more or less mineral matter, and is not "pure" in the same sense of the word, it is very misleading to describe both artificial and natural substances as "pure" when the word is used to express two different meanings. Neither will a claim to official "pedigree" on to make statements that are "meant to imply."

Mr. Nathan a little further on in his letter says gilsonite "is one of the purest forms of solid native bitumen" and as gilsonite certainly is a pure—meaning free from mineral matter—natural material, your correspondent is therefore using the word "pure" in two quite different ways. I am also opposed to Mr. Nathan's other definitions of asphaltum and asphalt with and without the "e," and his suggestions, in my opinion only help to make the matter more complicated. What if an engineer ordered asphalte with an "e" when he wanted asphalt without an "e"? I quite agree with Mr. Bastian that there is some mistake in the definitions and views that have been expressed. Asphaltum is, of course, pure hard bitumen—such as gilsonite and similar substances—and not an artificial product, as Mr. Nathan declares it to be.

This is the one point I think upon which Mr. Nathan joined issue with Mr. Hutchinson. Mr. Hutchinson stated that the words asphalt and asphaltum "were used in America to denote the solid form of natural bitumen." Mr. Nathan, in reply to this, said that asphaltum "was recognised throughout the world as the residuum obtained from distillation of asphaltic or semi-asphaltic base petroleums." I, like Mr. Bastian, am also "more than surprised" at this statement.—Yours, &c.,

A. E. H. Dussek.

Canal Bank,
Deptford,
London, S.E.
December 17, 1912

THE INSTITUTE OF SANITARY ENGINEERS: ELECTION OF COUNCIL.

To the Editor of The Surveyor.

Sir,—As one who has for many years given of his best to this council, and to the interests of the institute generally, may I have the privilege of your columns to offer a few observations on the letter from "Fellow" appearing in your current issue?

First of all, "Fellow" is to be congratulated on his astuteness in timing his communication so that no reply to it could appear in your columns previous to the election to which he refers taking place. (Ballot lists are returnable by Thursday morning next, 19th inst.) That changes in the council are needed is a *sine quâ non* which members of the council, and especially old members, are not likely to dispute; but whether they are necessary for the reasons suggested by your correspondent is a matter of opinion. Some of us would welcome a change which would relieve us of the constant strain upon our time and resources which the apathy of the members generally has cast upon us. It was with the view of arousing the interest of the members and of getting good men to serve on the council that the system of election by postal ballot was introduced by the council, after some opposition, two years ago. There is no difficulty in getting men to become members of council of any society, as the position gives a certain status. To get men who will attend council and committees is quite another matter. If your correspondent's letter leads to the introduction of men of the latter class on the council I am sure they will be heartily welcomed. The "honoured posts" which it is necessary, in the best interests of the institute, to fill are the working positions. I am not quite sure that a reference to the membership lists of other institutions will assist in detecting the best and most qualified men in this respect.

Then "Fellow" appears to wish that the control of the institute should pass into the hands of municipal engineers. Are we then to have "another Richmond in the field"? It is extremely doubtful if the two already existing institutions would welcome such an addition, and, what is more important, there appears to be no need for it. Of course, much depends upon what is intended by the term used. The institute is largely composed of men in private practice as "municipal" or "sanitary" engineers, with a goodly number of engineers to public authorities, and other men engaged in sanitary work, and it forms a common ground upon which the man who designs and supervises the work, and he who executes it, can meet together in the interests of public health.

This ground is sufficiently wide, as I endeavoured to indicate in a paper on the "Status of the Modern Sanitary Engineer," read before the members of the institute some time ago, without encroaching upon that already covered; and it is in this direction that the members can, with advantage to themselves and to the community, devote their efforts in order to make the institute "of still greater value."—Yours, &c.,

Geo. W. Chilvers.

Chiswick.
December 17, 1912.

INTERCEPTING TRAPS IN HOUSE DRAINS.

To the Editor of The Surveyor.

Sir,—In the letter of Mr. Richard Read in your issue of the 13th inst. it is to be observed that his adverse criticism of Jennings' closet of the century is based on theoretical opinion, seemingly due to his having been misled by the illustration in the adver-

usement, showing the closet at rest. When flushed a powerful jet of water is admitted to the top of the syphonic leg, which, in combination with the water expelled from the basin by syphonic discharge, scours and maintains the pipe in a perfectly clean condition, as is proven by examination of closets inspected after six years' constant use. Had Mr. Read been fully informed of the working of this closet, I venture to predict his opinion would have been favourable, and he would more likely have advocated a well-tried invention which, after most severe tests, secured the highest award of the Royal Sanitary Institute—a special Silver Medal of merit—as also other distinctions, and has, moreover, obtained a very considerable share of public favour, as is evident by the fact that over 20,000 are in use, and the demand is increasing.

These facts could be amplified, but that I fully recognise such a further trespass would be neither excusable nor permissible.—Yours, &c.,

WALTER JENNINGS.

Lambeth Palace-road,
Westminster Bridge,
London, S.E.
December 16, 1912.

THE PITTING OF STEEL PIPES.

MILL SCALE AS THE CAUSE.

The contention that the failure of steel pipes through pitting is largely due to the nature of the scale formed on the surface of the steel during the course of manufacture is the chief point in the paper read by Messrs. George and Melville C. Whipple, at New York, at the eighth International Congress of Applied Chemistry.

The authors state that for small pipes up to about 3 ft. diameter cast iron is the best and most economical material, while for larger sizes steel, being a stronger material, presents the advantage of a thinner pipe of greater strength, and thus the more costly metal becomes the cheapest. The use of steel pipes is increasing, but is hindered owing to the fear that the steel may corrode and shorten the life of the pipe to such a degree as to render its use uneconomical. Some wrought-iron pipes have lasted well. Steel has been used for a shorter period. The best pipes have generally retained their useful life, but in some cases, owing to exceptionally severe conditions, they have given trouble. These have developed leaks owing to corrosion in spots—that is, to pitting. The pitting does not appear to occur to the same degree in wrought-iron pipes, where the rusting is more uniform. Steel pipes do not fail completely by breakage as do cast-iron pipes, they merely leak through small holes or pits produced by corrosion and failure comes about as a gradual process.

In making experiments in order to ascertain the causes of this corrosion, samples of steel and iron were placed in jars of water and in jars containing various corrosive solutions, but it was found that the immersion tests in tap water and dilute solutions progressed too slowly, while the use of strong solutions failed to produce in the laboratory the conditions of actual practice. Finding these tests unsatisfactory, a new test was made, one in which corrosion was stimulated by a current of electricity—was used. By this electrolytic test corrosion was made to take place in ordinary water, and, though the ordinary conditions of service were not reproduced, it was unnecessary to use an acid solution. This test presented the manner of corrosion as distinguished from the rate of corrosion better than the acid tests inasmuch as the question at issue was one of pitting and not of general corrosion.

The results showed clearly that mill scale had a marked influence on the uniformity of corrosion in the formation of pits. With regard to this electrolytic test, it should be observed that when two plates of iron are immersed in water and connected with a battery in circuit, a current of electricity will pass through the water from one plate (the anode) to the other (the cathode), and iron will be dissolved from the anode—that is to say, corrosion will take place. If the plate forming the anode is uniform in composition, the corrosion will be uniform over its surface. If the anode is not uniform in composition, the corrosion will be greater at some spots than at others because the density of the current will not be uniform over the plate. Thus no corrosion will occur over areas where an insulating material has been spread. The mill scale on the surface of steel differs in chemical composition from the metal beneath it, also its thickness varies, and it exists commonly as a series of flakes; hence it was expected that the current density would vary and that the corrosion of the metal would occur in spots.

Plates of steel ingot iron and wrought iron were thus tested, with the result that the wrought iron rusted in streaks, which covered nearly the entire surface, while the steel and ingot iron rusted in spots, the pitting in the steel being the worst.

A second series of tests were made, but the mill scale was removed in each case by grinding on an emery wheel; these plates corroded uniformly without any sign of pitting.

Further experiments were made bearing in mind the fact that mill scale may exhibit marked differences of potential toward iron due to its varying composition and thickness. According to the electrolytic theory of corrosion a solution of iron is brought about by the action of current set up between different particles of the metal which have different electrical potentials. Uniformity of composition of the metal tends therefore to diminish corrosion; it is believed that pits in steel occur at points where the particles have greater differences of potential than that of the metallic iron and the mill scale. It is thought that these may result from segregation of the impurities during the cooling of the ingot, or may be due to the effect of rolling, cooling or other treatment. In order to study the potential differences between the mill scale and the raw metal beneath, the method was adopted of connecting the raw metal of a sample with its mill scale by means of wires and placing a very sensitive galvanometer on the circuit. It will be understood that one wire was connected to the metal and one wire to the mill scale. It is extremely interesting to note that when both poles were connected with the raw metal no current could be detected, but when one pole touched the raw metal and the other pole touched the scale a noticeable current was set up. On the steel plates the current sometimes differed greatly at points only 1 millimetre apart, and it was found that the current varied with the thickness of the scale generally, but not always. In order to compare the different samples, areas of 1 square centimetre were marked out in squares, and nine spots were tested in each square. The results are tabulated, and show a surprising difference in the intensity of the current at various points.

Microscopical examination of the scales showed in many instances the presence of minute cracks, through which water might enter and come in contact with the metal.

Experiments made with copper steels showed that, while the presence of small amounts of copper in steel may retard corrosion by strong acids, they do not serve to protect the steel against corrosion in weak acid solutions or in ordinary water. The presence of copper does not materially alter the electrical conditions of the scale, and does not therefore protect the metal against pitting.

American ingot iron plates, so far as failure by pitting is concerned, prove to be somewhat better than steel, but the difference was insufficient to justify any great difference in cost.

Wrought iron is much less likely to pit, and only under conditions of severe chemical corrosion sufficient to remove the mill scale and silicates, or under conditions of atmospheric corrosion where the electrolytic form of corrosion does not predominate, would the two metals be equal.

The effect of removing the mill scale is marked. A partial removal tends to increase corrosion, and thus where scale becomes chipped off in handling and in fabrication there is greater opportunity for electrolytic action between the scale and the raw metal. The complete removal of the mill scale appears to prevent pitting absolutely, and in the tests made after the removal of the scale there was not a single instance of pitting. The authors suggest that some method may be found to modify the mill scale during manufacture so as to make it more uniform, or to improve its electrical condition, or to make it more easily removable.

South London Tramways.—Bermondsey Borough Council have had under consideration the system of electric traction to be installed in place of the existing horse tramway from Tower Bridge-road to Rotherhithe New-road, and have decided to insist on the adoption of the conduit.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Cardiff T.C. (December 12th. Mr. R. H. Hooper).—£7,672 for services, transformers, and plant in connection with the electric light undertaking.—Evidence was given by Sir John Courtis (chairman of the Electrical Lighting and Tramways Committee), the town clerk (Mr. J. L. Wheatley), the city treasurer (Mr. J. Allcock), and the electrical engineer (Mr. A. Ellis). There was no opposition, and at the conclusion of the inquiry Mr. Hooper, in company with the electrical engineer, visited the Roath power station and the Hayes.

Desborough U.D.C. (December 5th. Mr. F. O. Stanford).—£3,457 for recreation grounds and sewage disposal works.—Evidence was given by Mr. G. E. Marlow (surveyor), Mr. C. W. Lane (clerk), and Mr. G. Luck, chairman of the Recreation Committee. Dr. Henry Gibbons said that as a medical officer of health he was bound to support the scheme, as an absolute necessity to the town.

Dublin T.C. (December 11th. Mr. P. C. Cowan).—This was an inquiry in support of petitions lodged by the corporation for Provisional Orders confirming improvement schemes under Part I. of the Working Classes Act in respect of the following areas: (1) Trinity Ward, (2) Beresford-street and Church-street, and (3) Ormond Market. Applications were made for loans to carry out these schemes, the amount applied for being respectively £17,940, £34,000 and £34,030. The portion of the scheme dealing with Trinity Ward was taken up.—Mr. Philip White, on behalf of the corporation, said the necessity for the proposed houses appeared from various facts, among which he mentioned that there were 8,000 tenements occupied by four persons and more—up to twelve persons each. Evidence was given in support of the Trinity Ward scheme. It was proposed to erect in this area forty-four cottages and forty-eight flats, at rents varying from 5s. to 3s. 6d. respectively. The inquiry was adjourned till Friday, January 3, 1913, when the scheme affecting the other areas will be considered.

Friern Barnet U.D.C. (November 25th. Mr. Courtenay Clifton).—£2,022 for making up part of Chandos-avenue.—The inspector then went into the specification, plans, sections, estimates and details as to the proposed work with the engineer and surveyor, Mr. E. J. Reynolds. The clerk of the council submitted various letters which had been received from frontagers in Chandos-avenue as to the proposed works, which the inspector considered.

Mid-Lothian C.C. (December 12th. Mr. J. Walker Smith).—This was an inquiry in connection with the application to the Local Government Board for Scotland by the local authority of the Suburban District of Mid-Lothian for authority to prepare a town planning scheme for Corstorphine district.—Mr. A. G. G. Asher, for the local authority, pointed out that the application was for authority to prepare a scheme, not for approval of one. The suggested area on the map shown was not intended to be a final decision of the local authority, but it would be put forward if permission was granted to prepare a scheme. Mr. Norman Macpherson, for the city of Edinburgh, said the city were in favour of a scheme for Corstorphine, and they had hoped that a joint application would be made. He had, however, got an undertaking from Mr. Asher that the county would consult and co-operate with the city regarding the preparation of a scheme, and this met the city's case meantime. Evidence was then led in four objections which had been held competent at this stage. Following upon this the commissioner closed the inquiry, and the interested parties paid a visit to the site of the proposed scheme.

North Bromsgrove U.D.C. (December 10th. Mr. R. G. Hetherington).—£10,018 for works of sewerage and sewage disposal at Rubery and Barnt Green. The clerk to the council stated that negotiations had taken place for several years with the adjoining district (now absorbed by the City Corporation of Birmingham) for the sewage to be conveyed through the Birmingham sewers to the works of the Tame and Rea District Drainage Board. The price asked and conditions were such as to make it financially impossible to make such arrangements, therefore the council had to embark on a scheme of sewage disposal at Rubery within their own district. The council's consulting engineer (Mr. Robert Green, M.INST.C.E.) explained the scheme in detail, which included a pumping installation, and necessitated the putting in force of the Land Clauses Act for the compulsory purchase of land. The total estimated population provided for was 2,000, the quantity of sewage to be dealt with at the rate of 18 to 25 gallons per head, dry-weather flow. Owing to the difficulty experienced in connection with purchasing the site for the pumping machinery, an alternative site had been provisionally arranged, which, with the addition of a cottage, necessitated the loan to be increased by practically £1,000.

Poole T.C. (December 5th. Mr. F. H. Tulloch).—£125 for additions and improvements to the two lodges in the park, and £63 for the purchase of land to give access on the south side to Alexandra Park.—At present there is no entrance from the Bournemouth-road, except by a circuitous route, and the only entrance is from Alexandra-road.—There was no opposition, and the inquiry was attended only by the town clerk and the borough surveyor, Mr. S. J. Newman, in addition to the inspector.

Walton-le-Dale U.D.C. (December 3rd. Mr. M. K. North).—£4,500 for works of water supply, and £350 for the provision of a new disinfecting apparatus.—The clerk, Mr. W. S. Woodcock, stated that at present water was obtained for the township from three sources, a well at Brindle, a supply from Thirlmere per the Manchester Corporation, and from a borehole in School-lane. The cost of the supply from Thirlmere up to 200 000 gallons per day was 7½d. per 1,000 gallons, and on all excess they had to pay 1s. per 1,000 gallons. They proposed to duplicate the present plant at School-lane, because they were confident there was an ample supply of water there. They asked that the period of repayment should be thirty years in respect of buildings and fifteen years in respect of machinery.

West Ward (Westmorland) R.D.C. (November 22nd. Mr. A. W. Brightmore).—£39,600 for a water scheme from Blea Water Tarn, a small lake about 2½ miles to the south-west of Mardale, for the supply of parishes in the West Ward's district.—Mr. Joseph Graham, the engineer, in his evidence, stated that there would be about 64 miles of mains, and three reservoirs—one capable of storing 200 000 gallons—from which the distributing mains would radiate. On account of the nature of the district, and the pressure required to obtain circulation over so large an area, he proposed to put in steel pipes for the greater part of the distance. A number of other witnesses gave evidence, both in support of and in opposition to the proposal.

APPLICATIONS FOR LOANS.

Castlebar R.D.C.—£2,610 for labourers' cottages.

Cheltenham T.C.—£5,464 for works of sewerage.

Grimsby T.C.—£14,870 for a new council school.

Salford T.C.—£53,000 for gasworks extensions.

Swansea T.C.—£10,000 for the payment of the cost of non-sanctioned sewerage works.

Wanstead U.D.C.—£1,250 for the erection and equipment of a new fire station.

LOANS SANCTIONED.

Aberavon T.C.—£12,675 for the erection of a town hall and municipal buildings.

Devonport T.C.—£2,000 for the purchase of an iron hopper barge.

Ellesmere R.D.C.—£2,500 for water supply works.

Cosforth U.D.C.—£710 for the purchase of a motor fire engine.

Hove T.C.—£659 for excavation and foundations, and £1,046 for wood paving.

Margate T.C.—£7,500 for the purchase of 6 acres of land at Westbrook for laying out roads and pleasure grounds.

New Mills U.D.C.—£10,000 for gas supply extensions.

FORTHCOMING INQUIRIES.

JANUARY.

2.—**Manchester.** For the purpose of including Heaton Norris in the city boundary (Mr. E. A. Sandford Fawcett).

2.—**Stockport.** For the purpose of including Heaton Norris in the borough boundary (Mr. E. A. Sandford Fawcett).

7 **Scarborough.** For authority to prepare a town planning scheme (Mr. Thomas Adams)

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below:—Buildings — Barnsley £15,000. Devon, Devonport £70,000, Glasgow, Lincoln, Northwich £9,580, Weston-super-Mare; housing and town planning, Richmond; roads and materials—Blackpool £50,000, Croydon £164,000, Sewerage and sewage disposal, Ayr, Cheltenham, Kiveton Park; water, gas and electricity —Birmingham £250,000, Croydon £96,000.—Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Airdrie T.C. The £11,000 scheme for a hospital and sanatorium is to be reconsidered with a view to the reduction of the cost.

Arbroath T.C.—Mr. Andrew Carnegie's offer of £7,000 for public baths is under the consideration of the council.

Barnsley T.C.—The council have adopted the proposed scheme for the erection of a new town hall at an estimated cost of £15,600.

Belfast T.C.—Consideration is being given to a scheme for extending the [illegible] building.

Bexhill T.C.—The surveyor, Mr. G. Ball, reported at the meeting on Monday last that thirteen intermediate groynes were nearly completed, the total cost being about £1,200. The Sea Defence Committee decided to defer the consideration of a suggestion that each of the groynes should be extended 50 ft. seaward to form low sand groynes. The intermediate groyning work [illegible] new seawall, and [illegible] at a cost of about £4,800.

Devon C.C.—A scheme has been adopted for providing a sanatorium near Bovey Tracey for dealing with [illegible] and [illegible] cases at Exeter, the latter at a cost of £3,250.

Devonport T.C.—The council have agreed to a £70,000 scheme for the erection of a new Guildhall on the glebe site near the Technical College.

Glasgow T.C. A report on [illegible] council regarding the preliminary sketch designs invited from outside architects for the proposed extension of the municipal buildings. Dr. John James Burnet, architect, the assessor in the competition, reported that sketch designs had been received from 100 competitors. Dr. Burnet and the city engineer, Mr. A. B. McDonald, examined the designs in the preliminary competition, and on his recommendation the [illegible] Messrs. Keppie & Henderson, Basil E. Vincent Harris & Moodie, London; Watson Simon, Glasgow; James B. Fulton, London; James Wright, junr, and W. J. Blain, Glasgow.

Grimsby T.C.—The tender of Messrs. J. H. Thompson & Sons, Limited, of Grimsby, at £13,333, has been accepted for the erection of the new school in Victoria-street.

Hunstanton U.D.C.—Shelters are to be erected on the esplanade at a [illegible] cost of £720.

Lanarkshire C.C. The [illegible] of the county buildings [illegible] by a [illegible] of the council.

Lincoln T.C.—The city engineer, Mr. R. A. MacBrair, has been instructed to prepare plans for the extension of the [illegible].

Llanelly U.D.C.—The question of finding a site for the proposed new town hall is engaging the attention of the council, who have a sum of £12,000 in hand for the provision of the building.

Maldens and Coombe U.D.C.—The council have referred to a committee an offer of a councillor, Mr. G. C. [illegible], to present a [illegible] land adjacent to the council offices on condition that they erect upon it, within three years, a hall suitable for public [illegible] and for small private meetings or the [illegible] of [illegible] to workmen's or other clubs.

Northwich U.D.C. Public baths are to be erected at a cost of £9,580.

Ramsgate T.C. A scheme is under consideration for a new shelter on the west cliff.

Sutton-in-Ashfield U.D.C.—A new [illegible] is to be provided at a cost of £550.

Weston-super-Mare U.D.C.—The plans of the surveyor Mr. H. A. Brown, for new public [illegible] have been approved.

HOUSING AND TOWN PLANNING.

Atherstone R.D.C.—The surveyor, Mr. H. J. Coleby, has prepared amended plans for the erection by the council of workmen's dwellings in Stanley-road, and these, with a fresh estimate, have been forwarded to the Local Government Board.

Milngavie T.C.—The council are considering the advisability of taking in an increased area outside the burgh boundaries, in addition to the burgh, in a proposed town planning scheme.

Peterborough R.D.C.—It has been decided to purchase about 5 acres of land and to erect fourteen houses in the parish of Eye. Negotiations are also in progress for the purchase of land for the erection of twenty-four houses at Walton, and also at Castor. The surveyor, Mr. G. A. Penwill, has been instructed to prepare schemes and plans.

Richmond (Surrey) T.C. It has been agreed to include, as part of the town planning scheme, a suggestion of the borough surveyor, Mr. J. H. Brierley, for making a new road to provide a more direct route through Petersham to Kingston, and to obviate the steep gradients and awkward corners of the existing main road. It is proposed that the new road shall be 50 ft. wide, and its construction is estimated to cost about £16,000, towards which the Surrey County Council will contribute one-third, and a grant may also be obtained from the Road Board.

Southmolton T.C.—The surveyor, Mr. H. C. E. Rayner, has received instructions to prepare the necessary plans and specifications for the housing scheme.

Wanstead U.D.C.—The General Purposes Committee have been instructed to consider the question of [illegible] accommodation for the working classes.

PARKS AND OPEN SPACES.

Droylsden U.D.C.—A new bowling green is to be provided at a cost of £615.

Manchester T.C.—The Parks Committee recommend that an offer of £10,000 be made to the War Office for the site of Hulme Barracks and the buildings thereon for the purpose of an open space.

Sunderland T.C.—A municipal golf course is to be [illegible] at Seaton Carew Links, at an [illegible] of £1,500.

REFUSE COLLECTION AND DISPOSAL.

Cosforth U.D.C.—The tender of Messrs. Humphries & Sons, of Chippenham, for two new refuse carts for the sum of £54, has been accepted.

ROADS AND MATERIALS.

Aylesbury U.D.C.—Southern-road and Eastern-road are to be made up with concrete channelling, the former at a cost of £789, and the latter at a cost of £451.

Barnsley T.C.—The tender of the Improved Wood Paving Company, at £1,878, has been accepted for wood paving in Cheapside and Sheffield-road.

Bath T.C.—A scheme for the widening of Brougham Hayes, which is estimated to cost over £3,000, has been referred to the Streets Improvement Committee to report.

Birmingham T.C.—It has been agreed to carry out various improvements to certain of the streets and roads in the city. The most important are associated with the districts of Hay Mill and Erdington. Plans have been approved for the widening of King's-road, Hay Mill, so as to form a useful connecting link between Hay Mill and the adjoining district. In carrying out this work it will also be necessary to [illegible] bridge over the canal. At Erdington [illegible]

decided, among other improvements, to widen and make Wheelwright-road, which connects Gravelly-hill with Bromford-road and the new Salford Bridge-road.

Blackpool T.C.—A considerable reclamation scheme is to be effected on the southern foreshore, with a view to the formation of a promenade. The estimated cost of the scheme is £50,000.

Caerphilly U.D.C.—It has been decided to adopt the system of direct labour in road maintenance, and the Roads Committee have received instructions to go into the question of ways and means.

Chichester T.C.—The city surveyor, Mr. F. J. Lobley, has been instructed to proceed with the making up of Eastcross and Westcross.

Conway R.D.C.—The council are joining with the representatives of the County Councils of Carnarvon and Denbigh, and the district councils, in asking the Road Board for a grant in aid of the construction of the proposed road between Colwyn Bay and Llandudno.

Croydon T.C.—A scheme was adopted by the council on Monday for widening North-end on both sides, and effecting an improvement at Crown-hill, at an estimated cost of £164,000. By this scheme the Whitgift Hospital, built in the reign of Queen Elizabeth, will not be touched.

Devon C.C.—The Road Board have selected the following road improvements for financial assistance: Widening road at corner of Pinhoe and Pinhoe roads, Heavitree, cost £450, proposed grant £150; widening portion of road through Fore-street, Heavitree, £750, £250; widening road between Countess Wear Bridge and its junction with the Exeter-Topsham main road from 13 ft. to 21 ft., and removing two corners by substituting a new road 500 ft. in length, £812, £406; Buckhill cross roads, Axminster, making new by-pass road, 305 ft. in length and 40 ft. wide, and improving radius of three corners, cost £674, alternative scheme suggested by the assistant engineer to the Road Board—viz., lowering of high bank to road level for a length of 250 ft., £250, two-thirds of latter cost not exceeding £170; construction of new bridge at Stoodleigh, Culmpton, £528, £350; altering brow of hill and widening dangerous corner at bottom of Dean Steep Hill, Lynton, £200, £133; new road round brow of hill in place of Beggars Roost Hill, Lynton, including widening road at top of the hill from 14 ft. to 21 ft., £1,200, £400; widening Bank-street, Newton Abbot, to 36 ft., £2,500, £500; widening Penn Inn Bridge, Newton Abbot, and approaches to 36 ft. for a length of approximately 500 ft., £1,200, £400; widening Totnes-road, estimated cost of work, apart from cost of purchase of property, £1,680, £540; widening King bridge, Salcombe road at various points, £689, £460. The council have received replies from the district councils to the letter addressed to them respecting their willingness, or otherwise, to observe the existing suggestions as to the maintenance of main roads. All the replies showed that the district councils were prepared to accept the advice and additional supervision of the county surveyor.

Edmonton U.D.C.—Church-street is to be widened at a cost of £1,487, towards which the Middlesex County Council have decided to contribute £495.

Hackney B.C.—The asphalt paving in Rosina-street, Homerton, having sunk at various places, investigations were made to the cause thereof, and it was found that a large number of runs had been burrowed by rats in the ground beneath the paving. The remains of the adjoining cottages also contained rats. Further investigations showed that the rats came from openings in a sewer which was laid in 1865, and the sewer has accordingly been now reconstructed at a cost of £45.

Hemel Hempstead T.C.—Street improvements are to be carried out at an estimated cost of £2,300.

Hove T.C.—The tender of Messrs. Parsons & Sons at £479, has been accepted for carrying out the proposed new street works in Tennis-road.

Poole T.C.—A number of streets have to be made up under the Private Street Works Act.

Richmond (Surrey) T.C.—The council have under consideration a suggestion of the borough surveyor, Mr. J. H. Rennie, that a grant estimated at £5,121, equal to the amount of the Local Government Board, be spent on reconstructing with a proper foundation and top of a patent road material of three roads in the district, and with a similar coating in the case of a fourth road which already has a satisfactory foundation.

Tyrone C.C.—Mr. J. W. Leebody, county surveyor, reported at the council meeting last week that the Clogher, Cookstown, and Dungannon District Councils had agreed to take up Road Board grants amounting to £214, £250, and £345 respectively. He had been in communication with the Road Board on the subject and was now taking a census of traffic.

Watford R.D.C.—The surveyor, Mr. E. Lailey, has been instructed to interview the landowners concerned in a proposal made by the county surveyor, Mr. U. A. Smith, for the widening of Eastbury-road, leading from Watford to Northwood, at an estimated cost of £1,895. The suggestion is to widen the thoroughfare to 40 ft.

SEWERAGE AND SEWAGE DISPOSAL.

Alsagar U.D.C.—Tenders are to be obtained for a sewage disposal scheme.

Altrincham U.D.C.—Public lavatories are to be established at Kings-way, at an estimated cost of £900.

Cheltenham T.C.—It is proposed to carry out extensive improvements in the sewerage of the Fairview district.

Kirkcaldy T.C.—A sum of £580 is to be spent upon the erection of public conveniences.

Kiveton Park R.D.C.—The surveyor, Mr. F. Hewitt, has received instructions to prepare plans and estimate for extensions at the sewage disposal works.

Pontardawe R.D.C.—Sewerage works are to be carried out at Clydach, at a cost of £631.

Ripley U.D.C.—The council have referred to a committee a letter from the Local Government Board regretting that practically no steps had been taken towards the conversion of the privies to the more sanitary water-carriage system. This could not but be a menace to the public health, and in particular to the infantile population. They therefore urged upon the council the desirability of the speedy conversion into water-closets.

Surbiton U.D.C.—The surveyor, Mr. H. T. Mather, has prepared detailed drawings, specification and bills of quantities for a surface-water drain at Rogers Farm, estimated to cost £209, in connection with the sewerage scheme in hand.

WATER, GAS, AND ELECTRICITY.

Abercarn U.D.C.—A sum of £1,000 is to be spent on gasworks equipment. With regard to the automatic lighting, it has been reported that a saving of £100 to £120 per annum would be effected at the end of three years. The new works proposed include a new exhauster at £100.

Birmingham T.C.—The Electric Supply Committee are giving consideration to a proposal to erect an electricity station at Saltley, at an estimated cost of £250,000.

Bo'ness T.C.—The council have concluded an agreement with the adjoining burgh of Grangemouth to give them an auxiliary supply of water from Bannockburn. The rate fixed is 4½d. per 1,000 gallons up to a limit of £750, and 4d. per 1,000 gallons beyond that; minimum payment in one year, £250. The agreement is for five years. Negotiations are still pending for the purchase by Bo'ness of the Avonbank Waterworks. Connections to which were made at considerable expense during the water famine of 1911.—It has been agreed to spend £1,000 upon extensions of the electric lighting system.

Croydon T.C.—The waterworks are to be enlarged and a reservoir constructed at Russell Hill at an estimated cost of £90,000.

Haltwhistle R.D.C.—The council are giving consideration to a water supply scheme, estimated to cost £4,000.

Hove T.C.—It has been decided to promote a Bill in Parliament for the purchase of the electric lighting undertaking.

MISCELLANEOUS.

Huthwaite U.D.C.—Roadmen, lamplighters and carters in the employ of the council are to receive an increase of 5 per cent in wages.

Troon T.C.—It has been decided to borrow £500 for the extension of the municipal cluibhouse, £150 for new sewers, and £900 for the widening of Fullarton-road and the bridges at Lochgreen.

PERSONAL.

Mr. J. P. Smith has been appointed road foreman to the Jarrow Corporation.

Mr. H. C. Blackburn has been appointed assistant surveyor to the Dartford Urban District Council.

Mr. F. Camble, surveyor to the Tavistock Urban District Council, has been voted £20 for extra services.

Mr. A. A. Goodall, surveyor to the Rhyl Urban District Council, has had his salary increased by £20 per annum.

Mr. W. Terrill, surveyor to the Ashford (Kent) Urban District Council, has had his salary increased to £350 per annum.

Mr. Frank Sumner, engineer to the Corporation of the City of London, has had his salary increased to £1,250 per annum.

Mr. G. Ball, borough surveyor of Bexhill, has been granted £50 by the town council for his services in connection with the construction of groynes on the beach.

Mr. W. Calder, city surveyor of Prahran, has been appointed honorary co-examiner in engineering, part 2 (roads, streets, and tramways), at the Melbourne University. He will act in conjunction with Prof. Payne and Mr. George Higgins, M.C.E.

Messrs. John Ennor, engineer and surveyor to the Newquay Urban District Council; G. R. Folland, borough surveyor's office, Gravesend; F. H. Holden, assistant surveyor, Lytham; J. A. Rodwell, borough engineer's office, Dewsbury; and G. M. Seels, council offices, New Malden, have been elected members of the Royal Sanitary Institute.

FOR OTHER ADVERTISEMENTS

See End of Paper.

CORPORATION OF MADRAS.

SPECIAL WORKS DEPARTMENT.

DRAINAGE SECTION.

CONTRACT M & M No. 18.

The Corporation of Madras is prepared to receive Tenders from competent persons willing to enter into a contract for the Supply and Delivery of English Stoneware Pipes and Specials, varying from 4 in. to 21 in. internal diameter, and aggregating a total length of about 165 miles.

Forms of Tender, prepared by J. W. Madeley, M.A., M.INST.C.E., M.AM.SOC.C.E., Special Engineer to the Corporation of Madras, may be obtained from the undersigned Agents of the Corporation, on payment of five shillings per set, which will not be refunded.

Tenders must be submitted to them at or before noon of Wednesday, the 22nd day of January, 1913.

The Corporation does not bind itself to accept the lowest or any Tender.

JAMES MANSERGH & SONS,
Agents to the Corporation,
9 Victoria-street,
Westminster, S.W.
December 18, 1912.

BOROUGH OF HORNSEY.

Applications are invited for the position of a General and a Junior Clerk in the Engineer's Department.

Preference given to Candidates having some knowledge of shorthand and typewriting, and previous experience in office routine. Salary—General Clerk, £70; Junior Clerk, £40 per annum.

Applications to be made in Candidate's own handwriting, stating qualifications, with two letters of reference, and forwarded to the Borough Engineer and Surveyor, Municipal Office, Highgate, N., not later than Wednesday, 1st January, 1913.

WANTED (for 6 months), Junior Assistant in Mains Drawing Office, accustomed to taking enlargements from Ordnance Maps, and the keeping of usual Mains Records. State salary required.—Apply, with copies of not more than three recent testimonials, to the City Electrical Engineer, Old Town Hall, Wakefield.

FOR SALE OR HIRE—6-ton Barford & Perkins Motor Roller, in first-class working order; just completed large Tar-macadam Contract. Apply Eddison Steam Rolling Co., Ltd., Dorchester.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

COUNCIL MEETING: OFFICIAL REPORT.

At a meeting of the council held at the offices of the institution on Saturday, December 7th, there were present: Messrs. R. J. Thomas (president, in the chair), T. W. A. Hayward, J. W. Cockrill, J. S. Brodie, G. F. Carter, W. H. Prescott, A. H. Campbell, N. Scorgie, J. Patten Barber, O. E. Winter, J. L. Redfern, A. D. Greatorex, G. A. Phillips, H. E. Stilgoe, J. S. Pickering, W. Harpur, C. F. Wike, W. T. Lancashire, Thomas Cole (secretary), and H. A. Giles (assistant secretary).

Election of Members.—Messrs. B. J. Wormleighton, engineer and surveyor, Loftus (Yorks) Urban District Council; J. A. Hutchinson, water engineer to the Paignton Urban District Council; J. S. Smith, road surveyor to the Kintyre District Council; R. A. Miller, surveyor to the Seaford Urban District Council; P. M. Hope, engineer and surveyor to West Ward (Westmorland) Rural District Council; W. F. Brindle, engineer and Surveyor, Twrcelyn Rural District Council; J. Ennor, engineer and surveyor, Newquay Urban District Council; J. J. Fleming, borough surveyor, Waterford; A. J. Oborn, engineer and surveyor, Burry Port Urban District Council; H. S. Tebbitt, engineer and surveyor, Tutbury Rural District Council; L. K. Brindley, chief engineering assistant, Zanzibar; R. Arrowsmith, surveyor to the Stoke-on-Trent Rural District Council; O. P. Abbott, engineer and surveyor, Hindley (Lancs) Urban District Council; W. McNeil Shimmin, ASSOC.M.INST.C.E., engineer and surveyor, Failsworth Urban District Council; A. J. Smith, borough surveyor, King's Lynn; C. G. Wellsted, ASSOC.M.INST.C.E., deputy engineer to the Sculcoates Rural District Council; J. Kershaw, surveyor to the Aethwy (Anglesey) Rural District Council; W. A. Rogerson, district surveyor, Norfolk County; F. M. Greenhill, deputy city engineer and surveyor, Cardiff; and D. J. Buckley, surveyor, Fermoy and Marlow Urban District Council.

Election of Associate Members.—Messrs. K. C. Bannerjee, assistant sanitary engineer, Government of Behar, India; T. Palmer, assistant surveyor, Lincoln; H. Anderson, city engineer's office, York; G. R. Folland, borough surveyor's office, Gravesend; B. Archer, assistant surveyor, Wellingborough Urban District Council; W. B. Acton, overseer, Public Works Department, British East Africa; E. Wicksteed, engineering assistant, Hastings; J. Maxwell, second assistant, county road surveyor's office, Hamilton; and D. H. Shaw, chief engineering assistant, Dunfermline.

Transfer from Associate Members to Members.—Messrs. S. C. Lloyd, district surveyor, East Suffolk County Council; and W. S. Lake, ASSOC.M.INST.C.E., Assistant Director of Public Works, Sierra Leone.

Transfer from Student to Member.—Mr. F. H. Holden, assistant surveyor to the Lytham Urban District Council.

Election of Students.—L. C. Blackburn (articled to Mr. G. W. Knowles), Clevedon; T. S. Griffin, assistant surveyor, Penkridge (Staffs); D. M. McBrair, city engineer's office, Lincoln; W. H. Dobson, junior assistant surveyor, Gillingham (Kent); B. F. Cadic (articled to J. L. Redfern), Gillingham (Kent); J. Wrest, assistant surveyor, borough surveyor's office, Dewsbury; and F. M. Copley, assistant surveyor to the Wath-upon-Dearne Urban District Council.

The council learnt, with regret, of the deaths of Mr. W. P. Robinson, late surveyor, Skelton-in-Cleveland, and Mr. W. S. Shell, late surveyor, Consett.

NATIONAL HEALTH WEEK.—Messrs. J. Patten Barber, T. W. A. Hayward, and O. E. Winter were appointed delegates to the General Committee. The president was deputed to represent the institution on the Advisory Committee.

On the recommendation of the Finance Committee it was resolved to print and circulate, for the information of members, a report on "Advertisement Hoardings," presented to the council by Mr. J. S. Brodie, borough engineer, Blackpool.

On the recommendation of the New Offices Committee, it was decided to acquire a suite of offices in Victoria-street, which would give the accommodation rendered necessary by the extension of the work and the growth of the institution.

A joint meeting of the Road- and Standardisation Committees called to consider the standardisation of road-stone was reported. Messrs. R. H. Dorman and

H. E. Stilgoe were elected, and Mr. A. E. Joyce, county surveyor, Mullingar, president of the Association of the County Surveyors of Ireland, was co-opted to the Roads Committee.

On the recommendation of the Standardisation Committee certain amendments to the street lighting specification were deferred for consideration at a special meeting. The second edition of the concrete flag specification, as revised, was ordered to be published, at a price of 2s. 6d. per copy, obtainable from Messrs. E. & F. N. Spon, 57 Haymarket, London, S.W.

The Constitution Committee reported receipt of a letter of thanks for assistance rendered to Mr. William Jones, Colwyn Bay, in the matter of the recent libel action which he had been compelled to bring. A further case of a member who had been libelled had received the careful consideration of the committee. In view of his complete vindication received at the hands of his council, the committee recommended that further action at the present moment was considered unnecessary.

On the further recommendation of the committee, the council resolved that the application of the Association of County Surveyors of Ireland for affiliation with the institution on the same terms as those granted to the Scottish Road Surveyors Association be acceded to, and that steps be taken to complete affiliation accordingly. The council referred back to the committee a suggestion from the Local Government Engineers of New Zealand for affiliation, with an instruction to complete the necessary details to give effect to the suggestion.

Mutual Defence Fund. The committee reported consideration of draft rules. At their request these were referred back for the further consideration of certain points.

On the recommendation of the Town Planning Committee, Mr. H. E. Stilgoe was added to the committee.

METROPOLITAN DISTRICT MEETING.

A Metropolitan District meeting of the Institution of Municipal and County Engineers was held at the offices of the institution on Friday last, at 6 p.m., those present being Messrs. R. J. Thomas (Bucks County, president), J. Patten Barber (Islington, district chairman), O. E. Winter (Hampstead, district representative on the council), G. Sturgess (Chelsea), J. Arthur Jones (Acton), T. W. A. Hayward (Battersea, vice-president), H. A. White (Battersea), W. J. Dresden (Battersea), J. W. Jameson (Stepney), J. Rush Dixon (Woolwich), E. B. B. Newton (Paddington), James Norrington, H. J. Marten, J. C. Radford (Putney), J. Sutcliffe (Deptford), A. W. Currie (Stoke Newington), P. Howard (Tottenham), J. E. Cooke (Islington), Thomas Cole (secretary), H. A. Giles (assistant secretary), H. E. Blain (West Ham, visitor), C. H. W. Biggs (visitor), and Norman Scorgie (Hackney, hon. district secretary). Mr. Patten Barber occupied the chair.

The minutes of the Metropolitan District meeting held on November 20th were read, confirmed and signed. Arising out of the minutes, the hon. district secretary reported the receipt of a communication from Mr. W. P. Wrack (Poplar), regretting his inability to serve on the Executive Committee, and it was resolved that the vacancy should be filled at the next district meeting.

The hon. district secretary also reported that copies of the resolutions adopted at the last meeting in reference to the draft by-laws respecting overhanging lamps, signs, &c., had been forwarded by the secretary of the institution to the town clerks and engineers of the cities and boroughs in the Metropolis, and that a number of replies had already been received.

Letters of apology for non-attendance at the meeting were read from Mr. P. Dodd (Wand-worth) and Mr. C. Chambers Smith (Westminster).

The meeting then proceeded to discuss the question of "The Influence of Motor Traffic on Metropolitan Roads," the debate being opened by Mr. J. Patten Barber (chairman), who exhaustively dealt with the subject from the point of view of the noise, vibration and damage to premises; the effect upon bridges, tar-spraying as a palliative, the use of [illegible] veneers, hard and soft woods, granite setts, and proprietary articles. A very spirited, instructive and [illegible] ensued, during which the [illegible] Heavy Motor Car Order, the limitation of routes, and so forth. The speakers were Messrs. O. E. Winter (Hampstead), J. E. Cooke (Islington), J. W. Jameson (Stepney), E. B. B. Newton (Paddington), J. Rush Dixon (Woolwich), R. J. Thomas (Bucks County), president, and Norman Scorgie (Hackney).

The time for adjournment having now arrived, it was resolved: "That the discussion on this very important subject be now adjourned until the next meeting of the Metropolitan District to be held in January, and that the actual date of the meeting be left to the chairman and the hon. district secretary to arrange."

Those present then proceeded to Lyons' Victoria Mansions Restaurant, Victoria-street, where they were joined at dinner by the following members and friends—viz.: Messrs. A. P. Piggott, A. E. Darby, B. Cooper, P. T. Chew, John Barber, J. Gerald Cocks, John H. Johnson, G. W. Allen, P. Dodd, L. W. Harvey, F. T. Hutchins and others to the number of nearly forty. At the conclusion of the repast, and after the loyal toast of "The King" had been duly honoured, an enjoyable musical and social evening, arranged by Messrs. Newton and Sturgess, took place. Messrs. F. T. Hutchins (piano), L. W. Harvey (violin), J. Patten Barber, O. E. Winter, G. Sturgess, P. Howard, E. B. B. Newton and John Barber were among those who contributed to the programme.

The best thanks of the company having been accorded to the chairman and to those who had assisted, the meeting terminated with "Auld Lang Syne," and a general expression of opinion that many more gatherings of a similar character should be arranged.

NORTH-EASTERN DISTRICT COMMITTEE MEETING AT YORK.

On the occasion of the North-Eastern District Committee meeting of the Institution of Municipal and County Engineers held at York on Saturday, 30th ult., twenty-four members, three associate members and one student assembled at the Guildhall, and were welcomed by the Lord Mayor (Sir Joseph Sykes Rymer).

The District Chairman (Mr. Frank Massie) thanked the lord mayor for the welcome given to the members, and the lady mayoress for her kindness in providing tea.

The election of an executive committee was then proceeded with. It was proposed by Mr. C. Lund (Cleckheaton), seconded by Mr. E. Picker (Beverley), and carried, that fifteen form the Executive Committee. It was proposed by Mr. E. R. Matthews (Bridlington) seconded by Mr. C. F. Wike (Sheffield), and carried, that three associate members be elected on the Executive Committee, one from Yorkshire, one from Northumberland, and one from Durham. It was proposed by Mr. J. H. Drew (Wath-upon-Dearne), seconded, and carried, that the two members of council (Messrs. C. F. Wike and W. T. Lancashire), the two district representatives (Messrs. E. R. Matthews and E. B. Martin), the district chairman (Mr. Frank Massie), and the district secretary (Mr. J. P. Wakeford) be elected ex-officio members of the executive.

A poll was then taken for six full members, when the following were elected: Messrs. J. A. Bean (Northumberland County) A. Beaumont (Yorkshire County, East Riding), C. Lund (Cleckheaton), L. Roseveare (South Shields), F. W. Spurr (York), W. J. Steele (Newcastle).

It was proposed, seconded and carried that Mr. W. H. Goldsmith (Hull) be elected associate member for Yorkshire to serve on the executive. It was proposed, seconded and carried that Mr. G. H. Whitaker (Sunderland) be elected associate member on the executive for Durham. Having ascertained that Northumberland was not represented by any associate member, it was proposed, seconded and carried that Mr. S. M. Senior (York) be elected as the third associate member to serve on the executive.

Mr. F. W. Spurr, city engineer, York, then read his paper on "Works in Hand at York." [Reproduced in our issue of last week.]

Mr. E. R. Matthews proposed, and the District Chairman seconded, a vote of thanks to Mr. Spurr for his paper. Both speakers dealt with various points raised in the contribution, Messrs. S. Dyer (Bridlington), J. H. Drew (Wath-upon-Dearne), W. Fowlds (Keighley), W. J. Hadfield (Sheffield), L. Ives (Wakefield), W. J. Steele (Newcastle), C. F. Wike (Sheffield), and J. W. Hill (Wakefield), student, also taking part in the discussion.

Mr. Spurr afterwards replied.

The question of a Spring meeting at the village of the members of the institution was then discussed, and Mr. W. J. Steele, of Newcastle, kindly promised such a meeting on a date to be hereafter fixed.

Institution of Municipal Engineers.

JOINT WESTERN AND SOUTH-WESTERN DISTRICT MEETING.

(Conclusion.)

The Exeter portion of the joint meeting was held on Saturday, November 30th, the chair being again taken by Mr. Frank Latham, the president of the institution, who delivered the address, of which the text was given in our last issue.

SUPERANNUATION AND SECURITY OF TENURE.

The PRESIDENT, on the conclusion of his address, went on to say that at their meeting at Gloucester the previous day two resolutions, to which reference would be made later, were passed. With regard to the question of security of tenure no official desired that any measures should be sought by the institution which were arbitrary to the local authority. They had no wish to tie the hands of any local authority in a way that would prevent their getting rid of officials who were not satisfactory. What they did desire was a little recognition, and it would be just as easy afterwards for an authority to get rid of a man who did not discharge his duties faithfully as it was at present. They simply asked for fair play, and to have it recognised as it was under the Public Health Act of 1847. They had many members of the institution who held the dual appointment of sanitary inspector and surveyor. A council could take away from their officer his appointment as surveyor, but before he could be relieved of his position as sanitary inspector the grievance had to go to the Local Government Board to receive their consent. They did not put forward their claim for absolute security of tenure; all they asked for was protection as under the Act of 1847, by which a surveyor could not be appointed or relieved of his office without the consent of a higher authority. In 1875, when that condition was omitted from the Act, the duties for which the officers were responsible were very much more onerous than in 1847, which was the transition stage. In 1875 the surveyor was left entirely in the hands of the municipal authority. He had to work with protected officers, and his lot was often made very hard. There was nothing stringent and nothing that any corporation could take exception to in the proposal of the institution, and when the matter was placed before the Association of Municipal Corporations he was sure if they knew how that institution regarded the matter they would support them in every way. He believed they would every chance of bettering what they proposed. They had a strong body behind them. As far as superannuation was concerned, it would be to the advantage of municipal bodies and officials to have a national fund from which superannuation might be drawn. Each municipal corporation would contribute to a central or national fund, *pro rata* to the salary paid to the officials in their own, and from that fund would be obtained the means of superannuation for the officer.

Mr. C. O. BAINES (Paignton) thanked the president for the full and able address he had given the meeting on security of tenure and housing and town planning. He fully endorsed all that had been said as to security of tenure, and he did not think any engineer or surveyor who was a fully appointed officer could doubt the wisdom of such a course, and the necessity for it. They must in the course of their duties have come across things which convinced them of the absolute necessity of pushing this matter home for all it was worth. They had no wish to take any unfair advantage of their employers by forcing them to do things which were unfair to the community; all they wanted was protection, so that they could carry out their duties properly. With regard to town planning, Mr. Aldridge, who delivered an address at the conference on the subject in that city the previous week, gave them some very good advice. It was not the big landowner who was the trouble; it was the small owner who was anxious to screw the last halfpenny out of the poorer people. That was the difficulty they were experiencing in regard to bad housing.

Mr. A. J. REDFERN (Honiton) said that when he came down from the Midlands a few years ago he found Devonshire different from what Birmingham was. He framed the same opinion as the last speaker however, and that was that in housing it was the small owner who was the biggest trouble to deal with. The large owners were fairly easy to get on with, and they could administer the laws very satisfactorily in their case, but when the little owner got on the council very often trouble began. The speaker went on to refer to certain instances of alleged persecution of officials, and said that if they got security of tenure they would have the protection they needed, and they would be able to go on in a straightforward manner without fear. His particular district comprised 73,000 acres, and he consequently had a lot of travelling to do. It was obvious that when a man got old he could not continue travelling hundreds of miles a week. Some provision must be made to keep him from spending his last days in poverty, and therefore it was highly important that the question of superannuation should be settled.

Mr. R. LAKE (Sidmouth) agreed that the main difficulty was with the small owner. He also thought that builders should pass a qualifying examination the same as themselves. Very often a man had no knowledge of masonry or carpentry, and he simply muddled along, while the surveyor had to put in most of his time watching him.

A MUTUAL DEFENCE FUND.

The PRESIDENT said he thought the time had arrived when a mutual defence fund should be established in connection with their institution. At the present time they had no fund devoted to that matter, and any expenditure under that head either came out of the general funds of the institution or from voluntary subscriptions. During the last two years they had had to face several matters. He suggested that if they increased their subscriptions by 2s. 6d. or 3s. they would get a sufficient sum to meet such cases. He invited discussion on the subject.

The SECRETARY read the resolution passed at Gloucester the previous day. It was as follows: "That this meeting of the Western District recommend the council of the institution to take immediate action to form a Mutual Aid and Defence Fund, to which contributions would be compulsory on the part of all corporate members and students."

Mr. BAINES moved that this meeting adopt the same resolution, with the addition of the words "and that a sum of 2s. 6d. be added to the annual contribution from each corporate member, and 1s. to that from each student."

Mr. C. DURIE (Williton) seconded and Mr. R. ELLIS (Tiverton) supported.

Mr. S. ALDAR (Exeter) said that as a young member of the profession and one practising, he saw the need for such a fund, and gave it his warm support.

Mr. T. JONES (Crediton), while fully in sympathy with the proposed fund, did not know whether it was wise to limit the contribution in the way suggested. Would it not be better to leave that point open for the executive to consider?

Mr. F. P. IVEY (Bristol) congratulated the institution on the steps they were taking that day. He thought their by-laws should be amended in such a way as to legalise the action they were taking, and not make it a professional matter. It was a great shame that there were persons going about taking upon themselves the name of engineers and surveyors who were in no way capable of performing the duties and who took time to train outside [illegible] those who had by careful study and considerable expenditure of money obtained their degrees.

Mr. T. G. TAYLOR (Plymouth) said if they got recognition by the Local Government Board, like sanitary inspectors, they would have no need for a defence fund, and what they collected from the members could be employed to help on young students. They must be united and compel recognition just in the same way as other officials were.

Mr. A. TILLOTSON (Honiton) complained of the family influence that was sometimes brought to bear in connection with appointments to public bodies and of offers to accept positions at reduced salaries. That was having the effect of cutting down salaries all over the country in regard to the junior appointments. They found assistant surveyors being

paid £50 a year. It was not a living wage. It was a shame to expect a young man who had served his articles to take up appointments as assistant engineers and surveyors and carry out the responsible duties for £50 a year.

Mr. ALGAR concurred in the opinion that a young man of inferior ability was often pushed into an office by influence, whereas another who had served his articles had to stand down. He should like to see something done to put a stop to this sort of thing.

The PRESIDENT said the council had before them an important matter in connection with the student section of the institution, which would be very much to the students' advantage. It was a very big matter, and was in its infancy at present, but they hoped to develop it into an important scheme. He brought the matter forward in council some time ago owing to the fact that he found there were young fellows whose parents had paid for their articles as students and they were practically left to themselves. There were many cases in which young men applied to them to know what books they should read, and yet it was found they had been pupils of surveyors for over twelve months. There were surveyors who took the premiums and the parents were ignorant that they were articling their sons to men who were too busy to attend to the pupils as they should do. They were often left to assistants in the office who wanted teaching themselves. It was absolutely ridiculous. They must, he added, agitate to get their profession to a better state. He knew of cases in which pupils had paid high premiums and had simply been thrown out on the world afterwards. It was a standing disgrace to the profession.

The resolution proposed by Mr. Baines was unanimously adopted.

The meeting then proceeded to a discussion of the papers on working-class housing, submitted by Messrs. Leonard Caplen and Sidney Palmer. The former has already appeared in our columns, the latter we give below.

WORKING CLASS HOUSING.

By S. PALMER, P.A.S.I.

Having already written a paper on the subject of houses for the working classes, which was read to the institution last May, I am afraid I have nothing much I can add to that paper. However, I will again state my views as briefly as possible.

ACCOMMODATION.

With regard to the accommodation to be provided, I am convinced that before we can build really economic buildings we must get the working classes to dispense with that bogey the sitting-room, which is hardly ever used except for knick-knacks. We must, it seems to me, see that every penny spent is for a useful purpose. I am therefore strongly of opinion that if one good-sized living-room is provided, in addition to a scullery, and three separate bed-rooms, all of which can be entered direct from the landing, those are all the rooms that are really necessary in a working-class dwelling, and all that can be provided of any useful size in a house which is to be let for 4s. or 5s. a week inclusive.

I submit with my paper a plan I have prepared which complies with the requirements I set out.

By keeping the entrances at the back, it allows of the best elevation being presented to the street or road on which the houses abut; it also allows one to dispense with a door out of the scullery, and this permits of the full use of the external wall of the scullery for sink, window and larder.

The coal shed and water-closet are in a small detached building, and a tip-up bath is introduced in the scullery.

SANITATION.

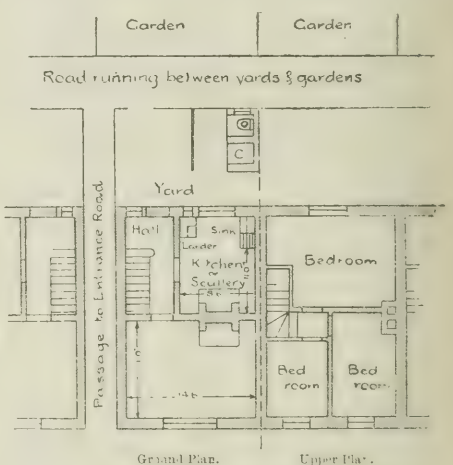
I am strongly in favour of spending more than is usually allowed in buildings of this class on the sanitary arrangements of the houses. These, to my mind, are more important than a larger number of small rooms.

Paving of good, durable quality should be laid to all the entrances and around the backs of the houses. Drains should be laid in as perfect a manner as possible, with proper manholes and glazed channels and barron bends, and good, heavy, airtight covers. Every wall should be rendered perfectly dry by covering with slates or other impervious material, or by building of granite blocks pointed in cement (which in my district would be as cheap as bricks), or hollow walls if necessary, anything rather than have damp walls and defective roofs.

Every ground floor should be covered with concrete, and every room ventilated with some well-devised ventilator that is not likely to be covered up either purposely or by, say, the hanging up of pictures. In the living-room I would suggest an ornamental ventilator in the ceiling over the gas jet, connected with a ventilating brick in the external wall by a tube in the depth of the first floor.

I am strongly of opinion that fireplaces in the bedrooms might well be dispensed with. The projections necessary for fireplaces take up a large amount of valuable room which cannot be spared in such small dwellings. Again, fireplaces in bed-rooms, even in villas, are seldom used, much less are they used in cottages where the man only earns probably 18s. or £1 per week.

Further, the ranges for these rooms and the fixing of them, together with the formation of additional flues and chimney pots, cost probably more than heating the rooms by a hot-water coil from the room below, and if this method is adopted, two of the bed-rooms, at a small initial cost (not exceeding that of grates, &c.), could be kept permanently dry, warm and well ventilated by reason of the air being warmed, and the full dimensions of the room could be utilised.



Of course, ventilation gratings at ceiling level would have to be introduced, as I said before, but this should be done, in my opinion, even when fireplaces are introduced, as fireplaces are not in the right position to act as ventilators, except when a fire is burning, which is very seldom the case in a bed-room.

I do not think I can add to my remarks, except perhaps that I have had considerable experience in dealing with the management of working-class dwellings in an urban district, and am strongly of opinion that good oil paint as internal decoration, although more expensive in the first place, is more economical than paper where there are children, and it is much more sanitary. I am of opinion also that, if possible, some use should be made of the space (often wasted) in the roof.

A long discussion followed, the interest evinced prolonging the meeting until ten o'clock.

SOUTHERN DISTRICT MEETING.

At a meeting of the Southern District of the institution held at 39 Victoria-street on Wednesday, December 11th, Mr. A. Winter Gray read a paper on "Superannuation and Security of Tenure." Mr. John Forrester, surveyor to the Theale Rural District Council, occupied the chair at the commencement of the proceedings, Mr. T. C. Barralet, surveyor to the Godstone Rural District Council, taking it later. At the conclusion of his paper Mr. Winter Gray moved the following three resolutions, which were seconded by Mr. Arthur Palmer, the honorary district secretary, and carried unanimously:—

(1) That this meeting recommends the council of the institution at once to consider the advisability of appointing a special committee to deal solely with the questions of superannuation, security of tenure and legal defence.

(2) That this meeting of the Southern District of the

institution recommends the council of the institution to take immediate action to form a Mutual Aid and Defence Fund, to which contributions would be compulsory on the part of all corporate members and students.

(3) That this meeting strongly urges every member of the institution in the Southern District forthwith to endeavour to form a local association in connection with the N.A.L.G.O. among his brother officers, or to co-operate with officials in the service of neighbouring authorities for the purpose of creating a joint association or guild.

MUNICIPAL WORK AT TIVERTON.

BOROUGH SURVEYOR'S REPORT.

Dealing with streets in his report for the year ended March 31st last, Mr. J. Siddalls, borough surveyor of Tiverton, states that the larger portion of the thoroughfares of the town were surface tarred during that period, partly with ordinary tar and partly with prepared or partially distilled tar, and owing to the long hot summer the advantages of the tarring were obtained to the fullest extent. In Mr. Siddalls' opinion the advantages in the way of economy and comfort derived from tar-spraying are more apparent in the case of the side streets even than on the main thoroughfares.

A length of "Rocmac" was laid down and proved very satisfactory under what, with one exception, is the heaviest and most concentrated traffic in the town, and the council decided to lay down a further portion of the material.

In regard to the sewerage system, the borough surveyor mentions that this has worked quite satisfactorily during the year, although there are signs that before long some improvements in the older portions of the system must be made.

The disposal of house refuse was attended with some difficulty. Owing to serious complaints in the early summer from residents, the deposit of the refuse at the site to which it was taken had to be abandoned. Efforts were made to dispose of it by hauling by means of a traction engine into the country, but it was found too expensive a process to continue, and in almost every case the place of deposit was in a field inaccessible in the winter with the engine. The damage also to the roads was very considerable, and, moreover, complaints were made with regard to the temporary deposit which it was necessary to make. Another site was then obtained. This, as regards capacity, would have served for many years, but here again, legal proceedings having been threatened, it had to be given up. A place of deposit has now been secured elsewhere. This site is remote from dwellings, and it is hoped may continue to serve the purpose for some time to come.

Worcestershire Roads.—The county road surveyor, Mr. C. F. Gettings, in his annual report, states that 1911 was the first year in which work was carried out under Road Board grants. Practically the whole of the strengthening and surface work approved by the board was completed. Although the council had appreciated that it was necessary to increase the estimates to provide for a larger expenditure on foundation work and improved surfaces, the amount allowed was insufficient to keep pace with the damages caused by the traffic referred to. From observations made during the past twelve months there was little doubt that the ordinary water-bound macadam surface was unsuitable for the heavy motor traffic. The Road Board had given grants for resurfacing with improved materials, but the amount allowed was totally inadequate for the requirements, and unless a much larger sum could be obtained the rate of progress made in this direction would be exceedingly slow. The Highways Committee had considered a comprehensive scheme for improving 57 miles of the more important main roads, but this was in abeyance until the programme for the year 1913 was submitted to the Road Board, when it was hoped the Board would be in a position to assist some scheme of this description by giving a much larger grant than had hitherto been received.—It was stated at the last council meeting that it was anticipated the Road Board would contribute not less than £15,000 a year for five years towards the cost of strengthening and improving the surfaces of certain first-class roads, on condition that the county council spent £5,000 annually.

SCOTTISH ROADS.

DEPUTATION TO SIR GEORGE GIBB.

On Friday last at the House of Commons a deputation of members of Parliament and others representing interests in the northern and western counties of Scotland was received by Sir George Gibb, chairman of the Road Board. Sir George was accompanied by Sir J. H. A. MacDonald, K.C.B., and Sir Charles D. Rose, Bart., members, and Mr. W. Rees Jeffreys, secretary of the board.

The proceedings were conducted in private, and lasted several hours. At the close an official account was supplied to the Press by Sir George Gibb to the effect that Lord Lovat and a number of members of the deputation addressed the board and urged the case of the northern counties of Scotland for special treatment from the Road Board.

The chairman replied on behalf of the board, and pointed out that the needs of improvement of roads was as great, if not greater, in the more populous counties in Scotland, and that in administering the Road Improvement Fund the requirements of the most important roads in the country must not be subordinated to the requirements of the more sparsely peopled counties. He, however, promised that the board would give careful consideration to the views of the deputation.

The point especially emphasised by the deputation was that the growth of traffic in the northern counties, and particularly motor traffic, for which outsiders were largely responsible, had very seriously affected the roads, and threw a heavy burden upon the local rates.

SOLVING THE CHRISTMAS GIFT PROBLEM.

Scientific American gives us an example worth emulating in this country of a course followed by a large manufacturer whose habit it is to send out Christmas presents to some of his customers. Assuming such a donor were in this country he would ask us to print the necessary number of cards in the following form:

> We have much pleasure in advising you that THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER will be sent to your address during the coming year, with the compliments of ———.

As our contemporary points out, such a course as this not only saves the worry and bother of having the gifts delivered at the proper time, but the arrival of THE SURVEYOR each week during the year serves to recall to the minds of the recipients pleasant memories of the donor. If it is your practice to give Christmas presents to your customers or employees, a year's subscription to THE SURVEYOR would be a gift of permanent value to the recipient.

WATER-STERILISING PLANTS WANTED.

Mr. R. O. Wynne-Roberts, M.INST.C.E., of Regina, Sask., Canada, is desirous of installing a water-sterilising plant which must be simple, self-contained and reliable. The city can generate electricity with two 80-horse power oil engines, which can be belted to dynamos. Hypochlorite is expensive, costing at least 1d. per lb. Salt can be had at 3½d. per lb., but is of unknown quality. Rock salt can be bought for 1 cent per lb. in bulk. It is desired to treat 2,000,000 gallons per day, and later to increase this to some 4,000,000 gallons. The water is very hard, but clear. We should be glad if firms who handle water-sterilising plants would send particulars of them direct to Mr. Wynne-Roberts, Regina, P.O. Box 65, and we should be obliged if they would at the same time notify us that they have sent such details.

THE CHRISTMAS HOLIDAYS.

Owing to the necessity for going to press earlier than usual, news and advertisement matter intended for insertion in the Christmas-week issue of "The Surveyor" must reach us not later than Tuesday morning, December 24th.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

ELEVENTH ANNUAL DINNER.

The annual dinner of this association was held at the Holborn Restaurant on Thursday night, the 12th inst., Dr. A. Bostock Hill, M.D., D.Sc., F.I.C. (medical officer of health for Warwick), the new president, being in the chair. Among those supporting the chairman were Dr. George Reid (past-president), Dr. Samuel Rideal (past-president), Mr. W. J. Dibdin (past-president), Mr. Sidney R. Lowcock, M.Inst.C.E., Prof. Henry Adams, Lieut.-Colonel A. S. Jones, V.C., Captain Jones, Mr. W. C. Easdale (Westminster), Mr. H. C. H. Shenton (Westminster), and Mr. E. White Wallis (secretary of the Royal Sanitary Institute).

After the customary loyal toast had been honoured,

The PRESIDENT said it was his pleasant duty to make a presentation to their old and revered friend Lieut.-Colonel Jones, V.C. He believed that nothing would be more dissonant to that gentleman's feelings than that he should dilate in an exaggerated form upon the many achievements that had made him one of the remarkable men of the age, but he must at all events say that they bore in mind the great service he had rendered on the field of battle. He referred to the fact that Lieut.-Colonel Jones had received at the hands of his Sovereign the most coveted distinction that any Britisher could have; and since he left the field of war for the fields of peace he had devoted his energies and his mind to a consideration of the principles underlying sewage disposal. Whether as a hero, or as one engaged in the scientific and practical work of sewage disposal, or, better still, as one whom they regarded as an upright gentleman in the best and truest sense of the word, he had the greatest pleasure in asking Lieut.-Colonel Jones to accept from them a small token of the high honour in which they held his services. He would present the gift—a stationery cabinet—with the words: "Titles add naught to his worth who is himself an honour to his title."

Lieut.-Colonel JONES, who was warmly applauded on rising to acknowledge the presentation, remarked that he was utterly floored on such an occasion as this. He could not thank them sufficiently for the great honour they had conferred upon him, but he must add that he felt utterly unworthy of their gift. He thought it must have been suggested by somebody who knew his slovenly writing habit, or somebody with an exaggerated idea of the proverb, "It's never too late to mend." Referring to his sewage farm experience, Lieut.-Colonel Jones said it was true he had left things in good order, but he had not, like his predecessor, to reclaim the land. It was the late James Beckham from whom he learned what he knew of sewage farming. For fourteen years he worked at the reclamation of the land, and he (Lieut.-Colonel Jones) then took up the work and continued it for seventeen years. When he had been in difficulties he was glad to say he had always had friends to help him out of them.

Dr. GEORGE REID, in proposing "The President," said that the name of Bostock Hill was so well known to be associated with the highest traditions and ideals of public health service that it was unnecessary for anything to be said to commend their president to their acceptance and appreciation. It must be a great satisfaction to Dr. Bostock Hill to see the numerous successes which were the direct result of his work and investigations. Since the publication of the last report of the Royal Commission, however, he (Dr. Reid) was afraid they would not be able to do with the local authorities what they had been able to do in the past. Only recently a county authority had received from a rural council a communication stating that they did not propose to proceed with certain projected works, and quoting as their authority the report of the Royal Commission. This particular district happened to be an extremely insanitary one, with a population upon the banks of a pure stream, who were anxious to turn their sewage into that stream. He ventured to suggest that one or some of the report would be greatly to the advantage of the expert witness. The commissioners had so extended the definition of purity, and mentioned so many circumstances that had to be taken into account, that he foresaw a great many opportunities for the intervention of the expert.

The PRESIDENT in response, expressed his high appreciation of the compliment they had paid him, not only that night, but in asking him to preside over this association for the coming year. He might say that the earliest knowledge he had was obtained in medical and public health circles, and almost the first thing he could remember was going, between 1860 and 1870, to take samples at the old Saltley sewage works, in the borough of Birmingham. They were all officers working for the good of the public health by seeking in their various spheres to prove those problems which were waiting for solution, and upon the solution of which would depend their progress in the cause of public health. The association was to be congratulated on the fact that its members gave to each other from the store of their knowledge facts which would otherwise go unrecorded. They must have bases for their theories, and the facts collected by the members and criticised by them were of the greatest value in the progress of the science in which they were all interested. With respect to the eighth report of the Royal Commission, he wished to take the opportunity of saying that after the enormous amount of time consumed by the commissioners, and the vast sums of money spent by them, he thought the results, as summarised, wonderfully small. He really doubted whether they were any advance at all, and he was inclined to believe that they tended to put back the clock rather than advance it.

The PRESIDENT next asked Mr. Daniel Ledsom to accept from the members an illuminated address and a roll-top desk, as part of the debt of gratitude the association wished to pay for his services to it, as well as an expression of regard and esteem.

Mr. LEDSOM returned thanks in a brief speech, saying it had been a work of pleasure for him to act as secretary for the Manchester district.

Dr. SAMUEL RIDEAL submitted "The Association," and incidentally alluded to the report of the Royal Commission. It was interesting to know, he said, that in America, where they had also had a sewage commission holding an inquiry, the commissioners had arrived at almost the same conclusion as the British Commissioners. They had concluded that effluents were not to be judged *per se* as effluents, but that the stream into which the effluent flowed was to be judged as suited or not for the work it had to do. With respect to the association, they had enrolled twenty-one new members since the last annual meeting, and there was now a total membership of 238, which, he thought, was very creditable after an existence of eleven years. He trusted that the status of the sewage manager would be appreciated and grow, and that he would be more and more looked upon as a public health officer carrying out public health work.

Mr. SIDNEY R. LOWCOCK and Mr. J. B. CROLL replied in speeches showing the strength and financial prosperity of the association. There was, it was stated, considerably over £300 in hand, while £150 had been added to the reserve, and a bank balance of nearly £85 had been carried forward.

Mr. GEORGE A. HART proposed "Kindred Societies," remarking that the sewage works manager was necessarily a handy man, as he was supposed to be an expert agriculturist on the one hand, while on the other he might be called upon to give an opinion upon an abstruse matter of mechanical repair.

Prof. HENRY ADAMS, in his response, remarked that kindred societies divided themselves into medical and engineering groups, and there was no rivalry or jealousy between them.

Mr. W. J. DIBDIN gave "The Visitors." They were told, he said, that there was nothing new under the sun. This was proved by the substance of the report of the Royal Commission, which was the same as the substance of the evidence he had the honour of placing before the Royal Commission twenty-eight years ago in regard to the treatment of London sewage. They had, he thought, reason to be satisfied with the result of their treatment of the sewage of London, as they had attained their object, not so much of obtaining drinking water, but of removing from the Thames the horrible impurities which then made the water so black that it was possible to write a letter with it.

Mr. WHITE WALLIS responded.

Bayard Cars.—Messrs. Clement Talbot, Limited, who are the sole concessionaires in the British Isles for Clement Bayard cars, manufactured by Mons. A. Clement Bayard, of Levallois, Paris, have taken premises at 98 High-street, Marylebone, W., for the purpose of handling these excellent French cars, under the name of Bayard Cars, Limited.

SOME RECENT PUBLICATIONS.*

The Geology of Soils and Substrata: With special reference to Agriculture, Estates and Sanitation. By Horace B. Woodward, F.R.S., F.G.S. Price 7s. 6d. nett. London: Edward Arnold.

The range of this important work is correctly indicated by its title, and the subjects which receive special attention are those mentioned in the subtitle, using the three words in a wide significance. While the importance of the book will be best appreciated by those who exercise some superior control over land development and estates management, scientifically or administratively, it will prove stimulating and suggestive to a larger class, including many who are practically engaged on work connected with soils and substrata, and all Englishmen who wish to know their England, for, wide as is the scope of the book, the author's intimate knowledge of his country gives a peculiar charm to those parts of it which deal specifically with places in England. As is customary and desirable in a work of this kind, the illustrations are in many cases *the* illustrations which have passed the test of recognition in scientific journals. Such are the general geological sections, many of which are excellent drawings from "The Geology of England and Wales." The author has, in addition, provided liberally in this matter for the special requirements of the work before us, so that the illustration of the book is throughout excellent.

Engineers must not expect to find more than passing references to roads and to irrigation works, and these references seem in some cases hardly to be called for, since the author is necessarily precluded from going further into the subjects; but in both branches of engineering the book, indeed as a whole, is of much value. An important feature is the continual reference by footnotes, and by lists of papers and books placed at the ends of chapters, to authoritative matter relating to the many subjects briefly dealt with in the work itself, and another valuable feature is an index of seventeen pages.

After a brief introduction the author deals, in three chapters, with the relations between geology and the soil, and the preparation of geological and soil maps. A chapter on subsoils and substrata is followed by an account of weathering and the formation of surface soils, these three chapters forming a group in which the nature of soils and substrata, from this point of view, is dealt with very effectively. Climates and other physical influences are next considered, and a chapter on analyses, soil constituents and plant foods is followed by an excellent summary of the main facts as regards the relation of geology to fertility and barrenness of land. A chapter on drainage and irrigation includes some account of water meadows, which are valuable assets in many pastoral districts in England. The author fails to note, however, that in many cases the usefulness of the water in producing early crops of grass is due, not to its effect in wetting the soil, but to the quantity of heat which it contains in the range of temperature between that of the open soil and that of the underground stores of water which feed the springs. Next follows a chapter on manures, a useful portion of which is the account of natural mineral manures; and the author then deals with forests, orchards, market gardens, and vineyards. The next two chapters, which will no doubt prove of special interest to estate owners, are devoted to a summary of important facts relating to mineral rights and economic materials, sites for houses, farm drainage, and so on, with some very useful remarks as to water supply and drainage. The remainder of the paper is devoted to a summary of the main features of the geological formations of England and Wales in relation to the subject of the book, and here the author is able to make excellent use of his profound study of English and Welsh geology, a knowledge of which is of great value generally as a basis for special studies in other parts of the world.

The subject dealt with is one in which the faculty of judgment in matters of fact, and a good sense of the value of evidence, are of more importance than the literary skill and talent for composition which might otherwise be missed in the volume before us, and the author has succeeded in writing a book which stands as a clear presentment of a subject of great economic importance and as an authoritative marshalling of leading facts.

Structural Economy. By E. A. Slater, Assoc.M. Inst.C.E. Price 6s. nett. London: The St. Bride's Press.

This work, which is based entirely upon the author's practical experience and observation of the matters upon which he writes, must not be confused as regards its scope with the ordinary descriptive text-books on the details of building or engineering construction. Its object is to enable the reader to compare possible alternative methods of construction in any given case as regards economy and efficiency, so that the maximum value may be obtained from the capital sunk in a building. In dealing with various parts of structures from this point of view, the author not only has regard to the first cost of the different modes of construction, but he also takes into consideration their respective costs of maintenance. The book is not confined entirely to those matters which affect the builder and architect, but it also touches on engineering matters—such as roads, tramways and reservoirs. Further, such calculations as are required to enable the reader to follow the argument are set out at the end of the book—and they are all of a simple character. The specific matters dealt with include, among others, foundations, walls, ground and upper floors, roofs and roofing materials, girders, ventilation, heating, drainage, corrugated iron buildings, fencing, planning of buildings, economical planning of an industrial suburb, paving, roads, tramways, quays, reservoirs, bridges and cuttings. The costs of the various alternatives are worked out in detail, with full explanations and notes in each case, so that the value of the book to the engineer or architect will be readily appreciated. An example at random of the method adopted is afforded by the treatment of boundary fencing. A detailed comparison is given of the costs of deal fencing, 9-in. brick wall in cement, unclimbable iron fence, and pier and panel concrete wall; hints on construction are given; and the text is well illustrated. The book will prove an invaluable addition to the library of the engineer, architect, or contractor, and its use as a reference work in daily practice will save many a sovereign which would otherwise have been spent without any corresponding improvement in the building or structure concerned.

The Royal Insurance Company, Limited have issued a sixth edition of their now well-known little red-covered book, "Rules of Golf." We have no doubt our golfing readers can obtain it free of charge on application to the general manager, 1 North John-street, Liverpool.

Skeleton Frame Buildings: District Surveyors' Fees.

On the 9th inst. at Lambeth Police Court Mr. Hopkins, Messrs. Spiers & Son, Limited, builders, of Hill-road, St. John's Wood, the *Times* reports, were summoned by Mr. Bernard Dicksee, district surveyor, for the recovery of £18 19s. 9d., fees alleged to be due to him in respect of a building at New Kent-road. This was a friendly action brought before the court in order to obtain a decision as to the fees payable to district surveyors in respect of skeleton frame buildings. Before the London County Council (General Powers) Act of 1909 all the London building Acts were based on the assumption that the buildings would be of brick construction. In order to meet the case of steel frame buildings the Act of 1909 was passed. Section 26 of that Act provides that the amount of the fee payable to district surveyors in respect of such buildings shall be equal to 2½ times the amount of the fee specified in regard to new buildings in Part I. of the third schedule of the Act of 1894. The contention of Mr. Pasmore, on behalf of the district surveyor, was that that fee was in addition to, and not in substitution of, the fee specified in the Act of 1894. The account of Mr. Dicksee was put in. It included an item of £4 2s. 6d., the fee chargeable under the old Act, in addition to the fee of £10 6s. 3d. payable under the 1909 Act, and it was to the former item that the defendants took exception. Mr. Dicksee, in giving evidence, said the amount of extra work entailed by steel frame buildings was perfectly enormous. On behalf of the defendants Mr. Price argued that the natural interpretation of sec. 26 of the Act of 1909 was that the fee therein stated was in substitution for the fee provided by the Act of 1894. Mr. Hopkins took that view, and gave judgment for the district surveyor for the amount claimed, less the £4 2s. 6d. in dispute.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. THOMAS, M.INST.C.E., County Surveyor, Buckinghamshire.

SCOTTISH DISTRICT MEETING.

A meeting of the Scottish District will be held at Falkirk on Saturday, December 21st.

SOUTH-EASTERN DISTRICT.

A meeting of members of the above district will take place at Sidcup at 2.30 p.m. on Wednesday, January 8th, when the road sections will be inspected.

Mr. Maybury has kindly consented to supply the revised cost of the trial lengths up to December 31st; the meeting will be followed by a dinner at Frascati's Restaurant, Oxford-street, at 6.30 p.m.

MEETING AT SWANSEA.

A meeting of the institution will be held at Swansea on Saturday, January 11, 1913.

NORTH-EASTERN DISTRICT.

A meeting of the institution will be held in the North-Eastern District at Newcastle-on-Tyne on May 2nd and 3rd next.

THOMAS COLE,
Secretary.

11 Victoria-street, S.W.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* **THE SURVEYOR** *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

BOROUGH SURVEYOR AND INSPECTOR OF NUISANCES.—December 21st.—Corporation of Ludlow. £200 per annum.—Mr. John H. Williams, town clerk.

SURVEYOR.—December 21st.—St. Bartholomew's Hospital.—Mr. Thomas Hayes, clerk to the governors.

CLERK OF WORKS.—December 21st.—East Suffolk County Council.—Mr. W. Jervis, chief surveyor of main roads, County Hall, Ipswich.

TEMPORARY ASSISTANT.—December 21st.—Corporation of Rotherham. £2 10s. per week.—Mr. Ernest B. Martin, borough engineer.

DEPUTY BOROUGH ENGINEER AND SURVEYOR.—December 23rd.—Corporation of Warrington. £200 per annum.—Mr. Andrew M. Ker, borough engineer and surveyor.

SURVEYOR.—December 27th.—Consett Urban District Council. £175—£205.—Mr. H. Jackson, clerk.

SURVEYOR'S ASSISTANT.—December 27th.—Consett Urban District Council. £52—£67.—Mr. H. Jackson, clerk.

TEMPORARY ARCHITECTURAL ASSISTANT.—December 28th.—Dartford Urban District Council. £2 10s. per week.—Mr. T. E. Tiffin, surveyor.

CLERK OF WORKS.—December 28th.—Hyde Town Council.—Mr. T. Brownson, town clerk.

ARCHITECTURAL ASSISTANT.—December 30th.—Corporation of Nelson. £90 per annum.—Mr. J. H. Baldwick, town clerk.

CLERK OF WORKS.—December 30th.—The Rivers Commissioners of the Manchester Corporation. £3 3s. per week.—Mr. Thomas Hudson, town clerk.

ENGINEER-IN-CHIEF.—December 31st.—Mersey Docks and Harbour Board.—Mr. Alfred Chandler, general manager and secretary.

STEAM-ROLLER DRIVER.—December 31st.—Corporation of King's Lynn. 27s. per week.—Mr. Alfred J. Smith, borough surveyor.

INSPECTOR OF NUISANCES AND SURVEYOR.—December 31st.—Shoreham Urban District Council. £225 per annum.—Mr. H. Brown, clerk.

SECOND ASSISTANT SURVEYOR.—January 3rd.—Cannock Urban District Council. £52 per annum.—Mr. C. A. Loxton, clerk.

ASSISTANT.—Blackwell Rural District Council. £75 per annum.—Mr. H. Silcock, surveyor, 67 Westgate, Mansfield.

MUNICIPAL COMPETITIONS OPEN.

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BELFAST.—January 1st.—Designs for 126 houses of two apartments each, and 126 houses of three apartments each, for the corporation. Premiums are offered of £25, £15, and £10.—Mr. R. Meyer, town clerk.

ORSETT (Essex).—January 1st.—For the construction of a sewerage and sewage disposal scheme in the parish of South Ockendon, for the Orsett Rural District Council. Premiums of £50 and £25 are offered.—Mr. James Beck, clerk, 2 Orsett-road, Grays.

HARROGATE.—February 3rd.—Designs for a council school, for 675 children.—Mr. C. E. Rivers, ASSOC.M. INST.C.E., borough engineer.

DUBLIN.—February 6th.—Designs for municipal buildings for the corporation. The proposed expenditure is £50,000, and the author of the design placed first will be appointed to carry out the scheme on a 5 per cent basis. Premiums of £150 and £100 are offered. The assessor is Mr. Albert E. Murray, F.R.I.B.A.—The Town Clerk.

RANGOON.—March 1st.—Designs for municipal buildings. Premiums are offered of £300, £200, and £100.—The Clerk to the Rangoon Municipality.

WINNIPEG.—March 1st.—Designs for city hall. Limited to British architects in Canada. Premiums are offered of 5,000 dols., 3,000 dols., and 2,000 dols.—The Clerk.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* **THE SURVEYOR** *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

Buildings.

BRAINTREE.—December 21st.—For the erection of caretaker's lodge, and dressing boxes at public baths, for the urban district council.—Mr. H. H. Nankivell, surveyor.

STAFFS.—December 21st.—For the erection of an institute, for the Education Committee.—Mr. G. Balfour, director of education, County Education Offices, Stafford.

WARRINGTON.—December 21st.—For the construction of concrete foundation works, for the corporation.—Mr. James Gray, water engineer.

BRADFORD.—December 21st.—For alterations to schools and erection of a boundary wall, for the Education Committee.—Director of Education, Town Hall.

EXETER.—December 23rd.—For the extension of the isolation hospital, for the corporation.—Mr. H. Lloyd Parry, town clerk.

PRESTWICH.—December 23rd.—For the erection of buildings and walls in connection with the extension of the town's yard, for the urban district council.—Mr. Lewis A. Orford, clerk.

HAMBLEDON.—December 23rd.—For the construction of a reservoir, for the rural district council.—Mr. F. Smallpiece, clerk, 138 High-street, Guildford.

PORTSMOUTH.—December 23rd.—For repairs and alterations at schools, and pulling down four houses, for the Education Committee.—Mr. G. Hammond Etherton, clerk.

TWICKENHAM.—December 27th.—For the construction of a stone-pitched inclined embankment along the river frontage, for the urban district council.—Mr. H. Jason Sanders, clerk.

SOUTHAMPTON.—December 30th.—For the reconstruction of Fore Bridge, for the county council.—Mr. H. Barber, clerk, The Castle, Winchester.

ALTRINCHAM.—December 30th.—For the erection of a shelter and conveniences, for the urban district council.—Mr. H. E. Brown, surveyor.

SOUTHGATE.—December 31st.—For the construction of an open-air swimming bath, for the urban district council.—Mr. C. G. Lawson, surveyor.

EAST HAM.—December 31st—January 21st.—For the erection of a school, for the Education Committee.—Mr. F. R. Thompson, secretary, Town Hall.

EAST RIDING.—January 1st.—For alterations to school, and erection of a school and teacher's house, for the county council.—Mr. J. Bickersteth, clerk, County Hall, Beverley.

HERTS.—January 2nd.—For the erection of a police station, for the Standing Joint Committee.—Mr. U. A. Smith, county surveyor, Hatfield.

CHATHAM.—January 4th.—For the erection of a school, for the Education Committee.—Mr. G. F. Bond, High-street, Rochester.

MANCHESTER.—January 8th.—For reinforced concrete work, for the corporation.—Mr. Thos. Hudson, town clerk.

WEST RIDING.—January 10th.—For the erection of a school, for the Education Committee.—Mr. Francis Alvey Darwin, clerk, County Hall, Wakefield.

PEMBROKE.—January 11th.—For the erection of a school, for the Education Committee.—Mr. H. E. H. Jones, clerk, County Education Offices, Haverfordwest.

FLINT.—January 14th.—For the erection of an elementary school, for the county council.—Mr. Sam. Evans, county surveyor, County Offices, Mold.

LANCASHIRE.—January 14th.—For the erection of a school, for the Education Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

MANCHESTER.—January 15th.—For the construction of a public library, for the corporation.—Mr. Thos. Hudson, town clerk.

Iron and Steel.

BRADFIELD.—December 21st.—For the supply of engines and pumps for waterworks at Stratfield Mortimer, near Reading, for the rural district council.—Mr. R. E. Rawstorne, clerk, 4 Bridge-street, Caversham, Reading

SALFORD.—December 23rd.—For the erection of three "Livesey" washers at gasworks, for the corporation.—Mr. L. C. Evans, town clerk.

BURY.—December 27th.—For the supply of iron castings, for the District Joint Water Board.—The Clerk, Bank-street, Bury.

RYE.—January 8th.—For the supply of cast-iron socket pipes and irregulars, for the corporation.—Mr. W. Dawes, town clerk.

SWANSEA.—January 9th.—For the supply of steelwork, for the Harbour Trustees.—Mr. T. Strick, clerk.

Roads.

HAMPSHIRE.—December 23rd.—For the formation of a gravelled footway, for the county council.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

EGREMONT.—December 23rd.—For works of kerbing and paving, for the urban district council.—Mr. John Nelson, clerk.

SOUTHALL-NORWOOD.—December 24th.—For making up and channelling work, for the urban district council.—Mr. R. Brown, engineer and surveyor.

ELGIN.—December 24th.—For the supply of road metal, for the county council.—Mr. A. Hogg, county road surveyor, 24 Academy-street, Elgin.

MERTON.—December 27th.—For making up a road, for the urban district council.—Mr. G. Jerram, surveyor.

EXMOUTH.—December 28th.—For excavation, sand filling making concrete footpaths, foundations of carriageways, and supply of tar-macadam for finishing coat of carriageways, for the urban district council.—Mr. Samuel Hutton, engineer.

WALMER.—December 28th.—For the supply of clean flints, for the urban district council.—Mr. H. W. Barker, surveyor.

DERBYSHIRE.—December 30th.—For the supply of granite, basalt, slag, limestone, tarred macadam, and tarred chippings, for the county council.—Mr. J. W. Horton, county surveyor, St. Mary's Gate, Derby.

LLANTRISANT AND LLANTWIT FARDRE.—January 1st.—For the completion of the new Ely Valley-road, and branch roads, about 3 miles in length, for the rural district council.—Messrs. Gomer S. Morgan & Thomas Saunders, engineers, School-street, Pontyclun, Glam.

SEVENOAKS.—January 1st.—For the supply of chert, flints and ragstone, granite, quartz, basalt, steam rolling, team labour, cartage and hauling, for the rural district council.—Mr. F. H. Vibert, clerk.

HULL.—January 1st.—For flagging work, for the town council.—Mr. A. E. White, city engineer.

HARWICH.—January 1st.—For the supply of broken granite and granite chippings, for the corporation.—Mr. F. Harold French, borough surveyor.

HOVE.—January 1st.—For laying wood paving, for the corporation.—Mr. H. H. Scott, borough surveyor.

DENBIGH.—January 1st.—For the supply of road stone and tar-macadam, for the county council.—Mr. Ellis W. Jones, county surveyor, Wrexham.

WHITLEY UPPER.—January 1st.—For road rolling and scarifying, for the urban district council.—Mr. Joe Sharp, clerk.

READING.—January 2nd.—For making-up work, for the corporation.—Mr. J. Bowen, borough engineer.

SALE.—January 2nd.—For works of paving and flagging, for the urban district council.—Mr. D. Hallewell, clerk.

DORSET.—January 4th.—For steam rolling on 458 miles of main roads for three years, for the county council.—Mr. W. Townshend Fletcher, county surveyor, Dorchester.

DORSET.—January 4th.—For the supply of granites, basalts, quartzites, limestones and tar-macadam, for the county council.—Mr. W. Townshend Fletcher, county surveyor, Dorchester.

NORTH RIDING.—January 4th.—For work of steam rolling and scarifying, for the county council.—Mr. W. G. Bryning, county surveyor, County Hall, Northallerton.

SUNBURY-ON-THAMES.—January 6th.—For the supply of 4,000 gallons of refined tar, for the urban district council.—Mr. H. F. Coales, surveyor.

GLANFORD BRIGG.—January 6th.—For the supply of granite and slag, for the rural district council.—Mr. Frank C. Hett, clerk.

EASTHAMPSTEAD.—January 7th.—For the supply of broken or unbroken granite, slag, limestone and flints, for the rural district council.—Mr. C. B. Wilson, clerk.

EAST GRINSTEAD.—January 8th.—For the supply of 20,000 gallons of tar, prepared in accordance with the Road Board's specification for tar No. 1, for the rural district council.—Mr. Francis S. White, clerk.

KESTEVEN.—January 8th.—For steam-rolling work, for the county council.—Mr. W. B. Purser, county surveyor, Grantham.

MIDHURST.—January 11th.—For the supply of granite and tar-macadam, for the rural district council.—Mr. A. G. Gibbs, surveyor.

ANTRIM.—January 11th.—For tar treatment and steam rolling in certain roads, for the county council.—Mr. Alexander Millar, deputy-secretary, County Courthouse, Belfast.

GLOUCESTER.—January 13th.—For the supply of road stone, for the county council.—Mr. S. E. Sinnott, county surveyor, Shire Hall, Gloucester.

CHELMSFORD.—January 16th.—For carrying out street work, for the corporation.—Mr. G. Melvin, town clerk.

SCUNTHORPE.—January 29th.—For making up a certain street, for the urban district council.—Mr. W. M. Hett, clerk.

Sanitary.

HARROGATE.—December 21st.—For the supply of disinfectants, for the corporation.—Mr. James Mair, medical officer of health, 33 Swan-road, Harrogate.

COATBRIDGE.—December 21st.—For the construction of sewage disposal works in reinforced concrete, for the corporation.—Mr. John Alston, town clerk.

MIDHURST.—December 23rd.—For the removal of house refuse and street scavenging, for the rural district council.—The Clerk.

LIMAVADY.—December 23rd.—For the construction of sewers, for the rural district council.—Mr. S. H. Crawford, clerk.

KILRUSH.—December 24th.—For the construction of sewerage works, for the rural district council.—Mr. T. J. Kelly, clerk.

LANCHESTER.—December 25th.—For laying pipe sewers, for the rural district council.—Mr. W. H. Ritson, clerk.

BOSMERE AND CLAYDON.—December 26th.—For scavenging work, for the rural district council.—Mr. R. M. Cook, clerk, 6 Providence-street, Ipswich.

FRIMLEY.—December 28th.—For the removal of house refuse for three years, for the urban district council.—Mr. F. T. S. Marsh, clerk, Municipal Buildings, Camberley.

WOKING.—December 30th.—For the construction of sewers and manholes, for the urban district council.—The Clerk.

LEYTON.—December 31st.—For laying stoneware sewers, for the urban district council.—Mr. E. H. Essex, Town Hall.

HARWICH.—January 1st.—For laying sewers and other works, for the corporation.—Mr. F. H. French, borough surveyor.

KIRKCUDBRIGHT.—January 2nd.—For the construction of a drainage scheme, for the county council.—Mr. William McConnel, district clerk, Gatehouse-of-Fleet.

READING.—January 2nd.—For works of sewerage, for the corporation.—Mr. W. S. Clutterbuck, town clerk.

SOUTHWELL.—January 2nd.—For constructing sewerage and settling tank, for the rural district council.—Mr. J. Ellis, clerk.

BUNTINGFORD.—January 8th.—For the construction of a precipitation tank at sewage works, for the rural district council.—Chairman of the Council.

PORT SAID.—March 1st.—For the construction of drainage works, for the municipality.—Mr. A. L. Webb, C.M.G., Queen Anne's Chambers, Broadway, Westminster.

Stores.

DOUGLAS (Isle of Man).—December 27th.—For the supply of stores for the several departments, for the Stores Committee.—Borough Surveyor.

HASTINGS.—December 30th.—For the supply of soap, soda, manhole covers, gullies, brooms and brushes, for the corporation.—Mr. P. H. Palmer, borough engineer.

SLOUGH.—January 4th.—For the supply of stoneware pipes, gullies, Portland cement, tar oil, distilled tar, Tarvia and prepared granite or macadam, for the urban district council.—The surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BLAYDON.—For works of making-up, for the urban district council:—

J. W. Henderson, Gosforth	£1,880
J. Friend, Blaydon-on-Tyne	1,742
G. Armstrong, Whitley Bay	1,715
G. Dyon, Chester-le-Street*	1,662

Surveyor's estimate, £1,830.

CHELSEA.—For the reconstruction of a portion of the Ranelagh sewer under Chelsea Hospital gardens, for the London County Council:—

Holloway Brothers, Limited, London	£12,420
J. Ford, Willesden	11,698
J. Mowlem & Co., Limited, London	10,823
W. Underwood & Brother, Dukinfield	10,803
E. Bentley & Son, Tooting, S.W.	9,800
Airds, Limited, London	9,498
Griffiths & Co., Limited, London	9,168
J. Cochrane & Sons, Limited, London	7,784

Chief engineer's estimate, £8,600.

HOVE.—For paving and other works, for the corporation.—Mr. H. H. Scott, borough surveyor:—

J. Parsons & Sons, Hove, £479.

ISLINGTON.—For the enlargement of the girls' and infants' playground of the Pakenham-street school, Islington, for the London County Council:—

W. Silk & Son, Homerton	£1,185
A. J. Staines & Co., Limited, London	1,252
E. Lawrence & Sons, Limited, City-road	1,213
G. S. S. Williams & Son, Barnsbury	1,192
W. Benson, London	1,179
W. Lawrance & Son, London	1,120
McLaughlin & Harvey, Limited, Islington	1,093
Stevens & Sons, Crouch hill	1,080
Brand, Pettit & Co., Tottenham†	1,026

The architect's estimate, £1,174.

MATLOCK.—For alterations and additions to the town hall, Mr. J. Turner, surveyor:—

J. W. Wildgoose, Matlock	£243
W. Boden, Matlock	245
F. Hopkinson, Matlock	234
E. W. Tayara, Matlock*	233

PONTARDAWE.—For laying sewers and water mains, for the rural district council.—Mr. John Morgan, engineer, Herbert-chambers, Pontardawe.

Contract No. 1.

T. Walker, Clydach	£546
S. R. Hill, Sketty	466
R. Clarke, Pontardawe*	418

Contract No. 2.

E. J. Hanney, Morriston	£637
T. Walker, Clydach	636
S. R. Hill, Sketty*	631

RHYMNEY.—For works of street improvement, for the urban district council.—Mr. William Lloyd Marks, surveyor:—

Evan & Co., Nelson, £262.

ROCHDALE.—For making-up a certain street, for the corporation:—

R. & Y. Howarth, Rochdale.

STOCKPORT.—For the erection of a shelter, bowl-house and tennis pavilion, for the corporation.—Mr. J. Atkinson, borough surveyor:—

D. Eadie & Co., Limited, Stockport, £785.

TRING.—For street and sewerage works, for the urban district council:—

MAKING UP LONGFIELD-ROAD.

R. W. Swaker, Hounslow	£3,265
W. Wright, Chesham	2,766
Langley & Johnson, Slough	2,681
Exors. of J. Smith, Hughenden	2,606
Green & Co., Aylesbury	2,490
W. Lee, High Wycombe	2,450
H. Williams, St. Albans	2,356
Free & Sons, Maidenhead*	2,293

Surveyor's estimate, £2,263.

SEWER IN BEACONSFIELD-ROAD.

Langley & Johnson, Slough	£152
H. Williams, St. Albans	142
Green & Co., Aylesbury	119
W. Lee, High Wycombe	125
Free & Sons, Maidenhead	125
W. Wright, Chesham*	110
R. W. Swaker, Hounslow	110

Surveyor's estimate, £120.

SEWERS IN MISWELL LANE AND AYLESBURY-ROAD.

Langley & Johnson, Slough	£266
H. Williams, St. Albans	260
Green & Co., Aylesbury	244
Free & Sons, Maidenhead	243
W. Lee, High Wycombe	230
W. Wright, Chesham*	226
R. W. Swaker, Hounslow	226

Surveyor's estimate, £200.

UXBRIDGE.—For the collection and removal of house refuse, for the rural district council.—

Cowley Parish.—R. Martin, Uxbridge, £24.*
Harefield.—C. Filkens, Harefield, £50; H. Tilley, Harefield, £17.*
Hillingdon.—G. Salter, Hayes, £61; F. Whale, Hillingdon, £57*; R. Martin, Uxbridge, £50.
Northolt.—F. J. Reed, Northolt, £32.*
West Drayton.—F. Cook, West Drayton, £49.

WAKEFIELD.—For the execution of private street works, for the corporation.—Mr. J. P. Wakeford, city surveyor:—

Dale-street.—G. Hall, Wakefield, £330.
Jessop-street & Pilkington-street.—Higgins & Pashley, Wakefield, £517.

WEST HAM.—For the erection of fire brigade station and firemen's dwellings at Silvertown, for the corporation.—Mr. J. G. Morley, borough engineer:—

A. & S. Wheater, London	£8,199
Leslie & Co., Limited, Kensington	7,919
Newman, Limited, Ilford	7,705
E. Proctor & Sons, Plumstead	7,699
W. Payne, Watford	7,466
H. C. Horswill, Forest Gate	7,403
F. & G. Foster, Norwood	7,436
F. J. Coxhead, Leytonstone	7,290
S. E. Moss, Southend-on-Sea	7,150
J. W. Jerram, East Ham	6,915
A. E. Symes, Stratford*	6,914
O. P. Drever, Kettering	6,820

WEST HAM.—For the erection of a handicraft centre, for the corporation:—

W. J. Maddison, Canning Town	£919
J. J. Quarterman, Upton Park	900
A. Webb, Stratford	509
J. W. Jerram, East Ham	806
W. J. Clemens, Stratford	833
F. J. Coxhead, Leytonstone	817
Turnbull & Son, London	800
S. Blow, Limited, London	779
A. E. Symes, Stratford	777
J. Barker & Co., Plaistow	745
H. C. Horswill, Forest Gate	737
J. T. Luton, Stratford*	697

The committee rejected one tender which was not sent by registered post as required by the regulations.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

DECEMBER.

21.—Institution of Municipal and County Engineers: Scottish District Meeting at Falkirk.
21.—Institution of Municipal Engineers: Council Meeting.

JANUARY.

8.—Institution of Municipal and County Engineers: South Eastern District Meeting at Sidcup.
9.—Concrete Institute: Mr. W. Valentine Ball, Barrister-at-Law, on "Concrete in its Legal Aspect." 7.30 p.m.
11.—Institution of Municipal and County Engineers: Meeting at Swansea.

The Surveyor

And Municipal and County Engineer.

Vol. XLII. DECEMBER 27, 1912. No. 1,093.

Minutes of Proceedings.

Royal Commission on Sewage Disposal.

The work in general of the Royal Commission, and its recently issued eighth report in particular, was the subject of the paper read by Lieut.-Col. Jones, V.C., M.INST.C.E., at the annual general meeting of the Association of Managers of Sewage Disposal Works. It is satisfactory to note that such an eminent authority as the author of the paper considers the recommendations contained in the report are "a common-sense view of the question, and if carried into effect the expense of much litigation and that of some unnecessary sewage treatment may be saved by ratepayers, besides gaining the advantage to all parties concerned of knowing for certain to what standard they must conform for periods of ten years." The paper was not discussed at any length, but from the brief remarks made upon the eighth report at the meeting and at the dinner which followed it the recommendations of the Commission are not considered satisfactory by medical officers of health and consulting chemists. So far as could be ascertained, this view is not held by sewage works managers and engineers who have charge of sewage disposal works. Everything will, of course, depend upon the manner in which the standards are administered, and, as Lieut.-Col. Jones points out, in the eighth report it is taken for granted that a central board and rivers authorities will be appointed as the commission proceeds to suggest rules for the procedings of such bodies. No definite reasons for their views were given by those who objected to the recommendations of this report, and we should have thought that the prescribing of a general standard by the authorities to be appointed for the purpose of preventing pollution and the fixing of definite periods during which such standards will apply, together with provisions for increasing or relaxing the stringency of the general standard according to the local conditions of particular cases, would have appealed to these objectors as being a fair and reasonable method of dealing with the subject. We shall, however, doubtless hear more of these objections later on.

As might be anticipated by those who are acquainted with the views held by the author of the paper, he regrets that so much of the outlay upon sewage disposal works is expended upon "artificial systems which can bring no money back, while land treatment grows valuable crops." We believe, however, that the idea of obtaining profit from the disposal of sewage is not now entertained to any great extent, and fortunately so, as, although it is not impossible to derive some little income occasionally from sewage works, it is of great importance that these should be operated with the sole view of disposing of the waste liquids without creating a nuisance, and experience has shown that this can only be done satisfactorily when all ideas of showing a profit are put on one side. With Lieut.-Col. Jones's suggestion that the Commission might have advised that sanitary authorities would find it good policy to increase the often inadequate salary of their sewage works managers we have every sympathy, but it would probably have been difficult to accept this as coming under their terms of reference. The only way in which this can be brought about is by educating local authorities to see that the efficiency of their works depends very largely upon the efficiency of their managers, and that efficient managers can only be secured and retained by the payment of adequate salaries. Fortunately the Association of Managers of Sewage Disposal Works is doing good work in this direction, and as it continues its efforts to provide efficient managers so will it have the effect of assisting to produce the adequate salaries which they so well deserve.

* * *

The Control of Advertisements.

The enormous increase in the practice of public advertisement which has taken place in recent years has not unnaturally led to a demand for some public control of a business (for such it is) which, although it has its legitimate uses, can so easily become a nuisance to the community. What are the proper functions of an advertisement? We are reminded of Carlyle's "Hatter in the Strand of London, who, instead of making better felt hats than another, mounts a huge lath and plaster Hat, seven feet high, upon wheels; sends a man to drive it through the streets; hoping to be saved *thereby*. He has not attempted to *make* better hats, as he was appointed by the Universe to do, and as with this ingenuity of his he could very probably have done; but his whole industry is turned to *persuade* us that he has made such!" We venture to say that if all the advertisements whose object is to *persuade* the public of a chimerical excellence were removed from our hoardings, the necessity for public regulation would be gone. The English law, however, is not so concerned with the effect on the national character of what Carlyle called the Deification of Quackery, as on the disfigurement of the landscape by hoardings and other vehicles of advertising. In these practical days we have to take things as we find them; and since the passing of the Advertisement Regulation Act, 1907, it is possible for local authorities at least to protect the amenities of their districts by exercising some control over the choice of sites to be used for advertising purposes. Whether the powers which are conferred by that Act are adequate for the achievement of the object in view is open to some doubt. It does not appear to have been put into force in many districts, only nineteen having made by-laws dealing with the control of advertisements under its provisions.

Mr. John S. Brodie, M.INST.C.E., the borough engineer of Blackpool, has collected very full information on the whole subject in a report which is being circulated for the information of members of the Institution of Municipal and County Engineers. The report will be found in another column.

and it shows what has been accomplished in various places, both under the general Act as well as under local Acts. The subject is one which will increase in importance with the growing complexity of our civilisation; for, as John Stuart Mill points out, if a man sets up business in a great community, "and trusts solely to the quality of his goods, he may remain ten years without a customer; be he ever so honest, he is driven to cry out on the housetops that his wares are the best." In a great community advertising is a necessity for the honest man and an opportunity for the quack. Hence the inevitability of its increase, and the necessity for placing it under public control.

* * *

Sub-Street Pipe Lines.

Municipal engineers in this country have realised to the full the wasteful expenditure and the serious inconvenience of reinstating roadways and footways after their cutting up for laying or repairing the sub-surface pipes that honeycomb them, but we do not remember to have seen the extent of the mischief expressed in exact terms. It has recently been done in America by Mr. George W. Tillson, consulting engineer, of Brooklyn, New York City, for the information of the road congress recently held at Atlantic City, and the figures are indeed striking. In the borough of Brooklyn, in 1911, the Bureau of Highways laid, over openings and trenches that had been made in the streets, sufficient pavements to pave a roadway 30ft. wide and 7 miles long. These facts, Mr. Tillson adds, are not peculiar to Brooklyn, and in other cities the extent of street openings is proportionate. The ideal remedy for this uneconomical process is, of course, subways for all pipes and wires, and it might be well worth considering how far their great capital cost could be lightened by charges to users. Meanwhile, Mr. Tillson points out, in New York a street cannot be paved until water, gas, and sewer mains have been laid and in Brooklyn, when a sewer is laid in an unpaved street, connections are made to the adjoining property, whether occupied or not, and their cost assessed against the lots benefited. In the same city there is a sub-surface bureau which is engaged in plotting accurately the positions of sub-surface structures. All applications for underground work are referred to this department, which, after an examination of the plans, assigns the location in the street for the proposed structure. This not only reduces to a minimum the tearing up of the pavements, but it also conserves the area of the street for future work. By locating the water mains of Brooklyn's new high-pressure system in the light of the knowledge gained from their plans, it is estimated that this department has saved the city an amount considerably more than the whole cost of the bureau to date. It is evidently possible, pending the arrival of the universal pipe-line subway, to do much, on lines suggested by the foregoing, to avoid some of the inconvenience and waste of money due to street openings. From a study of the condition of pavements which have been laid in front of cemeteries, parks, churches and other places where street openings are not often necessary, Mr. Tillson considers that, as a whole, street pavements in the business part of any city are damaged to an extent of 25 per cent of their cost by street openings.

* * *

Some Aspects of the French Highway System.

In a useful paper reproduced on another page of the present issue which he presented at the recent American Road Congress, M. de Pulligny dwelt upon several of the less familiar features of French road administration. While the main characteristics of the French system are well-known to most English highway engineers, we are confident that almost all of our readers will learn something fresh from M. de Pulligny's explanations of the financial arrangements as they have worked in actual practice, and from his lucid account of the measures taken for dealing with exceptional traffic. He also explained the position as regards certain associations which have, nominally, considerable powers in highway matters, though these powers have been exercised to only a small extent. As regards the suggestion that the example of France, in this respect, might be of some value to the United States, the position in the latter country seems to be such that there is, for the present, room for every kind of activity: the educational work of the Federal Government, the organisation of State highway departments or commissions, the local efforts of public-spirited citizens, and the propaganda of good roads associations. At the same time we must not lose sight of the idea so neatly expressed by Prof. F. P. Spalding, in the preface to his book on "Roads and Pavements," in the words: "The improvement of our common roads must come through transferring such work to the charge of those who make it a profession, and not through teaching the public how roads should be constructed." This is a shrewd blow at certain activities in the United States, but a worse thing would be that, in some country not to be mentioned, the public should want to teach the engineer how roads should be made and maintained.

The French system of highway administration is by no means a simple one, and some of the complications of financial adjustment and the apportionment of funds are referred to in M. de Pulligny's paper. It is clear that the example of France in this matter points to the importance of devising some simple method of arranging the finances of road administration in the interests of both economy and efficiency. As regards extraordinary traffic, the conditions in France seem to make it possible to deal with a considerable amount of exceptional traffic in a manner which offers important advantages over our own system. At the same time it is clear that such arrangements would by no means cover all the cases which at present are dealt with, when necessary, by legal procedure in this country. Beyond this we have to take the national temperaments into consideration, not only with regard to matters of this kind, but generally in dealing with proposed changes in highway administration in the light of experience in other countries.

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The Institute of Sanitary Engineers.

An event of more than ordinary significance is the election, reported elsewhere in this issue, of Mr. H. Percy Boulnois, M.INST. C.E., as president of the Institute of Sanitary Engineers. It will be agreed that Mr. Boulnois' long and distinguished career, first as a municipal engineer holding a number of important appointments, then as one of the chief engineering officials of the Local Government Board, and subsequently as a consulting engineer in private practice, render him par excellence a fitting head for the institute in question. He will read his presidential address at Caxton Hall, Westminster, on Monday, January 20th, and a fortnight later the Institute will hold its annual dinner at the Holborn Restaurant. The next few weeks are expected to witness a large accession of new members to support the popular incoming president and strengthen the hands of the council in their work in the interests of the profession.

The council of the Institute have been unsparing in their efforts to promote the study of sanitation in all its branches, and to further the interests of the profession. The sessional meetings during the past twelve months have been of great interest and importance. The papers, covering a wide range of subjects, and by authors exceptionally competent to deal with them, have evoked brisk and well-sustained discussions; and the names of the distinguished men who have presided over the meetings testify to the growing esteem in which the Institute is held. The exacting duties of sanitary engineers, and the many committee meetings which men holding a municipal appointment have to attend, render it increasingly difficult for the provincial members to be present at meetings in town. District

centres have accordingly been established at Birmingham, Manchester, and Northampton to afford more frequent opportunities of foregathering than would otherwise be possible. Good work has already been accomplished as a result of this departure, the several meetings which have since taken place having proved most successful from every point of view.

* * *

County Surveyors and Motor-cars.

As we reported last week, the decision of the Devon County Council to engage the services of a third county surveyor has been confirmed, as has also the recommendation of the Bridges and Main Roads Committee to pay each official an annual travelling allowance in future of £200 instead of £160. It was chiefly this latter proposition that gave rise to some criticism at the meeting of the council, and as usual the statement had to be combated that the use of a motor-car by the road surveyor was a luxury. This is, to say the least, a somewhat perverted view to take, for it seems to imply that in discharging their official duty the surveyors are out for pleasure, which is totally opposed to the real fact of the position: or else that a standard of comfort is lavishly provided at the cost of the rates for which no adequate return is given in the shape of serious and sufficient service. No self-respecting official would admit the validity of such a contention, which is indeed totally negatived by actual experience, which goes to prove that the invariable result of improved conditions of work is an improvement in the quality of the work performed. Our contemporary *The Western Daily Mercury*, in the course of some apt references to the subject, writes: "It is hard to resist Mr. Young's contention that surveyors are none the worse for a little experience of what some cynics call road nuisances. It is all to the good, too, that the surveyor should be as ubiquitous as possible. And is not the motor-car the ideal means of making 'surprise visits'? We do not know whether Mr. Fox would give preference to a flying machine for this purpose. But perhaps too much vol-planing would be objectionable. Earl Fortescue's significant hint was, perhaps, the heaviest weight that affected the balance. The extra outlay would be justified by the extra attention that would be given to the roads, even if the committee were not pledged to a portion of that outlay, 'by the correspondence with the Road Board.'"

* * *

District Surveyors' Fees.

In a case which recently came before Mr. Cecil Chapman at the Tower Bridge Police-court a novel and important question arose concerning the position under the London Building Acts of a local authority executing works of sewerage. It appears that the Bermondsey Borough Council had been laying or reconstructing a sewer in the ordinary course of their duty as the proper authority in such matters, and the district surveyor under the Building Acts contended that in any case where such a sewer passed under a structure or building, or within 3 ft. of it, notice of intention to commence the work must be served on him—and his fees paid. As was pointed out by counsel on behalf of the borough council, such a claim on the part of a district surveyor is a novel one, and if allowed it will be a very serious matter for the Metropolitan borough councils generally. The whole question really turns upon whether anything done to the foundations of a building, or within 3 ft. of a building, must be "work" within the meaning of sec. 145 (*a*) of the London Building Act, 1894, although the interference is only incidental to the execution of other work which is admittedly outside the operation of the Building Acts. Mr. Chapman gave a considered judgment in favour of the borough council, holding that any incidental interference with a building or its foundations which takes place during the execution of sewerage works is not a work for which notice must be given to the district surveyor. It would thus appear that in this matter the conclusions of law and common sense are identical. Inasmuch, however, as counsel for the district surveyor asked the learned magistrate to state a special case for the opinion of the High Court—a course which he consented to adopt—we desire to call the attention of engineers to Metropolitan borough councils to the case, so that they may watch its future progress.

* * *

American Opinions on Road Foundations and Drainage.

Among the subjects discussed under the head of "Road Construction and Maintenance" at a meeting of the American Society of Civil Engineers, reported in a recently published volume of the "Transactions," one of the most interesting was "Drainage and Foundations." We are indebted to Mr. W. W. Crosby, M.AM.SOC.C.E., for a reprint of this part of the "Transactions," from which we have extracted a number of passages that seem likely to be of special interest to our readers. These extracts appear on another page, grouped for convenience of reference under three sub-heads of our own, with a running comment by Mr. Reginald Ryves, M.CONS.E., ASSOC.M.INST.C.E. In road engineering, as in other matters, evolution proceeds partly by the encouragement of the fit, and partly by the discouragement or slaughter of the unfit, and, while the former function is performed in books, in special articles written for technical journals, and in annual retrospects and the like, the latter function, the immediate recognition of what seems wrong in form or unsound in principle, is more especially performed in the editorial and cognate portions of periodical, particularly weekly, journals. It is the function of the daily Press to gape, and that of the weekly and monthly journals to chew, while the swallowing is left to the authors of books, or annual publications. If then we have not, on several occasions, done visible justice to the admirable work which is being performed by American highway engineers, and, we may add, by several influential journals of high standing, it is because we are bound to confine our constructive criticism mainly to matters Brit sh.

* * *

Tendering by Architects.

At a recent meeting of the Royal Institute of British Architects, Mr. Robert J. Angel, the borough engineer of Bermondsey, who is an associate of that body, raised the question of the propriety of architects tendering in competition for the preparation of designs, and so forth. The point at issue was entirely different from anything which concerns the ordinary architectural competition, which is of course well recognised in the profession. Mr. Angel gave an instance where an advertisement had been inserted in a newspaper inviting applications for the office of architect of a public building, and asking candidates to state their qualifications and experience, and the *remuneration* they required. The result of this was that one applicant at least replied offering to undertake the work at a rate less than that specified in the Institute's scale of charges. As a matter of fact this particular candidate was not appointed, but the case cited affords a very good example of what must inevitably happen if such a system of tendering became general. Mr. Angel made it perfectly clear that he brought the matter forward on principle and not with a view to the consideration of any specific case, and on his motion the question was referred to the Practice Committee for consideration and report. He observed that two points arose on the reference—namely, the act of a building owner in publicly advertising for tenders from architects, and the propriety of members of the institute replying to such an advertisement. The matter is certainly one of great importance to architects, and Mr. Angel has rendered a service to the profession in calling the attention of the institute to it.

The Royal Commission on Sewage Disposal.

COLONEL JONES AND THE EIGHTH REPORT.

[At the recent annual meeting in London, of the Association of Managers of Sewage Disposal Works, Lieut.-Col. Jones, V.C., M.Inst.C.E., submitted the following paper as an attempt to express in practical form the effect of the Eighth Report of Lord Iddesleigh's Royal Commission on future arrangements for preventing pollution of rivers by sewage.]

A useful discussion on the fifth report from Lord Iddesleigh's Royal Commission took place at our annual meeting in 1908, and as the eighth and penultimate report was published on November 21, 1912, I venture to open its subject to-day with a few remarks.

Appointed in 1898 in response to appeals from inventors of artificial systems of sewage disposal and from sanitary authorities, all calling for some authoritative guidance in a very complicated technical matter, this commission has during fourteen years been consistent in its resolve not to commit itself to any detailed approval or condemnation of any system, however much such a decision might be clamoured for by interested parties, and by the public at large, despising sewage as an unsavoury subject, but expecting assurance from a Royal Commission that some particular treatment of a nuisance would satisfy sanitary requirements at the least possible cost.

The commission was not long in realising the fact that nothing but a permanent central authority and watershed rivers subordinate bodies can satisfy the public requirements, and in this eight report a recommendation to that effect has been again repeated in terms which must attract the notice of the Government in the next Session of Parliament. The eighth report, indeed, takes it for granted that a central and rivers authorities will be appointed, and proceeds to suggest rules for the proceedings of such bodies.

It will be remembered that the long disputed question of standards for sewage effluents was discussed in the fifth report, wherein it was stated: "The terms of our reference require us to have regard to the economical and efficient discharge of sewage by local authorities, and in view of the importance of not requiring a local authority to incur any further expenditure on sewage disposal than the circumstances of its area require, we feel that the law should be altered so as to allow local circumstances to be taken into account."

The Rivers Pollution Prevention Act, 1876, makes no distinction of that kind with regard to non-tidal rivers, and after four years' study of the question the commission recommends an amendment of that Act, because observation and experiment have led the committee to recognise dilution in river water as a powerful agent in purification, and it now lays down rules under which even raw sewage or tank liquid may be admitted to a river in certain cases, and thus part, or the whole, of our work in sewage purification may in certain cases be dispensed with.

The fifth report introduced a new process of analysis—called the five days' oxygen absorption [illegible] to the Wanklyn ammonia, and the four hours' permanganate tests, to which we have so long been accustomed, and now we see how useful [illegible] in the dilution experiments which have enabled the commission to arrive at a normal standard applicable to ordinary cases and special [illegible] on the ratio of volume of foul waters to [illegible] into which it discharges. The [illegible] proposal is as follows: Suspended [illegible] not to exceed 3 parts per 100,000, and when [illegible] with suspended matter included, not to take [illegible] than 20 parts per 100,000 of oxygen in five days at 65 deg. Fahr.

[illegible] may be as follows: (1) If the [illegible] between 150 to 300 volumes the oxygen [illegible] may be omitted and the suspended matter may reach 6 parts per 100,000; (2) when the dilution ranges between 300 and 500 volumes, no [illegible] matter may be allowed [illegible] parts per 100,000. (3) If the dilution is very [illegible] be suspended altogether. It is pro[illegible] standards be fixed on report of rivers [illegible] by the local authority, and remain in force [illegible] as well as the [illegible] rivers or reaches of [illegible] to be specified. To [illegible] the [illegible], and in case [illegible] into effect the expense of much litigation and that of some unnecessary sewage treatment may be saved by ratepayers, besides gaining the advantage to all parties concerned of knowing for certain to what standard they must conform for periods of ten years.

In 1908 I gave the weight of Blue-books then published by the commission at 40 lb. avoirdupois, and an estimate of the cost for ten years' work of the Royal Commission at £50,000, which has not been disputed, and the latter sum must now be increased to £80,000 at least. It is, however, to be hoped that at last the country may reap practical advantage in improved river water from good administration by the permanent authorities called for which may well repay, not only their current charges, but the accumulated sum, say £100,000, which may, I think, be justly regarded as preliminary educational expenditure. That education has necessarily been destructive as well as constructive—destructive of old ideas and inveterate prejudice, as well as constructive of good sanitary practice—and this fact may account for the long life already passed by Lord Iddesleigh's Royal Commission and for the bulky volumes recording its conclusions, and the evidence of 204 persons called to give evidence before it.

In this connection it should be remembered that the science of hygiene was little thought of until the late Dr. Parkes (in whose memory our Royal Sanitary Institute maintains the Parkes Museum) published "Military Hygiene" about the year 1855, before which date many of our English rivers had been turned into open sewers, and the separate system of sewerage and drainage was not generally recognised in engineering practice until about 1885. Reaction from previous indifference led the public to expect great results from sewage farming, but its initial cost and bad management turned the common mind to chemical precipitation, until universal disappointment prepared ratepayers for submission to the necessary expense of getting rid of a nuisance anyhow they could. This necessary expense is certainly improving our rivers, but one cannot help regretting that much of it is spent on artificial systems which can bring no money back, while land treatment grows valuable crops, and we are told by Mr. Roechling that the municipality of Berlin makes a profit of 11s. per acre per annum on its 40,000 acres of sewage land.

Reviewing the whole ½ cwt. or so of printed matter, there are two or three points to which, I think, with all its just and proper impartiality, the commission might have directed more attention than is apparent—viz.: (1) The fact proved by Dr. Travis, at Hampton, and by Mr. Dibdin's slate beds, that "de-solution" or deposition not only of original solid matters, but also of colloidal matter, is the first and most important step in sewage purification, and that de-solution of colloids is best effected by surface attraction of particulate particles from slowly moving liquid to be subsequently acted upon and transformed by many species of organisms besides those microscopic bacteria, which latter have been expected by their enthusiastic admirers to perform ten times the work that they always do in the land, if confined by artificial means in crowded workshops. (2) That vegetable life affords the only effectual means of [illegible] of sewage. (3) The comparatively [illegible] and the fact that good management is essential to success in sewage works, but has as yet failed to suggest that sanitary authorities would find it good policy to increase the often inadequate salary of their manager and to give him a free hand in the adjustment of wages for the highly skilled labour which he ought to employ if the purification of sewage flowing through in ever-varying volume night and day is to be properly provided for in his work.

Being no longer a manager, I may, without impropriety, offer a strong opinion founded on forty years' experience, that real improvement in our rivers depends very much on the adoption of this policy by the authorities concerned, and I trust it may not be too late for action now by Lord Iddesleigh's Royal Commission.

Recent Advances in the Science of Water Purification.

By ADOLPH KEMNA, D.Sc., Antwerp.

[The subjoined paper, a summary of which appeared in last week's issue, was read at the recent Winter General Meeting of the Institution of Water Engineers.]

Underground waters have been preferred from very ancient times, not only because of the abundance of water obtained in many cases, but also because such supplies are usually characterised by constant temperature and natural purity. It is a fact that many underground waters are excellent and yield plentiful supplies to populous cities, but it is an obvious exaggeration to consider this the only permissible source of public water supply. All underground waters are not abundant, nor are they always chemically pure, nor hygienically innocuous. There are many examples of springs which have become dangerous by contamination and which have spread epidemics of typhoid fever.

In France for several decades the purity of springs was considered as unquestionable, the engineer agreeing with the theoretical hygienist in that opinion. The frequent recurrence of typhoid epidemics in Paris was, however, finally traced to the contamination of first one and then another of the springs from which supplies were obtained, and similar experience was obtained in many other places. A comparison between the health statistics of spring-supplied and surface-supplied towns resulted in favour of the latter, and naturally brought about a change of opinion as to the superiority of underground waters which were no longer considered as the only admissible sources of supply. This change took place between the years 1895 and 1905. At about the same time there was also a change of opinion in Germany, but in the reverse direction. The leading German hygienists took up the exclusive attitude abandoned by the French, and began worrying municipalities who used filtered surface waters. Several large cities replaced, either partially or entirely, their surface-water supplies by those from underground sources, and not always with satisfactory results. In most cases the surface water supplies had been well filtered and the health statistics were good, and although no harm resulted from the change, no advantages were obtained, and it was difficult to justify the costly change enforced by the theorists. Mistakes were often made in the estimation of quantities, and these were always in the same direction, namely, that the actual yield was less than was expected. As to quality, experience was often equally unsatisfactory. The majority of the underground waters in the German or Baltic plain are chalybeates, and, however easy it may be to remove the iron, still the process involves trouble, extra cost, and a tampering with the natural water, which, after all, was one of the grievances against filtration, the only real advantage obtained being constant temperature, which is partly lost when the water has to be heated for the removal of iron.

Breslau, the capital of Silesia, is one instance of how a municipality can get into trouble by a change of this sort. The original supply was obtained from the river Oder, the water being filtered, and although the filtering arrangements might certainly have been better, still their hygienical conditions were normal. Prof. Flügge, the well-known bacteriologist, was mainly instrumental in inducing the municipality to abandon the surface-water supply and to introduce a boasted scheme with [illegible] wells sunk in a district where there was said to be an inexhaustible underground supply. However, instead of the daily supply of 60,000 cub. metres expected, the wells gave a maximum supply of 40,000 cubic metres per day, and instead of tapping an underground river, as was foretold, the supply was found to emanate from a limited and rather shallow basin, absolutely dependent on local precipitation. In March, 1906, a part of this district was inundated, the first effect of which was to dry up the wells. For a period of thirty-six hours nothing but air could be pumped from the wells, and when the water came back, it was found to contain 0·6 grammes per litre of metallic iron, and 0·4 grammes per litre of manganese sulphate. The [illegible] is that large proportion can easily removed, a fact which spoke well for the efficiency of the plant, but the manganese remained, blackening everything with which the water came in contact. Fortunately, all the wells were not affected, and as the filter had not been demolished, the supply was maintained.

Surface-water supplies have the great advantage that the quantity can be correctly estimated. There would be only one way to deal with an engineer who made a gross mistake in gauging a river or in calculating the yield of a gathering ground. There is also another safeguard in connection with surface-water supplies—namely, that, being always open to contamination, they must be treated as if contaminated, and purification is absolutely essential.

In a previous paper the author has given a historical sketch of

SAND FILTRATION,

and has shown how Simpson's first attempt in 1829 proved efficient for the mere clarification which, at that time, was all that was required, and later proved equally efficient to meet the increasingly severe demands of the hygienist; but here a qualification is necessary, and we must say the "reasonable" hygienist.

Thousands of analyses have been made with all sorts of chemicals in strangely-shaped flasks; gallons of broth with gelatine and peptone have been destroyed by the introduced microbes, and the final result of all that labour is simply the confirmation of what every engineer was already fully aware of—that ordinary filtration is an efficient safeguard against water-borne disease. This is also proved by experiments, not only those carried out within the walls of a laboratory and with special apparatus, or by sacrificing a few poor rabbits, but also in the supplies of our large towns and cities, experiments carried out during a period of three-quarters of a century, on millions of human beings, who, after all, are better examples of the species "Homo" than rodents. Here there is no question of drawing inferences from tests made with a few milligrammes of permanganate of potash for organic matter (the real nature of which we know nothing of), or from a variable number of microbes generally nameless; the experiment is a direct one, the information obtained is above cavil, and the engineer and the "reasonable" hygienist were satisfied with the results.

Their rooted conviction of the hygienical efficiency of sand filtration, although fully justified, has had one drawback—namely, the absence of any inducement to improvement. For a period of fifty years the sand filter remained practically unaltered; the only addition to it which has become general was a preliminary treatment by the simple process of decantation. The theorist can certainly claim that he roused the engineer out of this state of torpor. Koch took up the question of filtration from the special standpoint of the bacteriologist, and introduced certain rules for the management of filtering stations. Koch was of a peculiarly practical turn of mind; by profession a medical man, he contended that all scientific studies in this department should only be considered as the means to an end, and especially with a view to practical application. His rules for the conduct of filtration works were the outcome of direct connection with actual practice; he wanted to improve the results, and was fully aware that asking too much was the way to get nothing; therefore he was moderate in his requirements, and even in suggesting a limit of 100 microbes per cubic centimetre he admitted the possibility of varying the standard to meet exceptional cases.

Moderation does not seem to be within everybody's power, and "common sense" is not at all common! This explains how

THE MICROBE CRAZE

started. Let us take a few instances. A medical man, writing on sewage purification, solemnly states that fire is the only absolute safe microbe killer. Six weeks ago, at the Washington Health Congress, Prof. Gaertner, of Jena, the leading hygienist in Germany, referred to an amusing case where ozonisation was applied to a water with 10, sometimes but 3, microbes per c.c.; the learned professor said that he appreciated a joke as much as anyone, but he thought this was

carrying a joke too far. At Antwerp last year an official notice was issued on account of the presence in the water of a few hundredths of a milligramme per litre of free ammonia, and the same bulletin referred to the presence of 1 microbe per c.c.! This was carrying the joke to absurdity, as was pointed out by several papers.

Who is responsible for such silly things? We cannot always discuss each case on its own merits; in the case of Antwerp this would involve us in the intricacies of local politics. The medical profession no doubt has its normal share of unbalanced minds, and among these will be found those who have most conspicuously run amok on microbes; their proportion is numerically small, but their voices are strong, and by taking an extreme view they have obtained the prominence they desire, and have found ready followers. Among these the heartiest supporters are the inventors of patent filters or sterilisers. Absolute sterility—that is, complete absence of microbes—is no doubt a consummation devoutly to be wished, and many people have devised systems by which this can be assured. Through the medium of the patent agent, various forms of filters, applications of ozone in nearly endless variety, quartz lamps for ultra-violet rays, a full set of chemicals to "drug" the water, have been, after due protection was secured for the inventive genius in each case, showered on the engineering world for the immediate benefit of mankind.

A multiplicity of systems is a necessary condition of competition and that struggle for existence which ultimately results in the "survival of the fittest," but in the meantime the existence side by side of so many competitors is a proof that none of them has attained to that degree of efficiency which would ensure its survival and the disappearance of its rivals.

It is only natural that the various inventors should criticise each other's systems and proclaim the advantages of their own. They all, however, agree on one point—namely, that the worst system is sand filtration pure and simple—and as this system is not patented, there is nobody constantly on the watch to defend it and to repel repeated attacks; moreover, it is practically the only system in general use, and the inventor, in trying to push his own patent, is constantly confronted with it; so that, in order to get in himself, he must of necessity endeavour to prove the defects of such a persistent rival. It must be remembered, however, that the inventor enters into this discussion with a decided bias in favour of his own discovery that he cannot be expected to keep an open mind or to judge the question fairly and impartially.

Those who are conversant with biology know how important a matter is the geographical distribution of plants and animals in deciding questions of affinities and parentage, and in disclosing the otherwise unrecorded history of our earth. It has also a certain analogous bearing on the subject of this paper. Take, for example,

THE APPLICATION OF OZONE

to the sterilisation of water. The first laboratory experiments were made in Germany; the first application on a somewhat larger but still experimental scale was made in Holland; the Belgian Government adopted the system to purify the water at Blankenberghe, a seaside resort near Ostend; but it was especially in France that the system was readily taken up and that the technical and hygienical authorities made the most of it. Nice, on the Mediterranean, is at work on it; Paris is fitting up the system at the St. Maur filtering station, which our institution visited in 1908, when comparative experiments with various systems were going on. In Germany there are a few installations, and in Russia the utterly bad system of filtration in use at St. Petersburg has been supplemented by an ozone plant. The English-speaking countries, however, which include more than half the civilised world, seem to be very reluctant to adopt ozone purification, and there appears but little likelihood of their changing their attitude. A leading American paper summarised a report of the meetings of various associations as follows: "Ozone does not appear to be deemed worthy of much consideration by waterworks men in 1910. This is almost as true outside as within convention halls, for although ozone is being given a trial at a few works, almost everyone seems to regard it as being in a rather unsatisfactory experimental stage of development." (*Engineering News*, September 29, 1910).

Ozone is undoubtedly a very powerful chemical agent and for this reason it is the more strange that since its discovery in the forties by Schönbein it has not been turned to practical use. There are obviously objections to its use, and among these the following may be mentioned:—Its production by electrifying air is rather difficult and costly; it cannot be obtained pure; only a small percentage of the air treated can be made into ozone, so that comparatively large volumes of air have to be dealt with. The greatest objection to it seems to be its insolubility. Passing a gas through water is nothing in the laboratory, but on a large scale it is more difficult. Even with an extremely soluble gas, such as ammonia, we find the scrubber the most conspicuous apparatus in gasworks. It is, of course, unfortunate that the use of ozone involves such difficulties, for it readily destroys colour and microbes, and itself turns into ordinary oxygen, so that nothing of it remains in the water. Experience has shown, however, that even with ozone complete sterilisation is practically impossible, and at the same time a certain selective action has become apparent, some microbes being more easily destroyed than others; the more resistant are the ordinary harmless water bacteria, while the pathogenic bacteria are the more sensitive. Now, the detection of the latter in a water is a mere matter of chance, and of very remote chance. For several years past the scientific staff of the Metropolitan Water Board have been making a systematic hunt for the typhoid bacillus in the Thames water; certainly over 1,000,000 microbes have come under notice, but not one single "typhosus" could be detected.

Among the intestinal bacteria there is one, bacterium coli, which much resembles the "typhosus"; that it is quite harmless, and not pathogenic, is obvious from the fact that it is constantly present in the intestine, and that we are still alive, but its presence in water is considered as indicative of pollution, and it has been adopted as a standard test for purity. As the B. coli is somewhat more robust than the "typhosus," it was safe to assume that the destruction of this involved the destruction of the "typhosus" as well. The municipal and other authorities in Paris lay great stress on the presence of B. coli, and wherever this is detected in the effluent from a filter, the filter is shut off. The ozone people at Petersburg felt so sure of being able to destroy the coli that they accepted a clause by which a fine of 1,000 roubles was incurred for each detection, with the result that in June last they had to pay 26,000 roubles. Under such circumstances the harmless coli might prove a valuable asset to the exchequer of a municipality.

The production and working of ozone depend on the instability of the molecular structure. Ordinary oxygen is O_2, represented as O=O, the two atoms being united by their two centres of attraction or atomicities. Ozone is O_3: $\overset{O}{\diagdown\!\diagup}_{O}$, where all the connections are simple, but this is a condition of chemically unstable equilibrium, the tendency of the atom oxygen being to fix each of its atomicities to the other. Ozone decomposes into O_2: O=O and O– a single atom, in the nascent state and apt to combination. Now, ozone is not the only compound which can evolve single atoms of oxygen in the nascent state. A variety of chemicals do the same, with the same sterilising effect. Permanganate of potash has been used at Alexandria (Egypt); the gaseous oxygenated compounds of chlorine, and lately ordinary bleach (chloride of lime), have also been employed.

Strange to say, the chemical nature of this substance is not exactly known. There are various structural formulæ, not one of them fully accounting for all the facts, but there is no doubt as to its hygienical efficiency. A dose or two of three parts per million is sufficient; the one single microbe found in the Antwerp water as mentioned above was the result of its use. Its efficiency has, however, been more effectively demonstrated by the fact of its having stopped epidemics of typhoid. In one case, exactly ten days after starting the application of chloride, an epidemic was suddenly arrested and the diagram showing the number of new cases fell abruply to zero. The three consulting engineers who had been called in, and who immediately and unanimously ordered the use of chloride of lime, certainly expected a favourable result, but not such a striking one as that. A physiologist would not perhaps have shared their astonishment. In experimenting upon small numbers of cases, say 100 people, the results are sometimes obscured by peculiarities in certain constitutions, but with 300,000 people the effect of individual peculiarities is lost by being blended with a mass of normal cases. Another most important result of this experiment is the exact determination of the period of incubation, still a

vexed question with medical men, the mean period being shown to be exactly ten days.

THE APPLICATION OF CHLORIDE OF LIME

is simplicity itself; a solution of the required quantities is made and regularly run into the water, and the plant can be started in a few hours. In some parts of America portable plants have been provided which are let out to municipalities when required. Within a period of five years the use of this system has spread all over the States, and its efficiency is no longer questioned. No trouble has been experienced from taste. Three parts per 1 000,000 of chloride of lime represents only 1 part, or 1 milligramme per litre of chlorine, a quantity which falls within the limits of error of ordinary chemical analyses. The taste (if any) only exists just after the introduction of the reagent and rapidly disappears.

The system has also been applied in Europe, as for example at Paris last year, but chloride of potash (eau de Javelle) was used instead of chloride of lime. Prejudice against "doctoring" the water is very strong in France, so extra precautions were taken. A number of chemists were stationed along the line of main with instructions to test the water with starch-iodine reagent every quarter of an hour, night and day, and to direct the use of chloride by telephone, for which purpose special wires were provided. The daily papers reported on all this, and created quite a sensation, with the result that several people detected the chlorine taste.

In the Rhenish provinces, especially in the district of the Ruhr, several cases are reported where the system was a failure, and had to be abandoned on account of the consumers complaining of the taste. It would be extremely interesting to know details of the way in which the chloride was applied, as this would probably explain the reason why the system failed in these cases and not in others.

Since the year 1904 the author has used chloride of lime in various ways at the various stages of the process of filtration—before decantation; before filtration; after filtration; before and after storage in the clean-water reservoirs. Since December, 1910, chloride has been used regularly and constantly at the Luythaegen auxiliary pumping station of the Antwerp waterworks, where the water is pumped to the town, with a view of still further reducing the number of microbes. The author is distinctly of opinion that there is no hygienical necessity for this in the case of a carefully filtered water, but it is an extra precaution, and is worth while in that it gives the low bacterial "counts" in which some of the local hygienists seem to revel. In the course of the author's experiments a very noteworthy fact was ascertained—namely, that a secondary pullulation of the few remaining microbes may occur; so that, while there may be only a few colonies in samples taken at the inlet to the mains, there are sometimes large numbers found in samples taken in the town. This after-multiplication is distinctly due to the influence of increased temperature. No reference to this will be found in the numerous articles already published, but this may be due to the fact that analyses are generally made at the entrance of the canalisation system, and it is obvious that if the results are constantly favourable here, the higher "counts" in the later stages of the distribution have no hygienical significance. Recently, however, the facts above mentioned have been observed elsewhere, and have been urged as an argument against the use of chloride.

There is not the slightest doubt that the chloride of lime process constitutes the greatest advance which has been made in water purification during recent years. The proofs of its hygienical efficiency are overwhelming. It acts like ozone, without the necessity of complicated machinery; it is soluble and readily diffused through the bulk of the water so that intimate contact is ensured without cumbrous mechanical appliances. As it would be difficult to patent such elementary apparatus as casks and tubs, the chloride of lime process is free from the attentions of the inventor, and can be arranged to suit any special local requirements. Indeed, its simplicity is in some respects a drawback, as the author knows of one case where ozone was adopted partly because the municipality wanted to be able to boast that their water was purified "electrically."

Another "drug" of the water engineer is

SULPHATE OF ALUMINA,

the systematic use of which was introduced with the "mechanical" or "rapid" filter. This also comes from America. It operates by a reaction between the sulphate of alumina and the carbonate of lime present in the water, sulphate of lime being formed; carbonate of alumina ought also to be formed, but as such a combination does not exist, the alumina is precipitated in large sticky flakes which form round the particles of suspended matter and carry them to the bottom. With most waters mere decantation after the addition of the sulphate of alumina is efficient in from twelve to twenty-four hours; anything not deposited then is very difficult to get rid of. In some cases the finer particles remain a long time in suspension, and recent studies in that new and interesting science known as "colloid chemistry" have revealed the existence of material so fine that it does not settle at all, but constitutes a permanent "colloidal" solution.

The waters of the rivers in the western parts of America seem to be of such a nature that nothing else but sulphate of alumina can deal with them. The theory of its action is rather complicated, and to consider it thoroughly would carry us too far into physical chemistry. The main point is that, besides the sticking action of the precipitated alumina, it probably has a "flocculating" action, the very fine particles coalescing, and, as their size increases, either settling out or being easily arrested by filtration.

The author has used sulphate of alumina regularly for several years past, rather for decolourising than for purposes of decantation. The colour of surface water is generally due to vegetable matter, the colouring substance being well known by such names as "humic acids," "crenic" and "apocrenic acids." These, however, are mere words, not warranted by any definite structural formulæ and while we do not know much of the scientific aspect of the subject, it is sufficient for the engineer who has to deal with such a water to know that sulphate of alumina is an effective remedy for his trouble.

The following facts will illustrate the action of alumina. A deep-well water of a brown colour like strong sherry was shaken up with precipitated alumina (not the sulphate) and then filtered. The effluent was beautifully clear and devoid of all colour, but the pure white alumina had become black, all the colouring matter had been abstracted from the water and deposited on the alumina. The latter had been prepared some time before, and the bottle showed two layers, the upper of a creamy character and the lower, where the substance had gone through a molecular condensation, of a more granulated character. The creamy stuff alone absorbed the colour from the well water, so that the sediment showed a black layer at the top and another, pure white, below. This experiment showed that the decolourising effect is not solely a chemical reaction, but that it is dependent also on the physical condition of the reagent.

All along the river from which the water supply of Antwerp is drawn there are extensive tracts of low meadows which can be irrigated. After heavy rain these meadows are flooded, and when this water is discharged the river water is quite clear with scarcely any silt in suspension, but very yellow. At such times the dose of sulphate has to be increased; but on these occasions the water gets much softer, and there is the risk that the quantity of lime present in the water may not be enough to decompose the sulphate. This condition frequently prevails in moorland districts and in some cases lime has to be added.

The use of alumina enables the water engineer to overcome the difficulty of a highly coloured water which, although quite innocuous from the hygienic point of view, is very objectionable to the consumer. The treatment of water with sulphate of alumina is cheap, and easily applied, and is not open to any reasonable objection whatever. The precipitated alumina is retained by the filters and nothing passes into the effluent; the sulphate of lime remains in solution and is perfectly harmless; on the contrary, the casual addition of some lime to very soft waters can only be beneficial. It is, however, important to ensure a uniform distribution of the reagent through the whole mass of the water. Where there is a constant flow at the intake a solution of the required strength may be constantly added in regular quantity, but where the river is tidal and subject to considerable variation in the amount of pollution at the different stages of the tide the intake period may have to be limited.

Under such circumstances it is found that even if the whole quantity of sulphate is added at the same time, the inrush of the water secures its being thoroughly mixed and well distributed. During last summer, on account of the copious rains, the water being clear but very yellow, some trouble was experi-

ceed with the settling of the precipitate due to the difficulty of dissolving the increased quantity of sulphate in the available tanks. The resident engineer made use of a float moved about on the intake reservoirs, from which a supplementary dose of sulphate was added to the water, and it was noticed that this addition of a comparatively small amount of the coagulant produced a marked effect. The explanation may be that suspended matter which normally separates easily from the water may remain in suspension a long time when the size of the particles is diminished, as is the case with cream in milk, which normally gathers at the top, but after the milk has been projected under pressure out of a nozzle against a plate, so that the globules of fat are broken up, the cream does not separate. If, therefore, the rush of the water is sufficient to break up the flakes of alumina, they will remain in suspension, and the addition of another dose of alumina will, after a certain time, gather these flakes together and bring them down.

Another illustration of the peculiar action of suspended particles has been pointed out by Fuller in connection with his experiments at Louisville. In this case small quantities of sulphate produced no effect at all; the sulphate was absorbed by the fine mud and held fast until this absorbent power was exhausted, after which the ordinary coagulating effect was produced. It is therefore a very important practical problem to decide to what extent decantation as a preliminary to chemical treatment may reduce the quantity of sulphate required, that is, to determine whether or no the capitalised value of the daily saving of sulphate will pay for an extra decantation reservoir.

Besides decantation proper, which is merely taking out mud and thus reducing the work of the filters, these reservoirs have also other effects on the water itself. There is a general improvement both in regard to colour, the quantity of organic matter and the number of microbes. Impounding reservoirs for surface waters from gathering grounds have been proved capable of securing a satisfactory condition of the water without any further treatment, but the recent researches of Dr. Houston in connection with the London water supply have, by systematic and extensive study of the question, thrown much new light upon the complex results of sedimentation. It has, for example, been shown that there is a reduction of hardness due to the loss, by dissociation, of carbonic acid, although in some cases the water, on the contrary, became harder after standing. This result was no doubt due to the infiltration of hard underground waters in low-lying reservoirs like those at Surbiton; the water in the Staines reservoir, built up high, showing a constant reduction of hardness.

It should, however, be pointed out that none of these reservoirs were built for purposes of purification, but they are reservoirs in the full sense of the word, creating a reserve for times when there may be a shortness of water in the river, or when floods have impaired the quality. Their limited efficiency as purifying apparatus alone and simply would not warrant their construction for this purpose alone, as there are better and more efficient means of accomplishing that end.

Returning to conditions affecting

UNDERGROUND WATERS

collected in drains, wells or springs, the most common difficulty is insufficient quantity. Many towns have shared the unfortunate experience of Breslau referred to earlier in this paper. At first there may be an abundance of water, and the most optimistic estimates may be surpassed, but gradually there comes a diminution and the trouble begins. This experience is generally due to the fact that there is an accumulation of underground water (called by some the "historic reserve"), and this at first gives an ample supply, but when the rate of abstraction exceeds the yearly amount of percolation it stands to reason that the reserve will ultimately become exhausted. At Brussels the drainage gallery under the Bois de la Cambre can be shut off in addition, so that during the period of increased consumption the water level rises, and provides an underground reserve which can be drawn upon at times of increased consumption.

If a drained district the level of the underground water would be lowered to that of the basin were it not for the constant replenishing from above by the percolating rain water. There is, however, another method of augmenting the quantity of underground water in low-lying areas, and that is by irrigation. The sewage-purifying agricultural purposes, and it is obvious that [illegible] for maintaining underground water supplies. A Swedish engineer, Richert, called attention to this system, which he applied with marked success at Gothenburg. River water is spread over a sandy area and percolates into wells sunk at a certain distance away. One of the great advantages obtained is the equalisation of the temperature of the water during all seasons of the year; but here also the indiscriminate application of an otherwise excellent system may cause failure. At Breslau irrigation of part of the drainage ground was attempted as a means of increasing the yield of the wells, but owing to the gradual choking up of the irrigation channels by the suspended matter in the river water this additional supply soon failed. It therefore seems desirable in most cases to provide for a preliminary filtration of the river water. It is also essential that the subsoil should be of such a nature as to facilitate the circulation of the water; thus very fine sand is an obstacle to circulation. On this account a big scheme proposed for the supply of Amsterdam was condemned by a special commission of engineers, and no doubt their unfavourable report spared that city a large, useless expenditure of money. The author knows of a small town where over £3 000 has been spent in sinking eight large wells in fine sand, all of which had to be filled up. The final report of the engineer states that there is an abundance of water, but that it is held back by capillarity due to the fineness of the sand.

The author has so far referred only to those systems of purification which, like treatment with ozone, have attracted much attention, or those which, after extensive use, have stood the test of time, but he has not by any means exhausted the list. There are many others, some of which have already been experimented with, and others which may ultimately prove to be of value.

The solar spectrum shows a gradation of undulations, with various physiological effects. The red end is chiefly heat, the middle portion is light, and the violet end is mainly chemical, this latter action extending beyond the limits of visibility and constituting the

ULTRA-VIOLET RAYS.

Direct experiments long ago proved that these rays are bactericidal, and the effect of prolonged storage upon microbes is certainly due to a great extent to that action. It is therefore quite reasonable to apply these rays for the purposes of sterilisation.

Some lights contain a great abundance of ultra-violet rays, especially that from the mercury lamp, but ordinary glass being impervious to these rays the lamps used for sterilisation must be constructed with quartz, which is transparent to the rays, but is expensive. To secure effective action the water must be quite clear, which means in the case of any ordinary surface water very complete preliminary filtration, as even a slight tinge of yellow absorbs these rays; a water which although clear has the slightest colour must also be first decolourised. It will therefore be seen that in the case of surface waters the ultra-violet rays do not replace ordinary filtration nor, in some cases, the use of sulphate of alumina, but must be considered as a supplementary treatment of a precautionary nature, exactly as in the case of sterilisation with chloride of lime.

It is not quite clear how these ultra-violet rays act; there is certainly a direct physiological effect on the living protoplasm as is the case with Finsen's light cure for lupus and kindred skin diseases, but they are also known to ozonise the air, so that after all part of their sterilising power may be of the same nature as that of other processes evolving nascent oxygen. The process would, of course, be most suitable in the case of a water (such as that from chalk springs) which is originally clear and colourless, and where electrical current or motive power to produce it is cheap. The process is not, however, yet out of the experimental stage.

Dr. Houston, in one of his reports, has suggested

THE USE OF LIME

as a sterilising agent. This substance has been used for many years to soften hard waters, the dose being calculated according to the amount of dissolved bi-carbonate to be precipitated, and being itself neutralised in the process. To sterilise much more lime must be added, and after having exerted the sterilising action this excess can be neutralised by mixing it with a certain volume of untreated water. There would also be a reduction of hardness, which would be beneficial to water such as that derived from the Thames. At first sight there seems to be an inconsistency in sterilising a part of the water and then

mixing it with unsterilised water, but Dr. Houston only considers the application of the process to cases of emergency, when only a part of the supply would require the special treatment.

Over-saturation with lime was proposed as early as 1883 by a Brussels chemist, who proposed the removal of the excess of lime by a current of carbonic acid, a process similar to the treatment of beetroot juice in sugar factories. An independent but similar system it at work at the town of Ghent, in Flanders, where permanganate of potash is added with the lime. A very bad water is there made quite clear and satisfactory. The present supply is, however, only a temporary one, the town having joined the Brussels suburbs in a scheme for taking water from springs in the valley of the Meuse, the works being not yet completed.

Speaking broadly it may be said that all these systems apply only to surface water, but this is due to the fact that generally spring waters are naturally pure and do not require any treatment. A few only of the various systems are intended to replace the time-honoured sand filtration, but most are intended to be supplementary to it. The contention is that sand filtration alone is not absolutely reliable, and therefore something more must be done, but it is with the same purpose in view that many water engineers have undertaken the closer supervision of filters, frequent chemical and bacterial analyses of the water and the erection of laboratories, &c. It must be borne in mind that the reduction or elimination of bacteria is not the only or chief object in view, but rather the maintenance of health and the prevention of cases of water-borne diseases. The author has stated what has been done at short notice by the use of chloride of lime, but it must not be assumed that the distribution of untreated river water should be considered as a normal proceeding. He firmly believes that with ordinary and reasonable care sand filtration is a sufficient safeguard against the distribution of polluted water, and such was the view of Dr. Koch when he formulated his conclusions on the immunity of Altona from cholera in 1892. Supplementary treatment and scientific control are improvements on older methods, and there is a moral obligation upon the water engineer to do his best in the interests of his consumers, but the intelligent adoption of improved methods and new processes does not necessarily involve the disparagement of older methods which have stood the test of time.

ROYAL SANITARY INSTITUTE.

THE HENRY SAXON SNELL PRIZE.

The subject given in 1912 for the essay in competition for the prize was "The Ventilating, Lighting, Heating, and Water Supply Appliances and Fittings for an Operating Room for a General Hospital." Ten essays were sent in, and they have been brought under the consideration of the council. The adjudicators for the competition were Mr. Edwin T. Hall, F.R.I.B.A., Dr. Louis C. Parkes, and Mr. A. Saxon Snell, F.R.I.B.A.; and they had the advantage of the very valuable criticisms and suggestions made by Sir Frederick Treves, Bart., G.C.V.O., who kindly acted as consulting referee.

Acting upon the advice of the adjudicators and of the consulting referee, the council have decided to divide the prize of fifty guineas, giving one half the sum to Mr. John Darch, M.R.SAN.I. (Wandsworth), writing under the motto "Aseptos," and the other half to Mr. H. F. V. Newsome (Manchester) and Mr. John G. Cherry, M.R.SAN.I. (Manchester), writing jointly under the motto "Magnum Bonum." The adjudicators consider that there are many excellent suggestions in each of these essays, but, on the other hand, there are some which they consider would prove unsatisfactory in practice.

A bronze medal of the institute will be awarded to each of the successful competitors. The adjudicators also desire to commend the essays sent in under the mottoes: "Science moves but slowly, slowly creeping on from point to point," "Ajax," and "Tout bien ou rien."

Hospital Stoves.—Messrs. E. H. Shorland & Brother, Limited, of Failsworth, Manchester, have received repeat order to supply their double-fronted patent Manchester stoves with descending smoke flues to the Napier Hospital, New Zealand.

LYE BUILDING LINE DISPUTE.

Mr. Justice Joyce on Friday last delivered judgment in the action in which the Attorney-General, at the relation of the Lye and Wollescote Urban District Council, sought by mandatory injunction to compel Mr. Thomas Parish to pull down and remove so much of a house erected by him in Perrin's-lane, Lye, as was in defiance of a building line prescribed by the urban district council. The case was commented upon in The Surveyor last week.

Mr. Justice Joyce, in giving judgment, said it went without saying that the order to set back the house 100 ft., when made under sec. 155 of the Public Health Act, must be properly communicated to the owner. In other words he must have plain and definite notice of what the authorities required, and it must be given in due time. It was agreed that the authorities could not prescribe the line under the 155th section until the building had been pulled down, and they must do so before rebuilding commenced. As to the time at which compensation should be tendered, he was not going to lay down any general rule, but it appeared to him to be the natural thing to tender the compensation at the same time the notice was given under the section. He thought that the tender ought to be made before the owner commenced to rebuild. So, without going so far as to lay down that it was necessary in point of law that the notice should refer to the section and mention it in the notice, it would be only right, in his opinion, that the council should do so. It seemed to him that the owner was entitled to know and to be told what the powers were under which the council were acting. In the present case it was not a new street, and he was not aware of any statutory authority enabling the council to make a general order with regard to an old street. If the lane had been widened and a new street formed it might have been reasonable to order that the owner should set the front of his building back, but no proceedings had yet been taken to widen the lane under sec. 154, which would have involved the council purchasing and paying for the land they took. After dealing with the evidence as to the discussions which had taken place on the subject between the council and the defendant, his lordship said that the council had not offered or agreed to pay compensation, and his opinion was that it was necessary that the council should have done everything necessary to put themselves right, and this they had not done. He thought no sufficient and proper notice had been given by the council or their officials. The conduct of the council could not be justified. In other words, it was unreasonable, unless they were going to widen Perrin's-lane. The defendant was at all events entitled to compensation, and the offer should have been made contemporaneously with, if not before, the notice was given. In these circumstances he declined to make a mandatory order compelling the defendant to pull down the building. That, under the circumstances, would be unjust to the defendant, who, he thought, had not been properly treated by the council, and all he could do was to dismiss the action with costs.

An application for a stay of execution was refused.

City of London Street Widenings.—With respect to the projected rebuilding of the General Post Office at St. Martin's-le-Grand the Improvements Committee of the City Corporation suggested that Cheapside should be widened to 95ft. at "Sweeting's Corner." That would involve the acquisition of additional land belonging to the Post Office and the setting back of Nos. 157, 157A, and 158, Cheapside. The committee recommended that that course should be taken, subject to the London County Council's paying half the net cost, and this the Court of Common Council agreed to.

Road Repairs in London.—In the House of Commons recently the President of the Local Government Board was asked whether he possesses any power to insist that when operations are in progress necessitating the taking up of the roadway of a London street these operations should be prosecuted vigorously and continuously until effected, in order that the inconvenience, danger, and disturbance caused may be as limited as possible. Mr. Burns replied in the negative. He added that he quite agreed that it was very desirable that works of this kind should be carried through as expeditiously as possible. He was glad to say local authorities were becoming increasingly alive to the importance of this being done.

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INSTITUTION OF MUNICIPAL ENGINEERS.

COUNCIL MEETING.

At a meeting of the council of the Institution of Municipal Engineers held on December 21st the following applicants were recommended for admission:—

To Membership: Messrs. A. Culkin, highway surveyor, Sculcoates Rural District Council; W. N. Hoskins, engineer for thoroughfares and waterworks, Pietermaritzburg; M. J. McMaking, assistant engineer, Boksburg Municipality; W. Wright, municipal engineer, Lagos; R. E. Jackman, sanitary surveyor and water engineer, Williton Rural District Council; R. Laycock, surveyor, Farsley Urban District Council, and C. W. Kendrick, sanitary surveyor, Bingham Rural District Council.

To Associate-membership: Messrs. W. C. Robson divisional surveyor's office, Warwickshire County Council; S. J. Kelly, Haxby-road, York; R. Claiborne-Dixon, 160 Warwick-street, S.W., and W. T. Hogben, assistant surveyor, Sandgate Urban District Council.

Transfer to Associate-Membership: Mr. H. W. Lovelock, assistant surveyor, Godstone Rural District Council.

(Under the new by-laws these elections will be ratified at the next council meeting if no written objections are lodged within fourteen days.)

Elected to Studentship: Messrs. R. R. Hogsden, surveyor's office, Midhurst Rural District Council; P. L. Stephens, surveyor's office, Llanelly Urban District Council; F. A. W. Clarke, main roads surveyor's office, East Suffolk County Council, and G. L. Bowron, surveyor's office, Darlington Rural District Council.

New Members, &c.—From the applicants recommended for admission at the last meeting three members and one associate-member were elected, and two transfers were made to the membership class.

Defence Fund.—The council considered certain resolutions which had been passed at district meetings requesting them "to take immediate action to form a Mutual Aid and Defence Fund, contributions to which would be compulsory on the part of all corporate members and students," and it was decided to take a postal vote upon the matter. Papers will be sent out with the report of the next council meeting.

Examinations.—Certain modifications were made to the syllabus for the General Paper, and a copy of this paper will be circulated later.

National Health Week.—Mr. Henry C. Adams was appointed to represent the institution on the Advisory Council of the National Health Week Committee.

Provincial Council Meetings.—It was decided that these be held as follow: Newcastle, February 22nd; Manchester, May 28th. The next London council meeting will be held on January 29th.

The attention of members is directed to the subjoined letter.

B. Wyand,
Secretary.

[COPY OF LETTER REFERRED TO.]

Dear Sir,—You may doubtless have read in the columns of the technical Press a circular letter, dated November 11, 1912, issued by another municipal engineering society. Since the alteration in its title this society has so often been mistaken for the Institution of Municipal Engineers that the council deems it imperative to issue a "disclaimer." The letter in question contains the following passage:—

"The council would be much obliged if you could assist them in reaching and influencing members of your technical staff with a view to their enlistment on the roll of the association and to this end I am enclosing a form of enquiry which the council trust you may be good enough to fill up in order that a personal communication may be forwarded to those members of your staff who are not yet connected with the institution."

The most unbiassed mind must read into this a direct invitation to the chief of a municipal engineering department to furnish a list of his technical assistants, in order that they might, with his assistance and "influence," the good offices of more than one intermediary be compelled to enrol themselves as members of the body from which the circular emanated. It is extremely doubtful if any junior official could reasonably be expected to ignore a hint (which in some cases would probably amount to something more) thrown out by his chief as to the advisability of joining the professional society of which such chief might be one of the pillars of strength. To do justice to the majority of the members of that society, however, there is little doubt that the suggestion will in most quarters be rejected.

It is a matter for extreme regret that any professional society should have recourse to such methods in order to increase its membership.

In the circular letter under review it is admitted that the erstwhile "association" has been in existence since 1873. The number on its roll at the present moment is, approximately, 1,250. The Institution of Municipal Engineers was founded only five years ago, and it now has a membership of nearly 900. Comment would surely be superfluous!

The Institution of Municipal Engineers has facetiously been described as the "Junior Institution," and no more flattering tribute could have been paid to it! At any rate, the "Junior Institution" has been responsible for the rejuvenation (so far as has been possible) of its aged relative. Every forward step taken by the latter during the last four years has been but a following of the lead of the infant. The institution does not deny that, to a great extent, it *has* catered for the younger members of the profession, having recognised on its inception that the assistants of to-day are the chiefs of to-morrow.

The Institution of Municipal Engineers has discouraged the reading of papers of purely local interest, papers in which prominence is given to the lengths of sewers, the mileage of roads and details of the daily routine work of a municipal engineer. It has taken the initiative in the giving of serious and prolonged consideration to such vital questions as superannuation, security of tenure, legal defence, fair competition for appointments, adequate remuneration and assistance of necessitous brethren. It has evolved, too, a professional society with clearly-defined objects and an absence of innumerable grades of members, and the work that it has done has been largely the work of its members.

Although the council of the institution deems it unnecessary to exhort you to use your best efforts to increase its popularity and usefulness, it has been thought advisable, in the face of the circular letter referred to, to request that you will bring to the notice of your professional brethren and the members of your staff the undoubted advantages to be derived from membership of the institution. It is felt that it would be equally superfluous to suggest that, in so doing, you would refrain from anything in the nature of coercion. The council hopes, too, that this single lapse from that originality which has hitherto marked the course of the institution will be pardoned.

One other matter! To remove any misapprehension which might exist as the result of certain correspondence and comments which have appeared of late in the technical Press, it may be necessary to state that the Institution of Municipal Engineers has never discussed the question of amalgamation, it having been felt that the success which has hitherto attended its efforts is the strongest possible guarantee of its stability and its continuance as a permanent institution.

(Signed)
B. Wyand,
Secretary.

39 Victoria-street, S.W.
December 21, 1912.

Preliminary Studies in Bridge Design.—This little book† a reprint of articles which appeared in The Surveyor and Municipal and County Engineer, is intended as the first of a series of similar volumes which, taken together, will form a treatise on the design of ordinary highway bridges of moderate spans. This first volume goes further back in the evolution of the bridge than do most treatises, and considers the bridge in its essential elements, that is as the means of providing a crossing for man and beast across a watercourse. The bridge engineer is apt to forget this primary purpose and to consider his bridge merely as a framework or a carrier of stresses. Mr. Ryves, in a refreshingly original manner, has emphasised the necessity for studying natural and economic predispositions, one might say, of the bridge site, with a view toward producing, not the best type of bridge, but the best method of getting the river and the traffic across one another. . . . *Engineering News*, New York.

† By Reginald Ryves, Assoc.M.Inst.C.E. London: St. Bride's Press, Limited, 24 Bride-lane, E.C. Price 2s. net.

The Road System of France.

HIGHWAY ADMINISTRATION: SYNDIC ASSOCIATIONS.

By M. de PULLIGNY, a Chief Engineer on the Ponts et Chaussées.

We are [illegible] *Engineering and Contracting* for the text of the following interesting paper. The interpolations in square brackets are made for the convenience of English readers, and cross-headings have been inserted to facilitate reference to the different parts of the subject dealt with.

The highways of France are divided into seven classes—viz., national roads, departmental roads, main traffic roads, roads of common interest, ordinary local roads, country roads, recognised and not recognised [local] and streets. [(1) Routes Nationales, (2) Route Departmental, (3) Chemins de Grandes Communications, (4) Chemins d'Intérêt Commun, (5) Chemins Vicinaux ordinaires. The last being divided as explained below in the text, and streets reckoned as a class, make seven classes.]

The first two classes constitute the main roads (grande voirie), and the five others the lesser roads (petite voirie). Under the present condition of things the departmental roads are gradually being absorbed into the main traffic roads and the roads of common interest, which, however, are controlled in about the same way with the exception only of certain proceedings.

Since the national roads are the property of the State, their classification is vested in the State, and, when they are declared to be of public utility by a decree of the council of State, they are established and maintained at the expense of the federal treasury [Treasury of the State, or the Republic]. They are controlled by the Minister of Public Works, and work on them is performed by the engineers of bridges and highways. In January, 1911, the extent of the national roads was 23,760 miles, which were [illegible] at the expenditure of $6,501,205 [£1,354,400.]

The Councils General have control over the next three classes of French roads, including the departmental roads, the main traffic roads, [main feeder roads, or main connecting roads], and the roads of common interest. The departmental roads belong to the departments, and are maintained at their expense, while the local roads are the property of the communes and are maintained by them. Departmental roads are authorised by State decrees declaring their practical need, but main traffic roads and roads of common interest require only the authority of the Council General.

All of these kinds of roads are under the jurisdiction of the prefects, [maires], who are represented in the actual work by highway overseers (agents-voyers), though the local road service is at present maintained by the federal [State] engineers of bridges and highways in forty-four departments. Within the [illegible] have thus come under the federal [State] control has increased by seventeen. In other words, the [illegible] of the departmental roads which was about 12,430 miles in 1811 and about 29,615 miles in 1869, has been reduced in the most recent census to about 8,142 miles. On the other hand, the total length of local roads of all descriptions, which was about 341,767 miles in 1868, had increased to 395,633 miles on January 1, 1911.

Between the years 1868 and 1911 the total development of classified roads increased 53,805 miles, while the [illegible] traffic is greater now by 136,136 miles. Moreover, in the same period of time 21,131 miles were removed from the classification of departmental roads. During [illegible] classes of local roads amounted to $37,537,018 [£7,820,000.]

THE LAW OF 1836.

The fundamental law which governs the network of local roads was passed on May 21, 1836. By its provisions the municipal councils are authorised to require for the maintenance of local roads, in case the ordinary funds of the commune are insufficient, [illegible] in kind or not more than 5 per cent in addition to the principal of the four general taxes [illegible]

Every inhabitant on the direct tax list is required to pay taxes as follows: (1) For himself and for each man between the ages of 18 and 60 years who is a member of his family or a servant, and who resides in the commune; (2) for each cart or carriage, and for each beast of burden, and draught and saddle animal in the service of the family. The tax may be paid in money according to rates fixed by the General Council, or paid in labour according to rates fixed by the Municipal Council. The general councils may divide the taxes, both cash and labour, between the main traffic roads and the roads of common interest. This is being done more and more frequently because of the increase in the mileage of these roads, and the consequence is that the greater part, sometimes the whole of the resources created by the law of 1836, are also used by the departments and nothing or not enough is left to the communes for the maintenance and improvement of the ordinary local roads. Nevertheless, while new legislation is needed on this point, excellent results have been produced for a long time in the development of the secondary road system of the country.

EXTRAORDINARY TRAFFIC.

The provisions of the law of May 21, 1836, concerning the use of local roads by heavy enterprises, such as mines, forests, quarries, &c., and the subsequent payment of extra taxes in labour or money for damages caused by such heavy works, have also been of great assistance in keeping the condition of the roads at a high standard. It has not been easy, however, to settle some of the points brought up by this law, for example, just when traffic becomes extraordinary so as to fit into the category that should be taxed by extra payments, and again the amount of taxes to be collected. For this latter point the practice has grown up of considering—(1) The state of the road before the beginning of the work; (2) the number of draught animals used by the exploiters; (3) the weight of the materials transported; (4) their nature; (5) the kind of conveyances and the method of loading them; (6) the distances passed over; (7) the season of the year during which the transportations are made.

[illegible] must not be forgotten that the roads may be used normally, and that, besides the extraordinary wear and tear produced by special enterprises, there is the ordinary wear caused by general traffic. The difference is to be noted only at the moment that the traffic is taking place. The simplest means of settling the difficulty is always to make a reduced advance payment whenever agreement can be reached between the Government and the individual engaged in the business. In general, a price is fixed per kilometre ton, but in the departments near Paris these tolls vary from $\frac{1}{2}$ to $\frac{3}{4}$ of a cent per kilometre ton [0·64d. to 0·96d. per ton-mile, or, say, ¾d. to 1d. per ton-mile], according to the nature of the commodities transported. Formerly the valuation was obligatory, but since the law of July 22, 1889, it is no longer required, and must be demanded by one of the parties.

In spite of the difficulties arising under application of parts at least of the law of May 21, 1836, the arrangement for paying for these improvements has given, and still gives, the greatest help in maintaining the local roads of France. It strikes directly the person using the road and causing the extra wear and tear, and creates special resources for restoring the road to its previous good condition. It has contributed [illegible] roads which each year are damaged by industrial enterprises, as, for example, the transportation of crops in the autumn when the roads are in a soft condition because of the rains. The communes would be utterly unable to make these heavy annual repairs without this extra assistance.

ASSISTANCE BY THE DEPARTMENT AND THE STATE.

It is necessary to mention the fact also that various laws promulgated at different times since 1836 empower the departments to assist in the maintenance of the main traffic roads and the roads of common interest. This assistance can be given only in the case of roads especially named in the text of legislative act. Moreover the departments can intervene

only when assurance is given by the communes that the usual maintenance will be given to their ordinary local roads, and that all their available funds will be applied to the works in question. The poorer departments are favoured by the State under such circumstances.

Until this year the fact that the State could assist the departments and communes only on their local road offered serious inconvenience, owing to the development of the tourist traffic, especially automobiles, in the last few years. Roads which formerly were but rarely used in the transportation of agricultural produce, especially mountain roads, are now used during the touring season by great numbers of automobiles. These roads have thus acquired a general interest, but the departments and communes did not have available the funds required by the increase of traffic, and consequently Parliament has passed an Act by which assistance for maintaining tourist roads may be given from the federal treasury.

With this purpose in mind the National Bureau of Tourist Traffic has this year undertaken a census of all classes of vehicles on certain roads in order to establish the respective amounts of local and tourist traffic.

Country [local] roads, in spite of their great mileage, are of less importance than the other classes of roads because they serve only the local needs. Their maintenance is, like that of city streets, entirely dependent on the communes.

SYNDIC ASSOCIATIONS.

One other feature of French legislation is to be found in the Syndic Associations which are authorised by various laws, for the purpose, among other things, of maintaining, establishing and widening roads. It does not appear, however, that many of these organisations have turned their attention to roads. According to the statistics of 1901, the latest available, less than 300 out of 7,000 have taken up highway work. The organisation is very similar to the drainage associations existing in central and western States of the United States, except that these latter are confined to the one purpose. In France there are two kinds of organisations—the free organisations, which are formed only by the unanimous consent of the persons interested, and the authorised organisation, formed by a decree of the prefect, either by change from free organisations or directly.

In the case of the authorised organisations the majority always rules. The landowners interested are united in an authorised syndic association by a decree of the prefect either at the request of one or more among them, or upon the initiative of the "maire" or the prefect, when the roadwork has been recognised to be of public utility by a decree of the Council of State. The work cannot start without the authorisation of the prefect, and this may be given only in case three-quarters of the persons interested, representing more than two-thirds of the land, and paying more than two-thirds of the land tax, or two-thirds of the persons interested, representing more than three-fourths of the land, and paying more than three-fourths of the land tax, join in the association. The prefect may also not give his authorisation until after the payment of the costs of condemnation and the guarantee by the organisation that all expenses incidental to the work will be paid. In case of the insolvency of the organisation, the persons who have suffered loss have recourse against the Government which has benefited by the works, whether it be commune, department, or the State.

The syndics or directors of the enterprise are elected by the members of the association, but in case of a subsidy by the State, the department, the commune, or a chamber of commerce, the prefect, the departmental commission, the municipal council, or the chamber of commerce, according to the circumstances, is granted the right to nominate a number of syndics according to the part that the subsidy represents in the total amount appropriated for the enterprise. The organisations have been placed on a better basis by the law of March 9, 1894, but various laws, even as far back as before the Revolution, were passed dealing with certain phases of the plan. As has been said, these organisations have not, up to the present time, been the means, to any great extent, of improving the public road, but there are great possibilities in such associations. In France the fact that the roads have been so thoroughly improved by the authorities is very likely [illegible] the work has been done by the public authorities. In the absence of central road work by the Federal Government and by some of the States of the United States, the information concerning these organisations is offered as possibly containing suggestions for securing road improvements in those States which have failed to secure it otherwise.

INSTITUTE OF SANITARY ENGINEERS.

ELECTION OF OFFICERS.

The general meeting of the members of the above institute was held on the 19th inst. at the offices, 120-122 Victoria-street, Westminster, when the president, Mr. A. J. Martin, M.INST.C.E., took the chair.

The report of the council stated that during the year 1912 the institute has materially improved its position in regard to the status, its influence, and particularly its finance.

The statement of accounts, balance-sheet, and auditors' report for last year were received and approved, the figures showing a very material reduction in the outstanding liabilities, and it was intimated that the council anticipated the financial results of the present year would show a still further improvement.

For the president for the coming year the council had nominated Mr. H. Percy Boulnois, M.INST.C.E., past-president of the Institution of Municipal and County Engineers and chairman of the council of the Royal Sanitary Institute. His election was carried with acclamation. Mr. Boulnois will give his presidential address on Monday, January 20th, at Caxton Hall, Westminster.

Mr. E. R. Palmer was re-elected to the office of treasurer, and Messrs. McPherson, Timmins and Ednie, chartered accountants, were elected the professional auditors.

The election of councillors was by postal ballot from all members of the institute residing in the United Kingdom. The counting of the votes was entrusted to four pairs of scrutineers, and the result was the election of the following candidates to fill the sixteen vacancies, for which there were thirty nominations.

Councillors to retire in 1915: Mr. Fred W. Mason, of Enfield; Mr. Harold S. Couchman, of Tottenham; Mr. Edwin H. Blake, of Westminster; Mr. George B. Hall, of Hornsey; Mr. Albert W. Sweetland, of Kensington; Mr. Walter E. Markham, of Essex-road, N.; Mr. William E. Farrer, of Birmingham.

Councillors to retire in 1914: Mr. William H. Wise, of Ennismore-gardens, W.; Mr. A. A. Kemp, of Whitstable, and Mr. E. E. W. Berrington, of Wolverhampton.

Councillors to retire in 1913: Mr. Henry T. Sidwell, of Hatfield; Mr. Guy B. Grave, of St. John's Wood; Mr. John D. Kendall, of Paddington; Mr. Herbert Freyberg, of Cromwell-place, S.W.; and Mr. Oswald J. Edwardes, of Surbiton, Surrey.

The council for the year 1913 will include the president, the vice-presidents, and the hon. local secretaries of districts, in addition to the elected members whose names are given above.

A special vote of thanks to Mr. Martin for the very great interest he had shown in promoting the welfare of the institute during his two years' presidency was carried enthusiastically, and the proceedings ended with the president's reply.

Royal Institute of British Architects.—The president's address to students and presentation of prizes have been fixed for February 3rd next.

Mechanical Filters for Morley.—The adoption of a mechanical filtration plant at the Wythens reservoir was unanimously approved at the last meeting of Morley Town Council. The expenditure is estimated at £9,500, and application for sanction to borrow this amount will be made to the Local Government Board in due course. "Turnover" filters, made by Messrs. J. Blakeborough & Sons, Woodhouse Works, Brighouse, for the Turnover Filter Company, 39 Chichester-street, Belfast, are to be installed, and it was stated in the course of the meeting referred to that the selection of this type had been decided upon after the most careful consideration. The Waterworks Committee had seen in operation one filter which had been at work for ten years without having been taken out, dealing with a much discoloured water and discharging quite clear and pure.

ADVERTISEMENT HOARDINGS.

REPORT TO THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

[The following report, prepared by Mr. John S. Brodie, M.INST.C.E., borough engineer, Blackpool, was presented recently to the council of the Institution of Municipal and County Engineers. Some comments on it appear in "Minutes of Proceedings," in the present issue.]

The Advertisement Regulation Act, 1907, was passed presumably with a view to embody in a general Act clauses which had been obtained by municipalities in local Acts from time to time during the past few years.

Sec. 2 of this Act enables any local authority to make by-laws, which must be confirmed by the Secretary of State, for (1) the regulation and control of hoardings and similar structures used for the purpose of advertising, when they exceed 12 ft. in height, and (2) regulating, restricting or preventing the exhibition of advertisements in such places and in such manner or by such means as to affect injuriously the amenities of a public park or pleasure promenade, or to disfigure the natural beauty of the landscape.

So far back as 1893 the corporation of Blackpool obtained a clause in their Blackpool Improvements Act, 1893, sec. 61, regulating advertising on bridges, vehicles, &c., and this clause has been of very considerable service in preventing unsightly advertisements on blank walls and vehicles used for advertising, as no such advertisements are allowed unless approved in writing by the corporation. This power appears to be incorporated in sub-sec. (2) of the General Act above referred to.

Again, a clause was obtained in the Blackpool Improvement Act, 1901, sec. 45, which is practically embodied in sub-sec. (1) of the Public General Act.

Following on the passing of the Act in 1907, Model By-laws were issued by the Secretary of State. These Model By-laws are subdivided into three parts.

Part 1 deals entirely with the structural details of all advertisement hoardings when they exceed 12 ft. in height.

Part 2 suggests by-laws for the regulation of advertisements when they are visible from any public park or pleasure promenade, or where they may disfigure the natural beauty of the landscape in certain specified areas or districts.

Part 3 provides that no existing advertisement hoardings shall be interfered with until after a period of five years has elapsed from the time of the making of the by-laws.

I find that the Administrative County of Southampton has obtained a by-law, which was confirmed by the Home Secretary on September 27th, 1911, as follows:—

No advertisement shall be exhibited on any hoarding, stand or other erection visible from any public highway (whether carriageway, bridleway or footway) and so placed as to disfigure the natural beauty of the landscape.

I also find that the following by-law was obtained by the County Council of the Administrative County of Surrey, and confirmed by the Home Secretary on May 22, 1912—viz.:—

No advertisement shall be exhibited on any hoarding, stand or other erection so as to be visible from any public highway (whether carriageway, bridleway or footway) or from any public waterway (whether river, river-tributary or canal) or from any railway, and to disfigure the natural beauty of the landscape.

The application of these by-laws is confined to such parts of the Administrative Counties of Southampton and Surrey as are not within any urban district containing a population, according to the last census for the time being, of over 10,000. The usual condition of five years' exemption for existing hoardings is imposed on these by-laws.

The above two examples are typical of the nineteen county boroughs and urban district councils who have had by-laws confirmed by the Home Office.

The Corporation of Edinburgh, however, appear to have obtained—in the Edinburgh Corporation Act, 1899, sec. 45, amended by the Edinburgh Corporation Act, 1906, sec. 77, sub-sec. (8)—the following clause:—

"For the purpose of protecting the amenity of the city, and of enabling the corporation to exercise control over any sites or hoardings to be erected and used for the purpose of advertisements, the following provision shall have effect:—

"(1) No person shall erect, exhibit, fix, maintain, retain or continue any advertisement, whether now existing or not, upon any land, house, building or structure, except on such sites, hoardings or other structures as the corporation may in writing license, and such licence may be granted for any period not exceeding four years."

To this general clause there are the following exemptions:—

(1) Window exhibitions.

(2) Signs in connection with trade or business carried on within the land, house or building upon which the same are placed, including sale or letting notices.

(3) Railway companies' business.

(4) Notices within any railway station, but not on the surfaces of walls or property fronting any public street.

(5) For a period of five years from the passing of the Act, of advertising hoardings then in use.

As the council are probably aware, there has been and there is much controversy in regard to this subject.

In Paris the Chamber of Deputies passed a Bill, on July 8th of this year, imposing a further very heavy tax on advertisement hoardings that disfigure the scenery of France, particularly along the chief railway lines. Hoardings will be taxed £2 per square yard if not over 6 yds. in area. If above that size, a graduated scale up to £16 per square yard will apply on advertisement panels larger than 20 sq. yds.; and the rates per square yard will be doubled, tripled and quadrupled if the panel contains two, three, four or more advertisements.

At Potsdam, near Berlin, no advertisement hoardings are allowed within 400 yds. from a railway under very heavy penalties.

All are agreed, I think, on two things—viz.: (1) That an abuse at present exists in regard to unsightly advertisements; and (2) that the powers conferred on local authorities by the Advertisements Regulation Act, 1907, are inadequate and insufficient to deal effectively with the evil.

I am strongly of opinion that nothing short of the powers conferred by the Edinburgh clause will enable local authorities, irrespective of population, satisfactorily to preserve the amenities of their districts, and I suggest that a model be adopted embodying the views of the council on the subject.

RIVER TRENT PROTECTION WORKS.

REINFORCED CONCRETE CONSTRUCTION.

The City Corporation of Nottingham have accepted the tender of Messrs. G. Bloms & Turner, of Nottingham, licensed contractors for the "Piketty System" of reinforced concrete, for the execution of the above, in accordance with the plans of Mr. Arthur Brown, M.INST.C.E., city engineer.

The whole of the work is to be carried out on the "Piketty System" of reinforced-concrete construction, which has been selected in competition. Full particulars of this method can be obtained from Messrs. Piketty, 14-18 Bloomsbury-street, W.C.

Seaham Harbour Housing Scheme.—Seaham Harbour Urban District Council have adopted a scheme for the erection of sixty-nine workmen's dwellings, and decided to proceed with the erection of forty-eight of them at once, on the sanction of the Local Government Board has been obtained for the borrowing of the necessary money. The site, on the south of the town, covers 2·874 acres, and is offered by Lord Londonderry at £550 per acre. The houses will be twenty-four to the acre, self-contained in blocks of five and six. Access to back doors will be through passages between each block. Each house will have a back garden 26 ft. by 16 ft., and the backyards will have a clear paved area of 130 sq. ft. The houses will consist of a living room 15 ft. 3 in. by 14 ft. on the ground floor, and also a scullery. Room has been left in the scullery for the insertion of a bath. On the first floor will be two bedrooms, one 15 ft. 3 in. by 12 ft. 3 in., and the other 11 ft. 9 in. by 12 ft. Joint wash-houses will be provided, well away from the dwellings. The rents will be 6s. per week. The total loan required for the sixty-nine houses will be £14,909, and the scheme will not become a charge on the rates.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

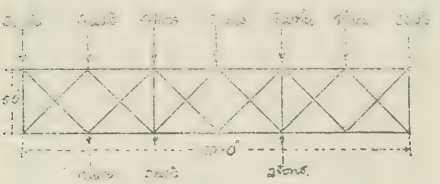
This week answers are invited to the following questions:—

294. Traction.—Compare the tractive force required for heavy vehicles over roads of various surfaces and grades, and show how this affects the cost of transport. (H. V. O., *West Bromwich.*)

295. Air Compressors and Ejectors.—Of what horse-power will an electric motor require to be to work an air compressing plant and ejectors to raise 100,000 gallons of sewage a height of 15 ft. in six hours? Show stages of calculations, and state the probable mechanical efficiency of air compressors and ejectors. (D. G. B., *Darlington.*)

296. Tides.—Please explain clearly what is meant by "H.W. of ordinary spring tides" and "L.W. of ordinary spring tides." Also state how the height of ordinary spring tides is arrived at, and over what period the observations or calculations are made. In what respect does an ordinary spring tide differ from an equinoctial spring tide? (Perplexed.)

297. Lattice Girder.—How would you obtain, graphically and by calculation, the stresses in the members



of a lattice girder braced and loaded as shown in sketch? (T. H., *Leicester.*)

298. Gauging of Streams.—In gauging the quantities of water in small streams over a rectangular notch 3 ft. 9 in. wide (taking the velocity of the stream into consideration) is there any known connection between the velocity of the stream immediately above the gauge and the height of the water above the sill, taking no other quantities into consideration? If there is no general connection between the two is there any within certain limits, and, if so, what are the limits? (E. K., *Sutton Coldfield.*)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the monthly Premium.]

REPLIES TO QUESTIONS.

292. Foundations.—Sheet piling is required round the foundations of a warehouse to hold in the soil, which is of a loose, sandy nature. Give neat sketches showing how this would be carried out. (T. R.)

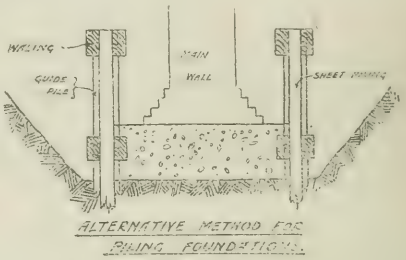
Where a building is to be erected upon soft soil, sand, loose gravel or mud, the whole of the site is sheathed in piles to confine the soil so that it may act as a homogeneous block, being unable to spread laterally, as it certainly would do were it not confined.

The method of sheet piling is as follows: The whole site is excavated to a suitable depth, say 2 ft. or more, and guide piles, 9 in. by 9 in. to 12 in by 12 in., grooved on two opposite sides, except for corner piles which are grooved on adjacent sides, are driven in 6 ft. to 8 ft. apart all round the site, and left projecting 2 ft. above the bottom of the excavations. Wallings about 9 in. by 6 in. are notched and bolted on to both sides of these piles in two pairs, one pair at the top of the piles and the other pair at the bottom of the excavation. These wallings act as guides for the sheet piling, and should be [illegible] between each pair equal to the thickness of the sheet piling to be used, say 4 in.

Sheet piles, say 9 in. by 4 in., birdsmouthed at edges, pointed at bottom on one side, and shod with sheet iron, are then driven in between the guides close together into the solid strata and left all flush along the top edge.

The whole of the site is then covered with a bed of concrete to prevent the soil from oozing up under the load.

As an alternative method a double row of sheet piling could be used with a clear space between equal to the width of concrete foundation, in order to confine only the soil immediately below the founda-



tion. The effect of this method would be to prevent the escape of the soil to either side when under load.

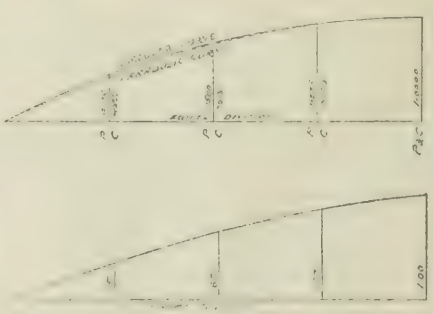
For a choice of method to be adopted in practice regard must be had to the size of the building and the purpose for which it is required. Either method will give stability, but from the point of view of economy the area of concrete must be considered in the one case as against the linear measurement of sheet piling in the other case, as an additional row of piling around the inside of the foundation, if at not too great a depth, may be cheaper in construction than covering the whole site with concrete of sufficient strength to withstand the upward thrust of the soil.

Interlocking steel sheet piles are extensively used in America, but the experience as yet obtained of their durability is not sufficient to warrant their unqualified recommendation. (D. G. B., *Darlington.*)

293. Road Making.—State the advantages claimed for the parabolic camber over the circular camber in road construction, and give a sketch with figured dimensions of a camber which produces the best results. (A. S. C., *Hove.*)

The advantages claimed by a parabolic camber over a circular camber in road construction are:—

(1) The cross gradient towards the channel is not



[illegible] steep, although the same total cross fall is obtained.

(2) The formation of the curve allows of a greater

The Surveyor
And Municipal and County Engineer.

CHIEF CONTENTS.

	PAGE
Advertisement Hoardings	885, 887
American Opinions on Road Foundations and Drainage	887, 907
Appointments Vacant	911
Assistants' and Students' Section	898
Bituminous Materials	899
Collection of Refuse	909
Contour System of Bushey, Herts	899
Control of Advertisement	885, 887
Correspondence	899
County Surveyors and Motor-cars	887
District Surveyors' Fees	887
Institution of Municipal and County Engineers Notices	911
Institution of Municipal Engineers	894
Institute of Sanitary Engineers	885, 886, 909
Intercepting Traps in House Drains	909
Law Notes	901
Local Government Board Inquiries	902
Lye Building Line Dispute	895
Municipal Competitions Open	911
Municipal Contracts Open	912
Municipal Work in Progress and Projected	904
Personal	906
Recent Advances in the Science of Water Purification	889
Recent Publications	886
Road Drainage and Foundations	887, 907
Road Improvements in and Adjoining County Boroughs	910
Road Systems of France	886, 887
Royal Commission on Sewage Disposal	885, 888
Royal Sanitary Institute	894
Some Aspects of the French Highway System	886, 890
Sub-Street Pipe Lines	886
Tendering by Architects	887

depth for wear before water will stand in the centre of the road.

The following sketch shows two curves, a parabolic curve and a circular curve, on each of which the respective ordinates are calculated and figured, and upon comparing these ordinates it will be seen that the difference between the two curves is very slight, and the advantages claimed are to a great extent more theoretical than practical.

In roads having channels at different levels, thereby causing the crown to be situated more towards the higher side, the length of the circular curve becomes somewhat greater, and the advantages of the parabolic curve in this case are more prominent.

In actual practice the true parabolic curve has not altogether given the best results. Telford recommended a very flat ellipse, and Walker preferred two straight lines connected by a short curve at the crown, but a modification of the latter section has generally been accepted as giving the best results, and the curve adopted by the late Mr. J. Price, of Birmingham, shown in the accompanying sketch, has proved highly satisfactory both from points of view of wearing capacity and cross drainage. (D. G. B., *Darlington*.)

Penwortham Sewerage and Sewage Disposal.—The Penwortham Parish Council have instructed Messrs. Taylor & Wallin (Mr. Harry W. Taylor, ASSOC.M. INST.C.E.), of Newcastle-on-Tyne and Birmingham, to report upon the sewerage and sewage disposal of their parish.

Housing at Shipley.—At a meeting of the Shipley District Council on Monday attention was drawn to the scarcity of houses for the working classes in the district, and the opinion was expressed that unless builders bestirred themselves it would be necessary to go in for a municipal housing scheme. A member stated that the industrial development of the town would be hindered if house accommodation were not provided.

Motor 'Buses at Todmorden.—At Todmorden Town Council meeting on Monday night a proposal was submitted to purchase additional motor-'buses. Alderman Isaac Dawson said it had cost £7,000 to keep running 'buses, which only cost £4,000, and they had cost the rates nearly £8,000. Mr. Rigby Dawson said Todmorden and Eastbourne had lost heavily by being the pioneers of motor-'buses, but the makers had profited by their experience. The council had better have spent money on pioneers to run trackless cars, which would cost a 2s. rate. The proposal was not adopted.

CORRESPONDENCE.

"We aim at argument, not victory, and court correction, for truth is our victory."—MARCUS TULLIUS CICERO.

THE CONTOUR SURVEY OF BUSHEY, HERTS.

To the Editor of THE SURVEYOR.

SIR,—Mr. Lange's article in your issue of the 6th instant is of great interest now that the importance of an altitude survey is being recognised as the first indispensable step in any comprehensive scheme for town planning purposes.

As regards the method to be adopted in the field for such a survey, it is not possible to lay down any hard and fast rule; it will depend largely upon two points—(1) The instructions which may be given as to the requirements—viz., the difference in altitude between the contour lines and the additional spot-levels which may be considered necessary; and (2) the nature of the country—viz., the frequency and variation in the undulations, the presence or absence of existing buildings, crops, standing timber, slow undergrowth, &c.

Assuming that the work is to be laid down upon a correct ordnance map, so that no survey beyond that of the contours or spot-levels will be required, and the instruction given that the contours are to be set out and surveyed for transfer to the map, then the first—or what may be termed the "chain"—method mentioned by Mr. Lange is probably the most practical. The chain lines need not necessarily run in a direction generally parallel to the contours, but should be determined by the regularity of the contours, their distance apart, and the size and shape of the enclosure to be surveyed.

If, however, the instruction given is that a spot-level survey is to be made and a contour plan prepared therefrom, then undoubtedly a tacheometrical survey would give the quickest and most satisfactory results, provided that the country will allow of the effective use of a tacheometer.

If it is proposed to use the plan for estimating purposes as well as for the general design of the lay-out, then a spot-level survey is certain to be the most satisfactory, sights being taken at every change in the ground, and the levels preserved for future use. With contours even at every 5 ft., the results—for estimate purposes—may be deceptive. This method has the further advantage that the spot-levels having been once obtained and plotted, the contour lines to be traced—not necessarily at regular intervals—can be determined when the requirements are better known. Although in the case of Bushey it appears that the tacheometer work was found to be quicker than the chain survey, it is obvious that, in many cases, to take a large number of spot-levels with a tacheometer (having regard to the great amount of office work involved in reducing) merely for the purpose of tracing contours therefrom would not be so satisfactory as to do the work by level and chain survey.—Yours, &c.,

J. F. JOBBETT REYNOLDS.

19 Old Queen-street,
Westminster, S.W.
December 18, 1912.

BITUMINOUS MATERIALS.

To the Editor of THE SURVEYOR.

SIR,—That the recent correspondence on this subject should have elicited such an excellent contribution as that from "Original" is an achievement in itself.

I agree with "Original" that the adjective "pure" as frequently applied to Trinidad, Bermudez, Cuban, and such-like individual asphalts as found in their natural states is somewhat ambiguous, inasmuch as that word is not intended to convey that such asphalts are chemically pure, but merely free from adulteration. I suggest that

(1) The word "asphalt" (without the "e") which is to-day recognised commercially as relating to (amongst others) the above-mentioned natural materials, be retained and construed to mean any natural mineral bitumen, either pure or mixed with foreign matter, in either a liquid or semi-liquid form, or from which, through natural causes in the process of time, the light oils have been driven off until it has become solid in consistency.

(2) The word "asphalte" (with the "e") relate only to natural rock asphaltes.

(3) The word "asphaltum" relate to liquid, semi-liquid or oxidised residuums obtained by the careful distillation of asphaltic or semi-asphaltic base petro-

lenins only, and not to paraffin residuums; further, that such asphaltums should only be regarded as of any real value when used as a flux or as an amendment to a limited extent to some of the natural asphalts in the manufacture of paving materials.

(4) The word "asphalt" never be associated with coal-tar products, and that paving materials manufactured from aggregate bound together with refined, fluxed natural asphalt be known as asphaltic paving mixtures as differentiated from bituminous paving mixtures in which coal tar products have formed the matrix.—Yours, &c.,

Cecil Nathan.

3 London Wall Buildings,
E.C.

To the Editor of The Surveyor.

Sir, I may say it was not my intention to enter further into this discussion, as it is my contention that the correct meaning of the words "bitumen," "asphalt" "asphaltum," &c., have been known since the introduction of these materials many years ago, but I feel obliged to congratulate "Original" on the very clean way he states his case in his interesting letter you published in your last issue. It seems strange that some of your correspondents should have put forward such peculiar definitions of asphaltum, &c., when it would have been a simple matter to ascertain from books of reference that asphalt—as "Original" points out—is the English spelling, and asphalte and asphaltum the French and Latin words respectively.

At the same time I do not agree with "Original" that Trinidad asphalt, either in its raw or refined state, means "asphalt formed by the artificial admixture of sand, &c., with Trinidad bitumen." The Trinidad Lake material is described by the Government whose property it is, and by the concessionaires of the lake, as "asphalt," and it is sold in its crude state as "raw Trinidad asphalt," so there is no doubt whatever that the Trinidad material alone is already an asphalt without the addition of any sand, &c. If, however, I have not understood "Original's" letter correctly, and he refers to a composition prepared from Trinidad asphalt, sand, &c., then this is, of course, another matter, and the preparation he mentions would be a "Trinidad asphalt composition" or "an artificial asphalt."

I also do not agree that bitumen and asphalt should be placed in two distinct classes, as nearly all native bitumens can rightly be termed asphalts, but these are, of course, quite different from the rock asphalt found in France, Germany, Sicily, and elsewhere.

I am sorry there is not time on this occasion to deal with this more fully, but as the native bitumens of Trinidad, Venezuela, Cuba, Turkey, and other countries can all rightly be termed asphalts, it is much more simple therefore, and at the same time quite correct, to place all natural materials of this kind in one class and rock asphalt separately in another.—Yours, &c.,

A. E. H. Dussek.

Canal Bank,
Deptford, S.E.
December 24, 1912.

INTERCEPTING TRAPS IN HOUSE DRAINS.

To the Editor of The Surveyor.

Sir, In reply to the letter of Mr. Walter Jennings in your issue of the 20th inst., I was under no misapprehension as to the action of the "Closet of the Century." I merely called attention to the indistinctness of his illustration published in The Surveyor of the 6th inst., where the flush pipe and air outlet pipes are somewhat mixed. I accept unreservedly his assurance that after six years' constant use the closets were found to be in "a perfectly clean condition," but it seems to me that this result was arrived at by the use of a very large quantity of flushing water, certainly more than any waterworks could afford for general application.—Yours, &c.,

R. Read.

Guildhall,
Gloucester.
December 21, 1912.

THE INSTITUTE OF SANITARY ENGINEERS: ELECTION OF COUNCIL.

To the Editor of The Surveyor.

Sir, I very much regret that Mr. Chilvers should feel regret at my letter re the above. Mr. Chilvers is a vice-president, and as such was not amongst those nominated or balloted for, and so he was not intended to be included in my remarks. I accept Mr. Chilvers' statements, and tender him my sincere thanks for his services.

I have personally written to Mr. Chilvers.—Yours, &c.,

Fellow.

December 21, 1912.

SOME RECENT PUBLICATIONS.*

Transactions of the Institution of Municipal and County Engineers (Vol. xxxviii., 1912—13). Edited by Thos. Cole, assoc.m.inst.c.e., secretary. London: E. & F. N. Spon.

Over 500 pages are taken up by the latest volume of Proceedings of the Institution of Municipal and County Engineers. In addition to the annual meeting held at West Bromwich in July of last year, thirteen district meetings are fully reported in the volume, the value of the papers read at the various gatherings being enhanced by the inclusion of a large number of explanatory drawings and photographic views. While, as stated, the proceedings at the annual and district meetings have received due attention, we note with some surprise that the interesting visit which was paid to Paris at Whitsuntide is dismissed in a seven-line paragraph which forms part of the annual report presented at the last annual meeting. In all other respects, however, the publication may be described with accuracy as a faithful and altogether admirable record of the doings of the institution from 1911—12; the arrangement of the contents is excellent, and its general appearance in every way up to the standard of previous volumes. A portrait of Mr. A. D. Greatorex, whose year of office is covered by the volume under notice, appears in the form of a frontispiece.

Applied Mechanics and Mechanical Engineering. Vol I.: Applied Mechanics. By Andrew Jamieson, m.inst.c.e. Price 6s. London: Charles Griffin & Co., Limited.

The popularity of this well-known work has become greater than ever since it was divided into five volumes, each of which is devoted to a particular branch of the subject. One evidence of this is the frequency with which new editions of one or other of the volumes is called for. This is the ninth edition of the first volume that on Applied Mechanics—which has once again been most carefully revised. The latest examination papers of the various examining bodies have been incorporated, together with answers to many of the questions. The book will be found of special value to the student preparing for the examinations prescribed by the Board of Education, the City and Guilds of London Institute, and the Institution of Civil Engineers.

Local Legislation (Supplement for 1912). By F. N. Keen, ll.b., Barrister-at-Law. Price 3s. 6d. nett. London: Walter Southwood & Co., Limited.

Mr. Keen's works on local legislation are of proved value to those who are concerned with the promotion of Bills in Parliament for municipalities. The present volume is supplementary to that which was noticed in The Surveyor some time ago, and it is designed upon the same plan. The clauses of Acts which were obtained during the session 1912 are collected and classified according to their subject matter. To those who are interested in the local legislation of the coming session, therefore, this supplement to Mr. Keen's work is indispensable as affording the readiest possible access to the latest precedents of clauses in regard to such subjects as streets, buildings, sewers and drains, sanitary matters, water, electricity, tramways, railless traction and many others.

Diaries and Calendars.

The London and Lancashire Fire Insurance Company, 45 Dale-street, Liverpool, issue a most dainty diary for a month's memoranda, and a desk tablet of tear-off sheets with, under each day's date, a half-page for notes.

We have to acknowledge, from Messrs. Shand, Mason & Co., of 75 Upper Ground-street, Blackfriars, S.E., the famous makers of fire engines and all other fire-fighting apparatus, a wall calendar for 1913, printed in two colours.

*Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction — i.e., without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used

BY-LAWS: CESSPOOL.—"Rusticus" writes: I should be very much obliged if you would give me your opinion on the following question as to the application of the by-laws with respect to new buildings. An owner about eighteen months ago deposited plans with this council for the erection of two cottages (semi-detached) showing the drains to empty into a cesspool on his own land, which cesspool complied with the by-laws as to distance from the nearest house and well to be provided for the use of the occupiers. These plans were approved, and the cottages erected in due course. The same owner has now deposited plans of two similar cottages to be erected on the adjoining site with the drains to discharge into the existing cesspool above mentioned, and with a new well to be dug for the use of the new houses. The new well will be about 35 ft. from the existing cesspool, and the nearest new house about the same distance. You will observe that the by-laws with respect to cesspools provide that the latter shall not be constructed at a less distance than 50 ft. from a house or 60 ft. from a well. Can the council disapprove the plans by reason of the new houses and new well being shown to be at less distances from the existing cesspool than required by the by-law for the construction of a new cesspool? I forward a copy of the by-laws in force in the district. By-laws Nos. 90 and 91 apply to the distance of cesspool from buildings and well. A short time ago another instance occurred which involves the same principle, but from a different point of view. An owner deposited plans of a house in a small paddock adjoining the premises attached to two existing cottages. The block plan showed the new house to be placed about 20 ft. away from the curtilage of the cottages, and also showed approximately the position of the cottages, but did not show any cesspool belonging to them. As everything appeared to be in order, the plans were approved and the building was proceeded with, but just before the new house was completed it was found that the slop drainage of the cottages discharged into a small covered cesspool at the corner of one of the cottage gardens nearest to the new house. As a matter of fact, the council, and, I believe, the owner of the new house, were unaware of the existence of the cesspool at the time that the plans were deposited.

By law 9 prohibits the construction of a cesspool within 50 ft. of a house, and by-law 11 prohibits the construction of a cesspool within 60 ft. of a well. But there does not appear to be anything in the by-laws to prevent any one from building a house or digging a well within any particular distance of an existing cesspool. In my opinion the council cannot disapprove of the plans of the new houses on the grounds suggested.

HOUSING AND TOWN PLANNING ACT, 1909: INSPECTION OF DISTRICT.—"Ynys" writes: Your help in the past has been much appreciated, and I shall be glad of your advice on the following: I have made certain inspections under sec. 17 of the above Act, and produced reports to my Health Committee, the consideration of which have been adjourned pending further inquiries as to the mode of procedure to be taken by the council. As I understand the Act, a record of each house as regards its sanitary condition must be kept, whether any defects exist therein or not, and I have adopted the card system for that purpose. Will you kindly advise whether: (*a*) The original Inspectors' Journal must be maintained, for ordering defects, which should be remedied without making a closing order? (*b*) Whether closing orders are only to be brought into operation when the usual measures to obtain the remedy of sanitary defects have failed? The defects referred to are dampness in dwelling-houses, leaky roofs, defective drainage, windows not opening at top, and defective backyards, which may, I assume, be remedied after notices served under sec. 94 of the Act of 1875. (*c*) Further, I think that the provisions of secs. 15 and 17 apply to houses which are in a state so dangerous or injurious to health as to be unfit for human habitation, and inasmuch as such conditions do not exist in the cases reported, that it is only necessary for the council to peruse my records, and order that notices as to the sanitary defects be served under sec. 94 of the Public Health Act, 1875. I shall be exceedingly obliged if you will favour me with your advice on the points stated, together with any other information that may be of service.

(*a*) There does not appear to be anything in the Act of 1909 superseding the provisions of the Act of 1875 as to nuisances which do not render premises unfit for human habitation, and presumably the existing practice as to such nuisances is to be continued. (*b*) If the house is in such a state as to be unfit for human habitation a closing order must be made. See subsec. (2) of sec. 17. When the house has been rendered fit for habitation the order must be determined. See subsec. (6) of sec. 17. (*c*) The act appears to draw a distinction between a house which is not "in all respects reasonably fit for human habitation" and a house "in a state so dangerous or injurious to health as to be unfit for human habitation." Sec. 15 deals with the former, and is restricted in its operation to houses the subject of such contracts as are specified in sec. 14. From a comparison of the two sections I think it is clear that there may be defects not so serious as to necessitate a closing order, which nevertheless bring such houses as are within sec. 14 into the operation of sec. 15. As regards such houses the procedure would be under that section. As regards others, if not bad enough for a closing order, the procedure would presumably be under the Act of 1875.

COMBINED DRAIN.—"South Cone" writes: I should be much obliged if you or one of your readers who knows the law would give an opinion on the following point: "A client of mine has a house in a row of four others, all drained into a common drain at the back, joining into a public sewer at the end. The houses belong to different owners. The district is an urban district, and the houses were built forty years ago. For many years they have been subject to flooding by reason of storm water backing up into the main sewer, and have had a flood ball-trap placed, without, however, removing the trouble. The sanitary inspector is threatening proceedings, and the district council are making improvements in their sewage storage. Is the district council liable, or are the owners? I think the London County Council lost a similar case two or three years ago."

The combined drain is a "sewer" vested in and repairable by the district council, subject, however, to this: that if the Public Health Acts Amendment Act, 1890, has been adopted, the council could exercise the powers of sec. 41 of the Public Health Act, 1875, in the event of a nuisance being caused by the condition of the drain itself. I do not think, however, that the latter section would apply in the case of flooding from the main sewer, assuming the drain itself to be sufficient for effectual drainage.

CONVERSION OF WORKSHOP INTO A CINEMATOGRAPH EXHIBITION.—"Ynys" writes: Your reply to the following query will be esteemed: A local joiner has made application to the county council for a licence to hold cinematograph exhibitions in a workshop (joinery) belonging to him, and I shall be much obliged if you will advise me whether he has a right to do so without first submitting plans of proposed conversion to my council. I shall be glad if you will favour me with your valuable advice and general comments at your earliest convenience.

This depends upon whether the alterations in the building amount to the erection of a new building. If such is the case, plans must be submitted. If the alterations involve the pulling down of the building to or below the ground floor this will amount to the erection of a new building under sec. 159 of the Public Health Act, 1875. But this clause does not exhaust the definition of a new building, and it is a question of fact in each particular case whether alterations constitute a new building (per Lord Coleridge in *James* v. *Wyvill*, 48 J.P., 725). In the present case it is difficult to express a decided opinion without knowing the precise nature of the alterations: it would be a question for the magistrates to decide.

PUBLIC HEALTH (BUILDINGS IN STREETS) ACT, 1888.—"R. W. T." writes: At the last meeting of this council a plan was submitted for the addition of a bay window to an existing house. As the building is in the main road, it was disapproved under sec. 156 of the Public Health Act, 1875. The building in question is situate on the corner of a cul-de-sac, and has a forecourt. I should be glad if you would express an opinion as to whether the council are correct in disapproving the plan.

Sec. [illegible] of the Public Health Act, 1875, was repealed by the Public Health (Buildings in Streets) Act, 1888, which re-enacts it in an amended form. The house appears to front towards the main road, and I think there can be no doubt that it is in that road for the purposes of this Act. The council therefore are, in my opinion, justified in disapproving the building of a bay window projecting beyond the front main wall of the adjoining house.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Bradford T.C. (December 13th. Mr. T. C. Ekin).—This was an inquiry into an appeal by the Low Moor Company, Limited, and others against a number of charges made by the corporation in respect of street improvements at Low Moor, on the ground of the unreasonableness of the charges and the non-necessity of the work carried out. Mr. Richard Watson, for the memorialists, said that, generally speaking, the condition of the properties concerned at the time the notice of repair was given was satisfactory, both from the point of view of the public health and convenience for traffic. Also, if the board could be convinced by the corporation that improvements were necessary, it would have been sufficient to carry out the repairs in a more modest way. Another point was that the principle of apportioning the cost was wrong and inequitable, as the amounts had been fixed per lineal yard of frontage, irrespective of the width of the road. In that particular district many of the main roads, over which heavy traffic passed, consisted of macadam, whereas the corporation demanded the streets, &c., to be paved. The freehold capital value of the property was £2,400 while the amount of contribution to the cost of repair was over £1,000 altogether.

Colne T.C. (December 11th. Mr. T. C. Ekin).—£2,100 for purposes of water supply, and £14,873 for works of paving in Burnley-road, Keighley-road and Queen-street.—The town clerk, Mr. A. Varley, stated that the first part of the application was for £450 for the installation of the Deacon system for detecting waste of water, and £1,650, the cost of the purchase of Laneshaw Bridge Corn Mill and water rights, and the purchase of water-pipe line easements through Barnside estate. With respect to the second portion of the application the borough surveyor, Mr. T. H. Hartley, stated that the amount was made up as follows: £13,950 for granite paving of roadways and flagging of footpaths on county main roads known as Burnley-road and Keighley-road, and £923 for reconstruction of Queen-street by paving with granite setts on a concrete foundation in lieu of local grit setts. Keighley-road and Burnley-road were main roads maintained by the county council, but the corporation, under the Local Government Act of 1888, claimed to retain powers of repairs. The total length of main roads in the borough was 4 miles 4 furlongs 99 yds., and at present there were 3 miles 2 furlongs 5 yds. macadamised, and 1 mile 2 furlongs 89 yds. paved, and the present macadamised surface and foundations were found to be insufficient for the present traffic. The proposed scheme was for the granite paving of the carriageways and flagging of footpaths in Burnley-road (White-street to the borough boundary) and Keighley-road (end of paving to car-shed), these lengths being as follows: Burnley-road, 5 furlongs 155 yds.; Keighley-road, 3 furlongs 46 yds.; total 1 mile 201 yds. When this length was complete there would then be [illegible] macadam road.

Dewsbury T.C. (December 13th. Mr. Courtenay [illegible]).—£1,000 for the purchase of property [illegible] posed to widen Bradford-road and Foundry-street, and erect new premises on an entirely new building line in Northgate. There was no opposition at the inquiry.

Downpatrick R.D.C. (December 13th. Mr. Barnewell [illegible]).—£475 for the erection of [illegible] Mr. A. [illegible]

East Ham T.C. (December 12th. Major J. Stewart).—£1,[illegible]42 for the purchase of a portion of the conveniences at the junction of Central Park-road, Barking-road and Beckton-road, and for the [illegible] The borough engineer, Mr. J. E. W. Birch, stated that [illegible] there was abundant evidence that it would serve a very useful purpose. The smaller convenience, it [illegible]

Harrogate T.C. (December 18th. Mr. H. R. Hoopers).—£[illegible] for the purchase of the Harrow Inn [illegible] consisting of 59 acres of land, including the pine woods, eight sulphur springs, an hotel, cottages, and [illegible] baths. Mr. J. Turner Tay[illegible] (town clerk) stated that the purchase was considered by the ratepayers to be a wise step. The corporation had tried to buy it for over twenty years, and in 1888 the price was the same as they were now giving—£8,000. In 1897 the owners asked £17,000. He did not think that there was any likelihood of the corporation running the hotel or becoming the tenants, and the present tenant had been told that the corporation hoped he would continue as tenant. Dr. Neville Williams said he believed the waters at Harlow Car were the most valuable alkaline mineral springs not only in England but in Europe, and were of immense value for certain diseases. There was no opposition.

Leiston U.D.C. (December 18th. Mr. Courtenay Clifton).—£500 for the purchase of the ground and for laying out a cemetery.—Evidence was given as to the extent of the ground, the right-of-way to the proposed cemetery, the sub-soil, the wells in the locality, the laying out of roads and the planting of trees.

Littleborough U.D.C. (December 12th. Mr. Courtenay Clifton).—£2,350 for purposes of street improvements at the corner of Hare Hill-road and Church-street.—The clerk, Mr. C. H. Wild, stated that the roadway had been very narrow for some years, and there had been no footpath on the westerly side, and on the easterly side the footpath was only 3 ft. wide. In November, 1900, the council approached the then owners of the property on the westerly side with a view to the purchase of the property, and the price put upon it was £2,058, which the council considered was too much. The property had now changed hands, and after several interviews the council had made a provisional agreement with the owner to purchase the whole of the property for £2,300. Councillors Taylor and Ashworth gave evidence of the value of the site, and also of the necessity for the improvements.

Merthyr T.C. (December 17th. Mr. E. Leonard).—£12,250 for the purchase of the Galon Uchaf estate, Gellifaelog, as a site for the erection of working-class dwellings and for purposes of small holdings and allotments, and £10,250 for the erection of working-class dwellings at Thomastown, Merthyr.—The town clerk, Mr. T. A. Rees, stated that since the notice of the inquiry had been received the council had decided to abandon the Thomastown scheme. The council, however, hoped to go in for another scheme which would be cheaper. The medical officer of health, Dr. Duncan, gave evidence as to the lack of houses and overcrowding. In Dowlais, he said, there were about 300 houses that were unfit. A number of houses had been closed, and if there was further accommodation for displaced tenants a number of other houses would be closed. The inspector: What kind of house do you suggest? I suggest one with a kitchen and scullery behind and two or three bedrooms. The rental should not be more than 18s. to 20s. a month for the class of people for whom the houses are wanted.

Pembroke (Co. Dublin) U.D.C. (December 16th. Mr. [illegible] F. McCo[illegible]).—£8,600 and £12,000 for the erection of working-class dwellings. It was explained that the first application was for a loan of £8,600 for the purpose of erecting forty-three houses at a place called Beattie's Field, in the Ballsbridge part of the township. The council had been able, by agreement with the owners of this place, to avoid the expense of compulsory purchase. It was proposed upon this site to erect twelve cottages of the A type, at a cost of £[illegible] each, and thirty-one cottages of the B type, at a cost of £145 each. It was proposed to let these cottages in the compounds at 5s. and 4s. 6d. respectively per week. The other part of the application was for a loan of £12,000 for the acquisition of Donnybrook Castle, at the Lower end of the township, and the erection thereon of forty-nine houses. Twenty-[illegible] of these houses would be what were called the B type, costing £136 each, and they would be let at 4s. 9d. per week; nine cottages of the C type, costing £150 10s., and proposed to be let at 6s. 3d. weekly; six cottages of the D type, costing £160 2s., to be let at 7s. 3d. per week; and thirteen cottages of the G type, costing £115 6s., to be let at 3s. 10d. weekly.

Portsmouth T.C. (December 18th. Mr. R. H. Bickmell).—£3,745 for works of [illegible] ment. The work in question is distributed over the northern [illegible] part of the town, some of the streets being [illegible]89 in Lyndhurst-road, £330 in Westbourne-road, £317 in Victoria-road, £358 in St. Piran's-road, and £253 in Kensington-road. Other amounts were £260 in

Dartmouth-road, North End, and £230 for Wharf-road, Rudmore. Evidence with respect to the proposed works was given by the town clerk, Mr. A. Hammond Etherton, and the borough engineer, Mr. A. Ward.

Portslade U.D.C. (December 15th. Mr. E. Dudley).—£1,000 for the purchase and adaptation of 17 Station-road as council offices. The clerk, Mr. Ernest H. Kempe, stated that the accommodation required was a large public office in front, a private office for the joint use of the clerk and surveyor, a surveyor's public office, and a suitable council chamber, which would provide accommodation for the public, and in which meetings of all sorts could be held. They also required accommodation for storing records and papers. The purchase price of the freehold of 17 Station-road was £800, with £25 in addition for costs; and the remainder of the money was for adapting the premises and for furniture and contingencies. The surveyor, Mr. A. Taylor Allen, said the cost of the land was assessed at £300, and of the building itself at £525, for the purposes of the inquiry, although it was considered that the actual value of the land was much more, £10 a foot, and even above that being mentioned as the price of land along this road.

Preston T.C. (December 18th. Mr. M. K. North).—£4,700 for the completion of the laying out the land presented to the town by Miss Haslam as a recreation ground.—It was explained that a loan for the purpose of £6,000 had already been sanctioned, and that a sum of £4,804 had been expended, the council not exercising their borrowing powers with respect to the remainder. Miss Haslam had supplemented her original gift by presenting a further 33 acres to the town, which permitted of a more comprehensive scheme being carried out. Towards the laying out of part of this land Miss Haslam offered £4,000, and the loan now asked for was to cover the remainder of the cost.

Stourport U.D.C. (December 19th. Major J. Stewart). £1,400 for the purpose of carrying out works for obtaining a water supply from Bewdley Corporation in lieu of the present supply from Kidderminster Corporation, whose contract with Stourport Council expires on March 5th next.—Mr. C. H. Watson, clerk to Stourport Council, said the proposal was to borrow £1,400 for thirty years. If the loan were sanctioned the work could not be carried out in time to supply the water to Stourport by the time the agreement with Kidderminster expired, but Stourport would trust to the neighbourly [illegible] of Kidderminster to continue the supply for a short time. Mr. R. Coventry, in a further statement, said Kidderminster Corporation had supplied water for [illegible] years at 6d. per 1,000 up to 20,000,000, and 5d. per 1,000 gallons afterwards. Stourport asked for reduced terms, telling Kidderminster it was also approaching the Bewdley Council. Kidderminster declined to make any reduction. Bewdley offered 5d. per 1,000 gallons up to 20,000,000 and 4½d. per 1,000 beyond that. The Bewdley supply would be both more economical and more efficient than that of Kidderminster. For the Kidderminster Corporation Mr. Willcox, engineer to the Kidderminster Corporation, said the present main from Kidderminster to Stourport was sufficient. The [illegible] was not laid to any [illegible] Kidderminster [illegible] valves at Stourport. Kidderminster spent £20,000 in [illegible] injustice to Kidderminster if Stourport ceased to take its supply from Kidderminster.

Wimbledon T.C. (December 5th. Mr. W. O. E. Meade-King).—£3,180 for the purpose of laying out part of the [illegible] (Mr. A. Steele Sheldon) stated that the proposal was [illegible] portion of the land acquired for sewage farm purposes. Mr. Booth, deputy borough treasurer, said the grave spaces which the extension would provide, together with those available in the present consecrated portion, would serve the necessities of the borough for twenty years. The unconsecrated portion would last for fifty years. There was no opposition.

Wirral R.D.C. (December 13th. Mr. Thomas Adams).—This was an application for permission to prepare a town plan for the parishes of Heswall-cum-Oldfield, Pensby, Barnston, and Gayton.—Mr. W. W. Shennan, surveyor to the council, said the main road to Chester from West Kirby ran right through the centre of the area it was proposed to plan, and the main county road from Birkenhead and Wallasey also passed through the district. Development was taking place very rapidly in Heswall, but they had difficulty in getting a uniform lay-out of the land on account of the operation of the existing by-laws. Large houses were mixed up with small cottages, and there were many owners, each desirous of developing his own land in his own way, and the council could not interfere so long as the owner conformed with the by-laws. In the course of the inquiry the inspector asked if it was not dangerous for a district with the contour of Heswall to be without light on the highways. Mr. J. T. Thompson (who appeared for the council) said he thought it was extremely dangerous. The inspector: You ought to have a lighting system of some kind. Mr. T. Davies, chairman of the council, said his authority and the parish council might take the matter up and see what could be done.

Worcester T.C. (December 11th. Mr. H. R. Hooper).—£7,900 for the electricity undertaking.—Mr. R. Clarke, chairman of the Electricity Committee, stated that there had been an increased demand in the city, following the change over to the polyphase system, and additional plant was necessary. The inspector remarked that the general information he had received showed the progress of the undertaking, which appeared to have been very hard hit by the metal filament lamps. There were reasons why they should expect the loss which had occurred. He thought that in two or three years' time they would be round the corner.

APPLICATIONS FOR LOANS.

Abingdon R.D.C.—£2,700 for a water supply scheme.

Bridlington T.C.—£5,000 for electrical plant.

Bridlington T.C.—£5,000 for extension of the electricity plant and engine-house.

Chelmsford R.D.C.—£5,860 for the Broomfield water supply.

Dartmouth T.C.—£140 for works of flood prevention.

Farnham U.D.C. [illegible]

Radcliffe U.D.C.—£1,000 for the purchase of electric [illegible]

Scarborough T.C.—£1,535 for alterations to school [illegible]

Tiverton T.C.—£1,600 for a site for workmen's dwellings.

LOANS SANCTIONED.

Abergavenny T.C.—£18,000 for waterworks extensions.

Alsager U.D.C.—£330 in connection with a water scheme.

Ashbourne R.D.C.—£1,300 for workmen's cottages.

Cosport U.D.C.—£1,673 for the introduction of the water-carriage sanitary system.

Keighley T.C.—£7,500 for public baths, and £7,795 for [illegible] grounds.

FORTHCOMING INQUIRIES.

JANUARY.

2.—**Manchester.** For the purpose of including Heaton Norris in the city boundary (Mr. E. A. Sandford Fawcett).

2.—**Stockport.** For the purpose of including Heaton Norris in the borough boundary (Mr. E. A. Sandford Fawcett).

7.—**Scarborough.** For authority to prepare a town [illegible] (Mr. Thomas Adams).

Crystal Palace Engineering School.—The "Wilson Prize" [illegible] Crystal Palace Engineering Society (affiliated to the Society of Engineers (Incorp.) during the present session has been awarded by the council to Mr. J. R. M. [illegible] "Water Tube Boilers." Other papers read during the session were "The South-Eastern Coalfield," by Mr. B. L. Rigden; "Compressed Air," by Mr. H. M. Jordan, and "Reconstruction of Komati Poort Bridge," by Mr. J. E. Thomas. The premium was presented to Mr. Chalon by Mr. R. Elliott-Cooper, president of the Institution of Civil Engineers, on the occasion of the 120th Distribution of Certificates of the above school on Thursday, the 19th inst., at which he presided.

Municipal Work In Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Newport (Mon.) £49,000, Renfrewshire, housing and town planning—Falmouth, Stafford; roads and material—Aberdeen, Cardiff; sewerage and sewage disposal—Camberwell, Rochester, Truro, Whitby; water, gas and electricity—Ebbw Vale £125,000, Widnes £36,000, Bridlington £5,000, Chelmsford £5,860.—Particulars of other works projected will be found in our "Local Government Board Inquiries" pages.

BUILDINGS.

Marylebone B.C. Additional means of exit are to be provided at the public baths, Marylebone-road, at a cost of £150.

Machynlleth R.D.C.—The surveyor, Mr. Richard Williams, at the recent council meeting reported that the building of the new Walton Bridge had been completed and that the wooden framing would be removed about February 1st, when the bridge would be ready for testing by the passing of a road roller over it.

Newport (Mon.) T.C.—Mr. J. J. Webster, M.INST.C.E., has prepared a report with respect to the proposed reconstruction of Newport Bridge. This shows that fifteen schemes were submitted by four firms, and that of Messrs. L. G. Mouchel & Partners (Mouchel-Hennebique) had received the highest number of marks, and Messrs. The Considere Construction Company the second highest number. Messrs. Mouchel's design is for the construction of a ferro-concrete bridge at an estimated cost of £49,000, or with granite parapets £50,500. Messrs. Mouchel have written that in order to demonstrate their complete confidence in ferro-concrete as a structural material, and in their ability to utilise it, they agreed that the bridge should be handed over complete and tested before any payments were made on account of its construction, and also to hand, after completion, a policy of insurance at Lloyd's on the structure. The cost of a new stone bridge over the river is estimated at £80,000. A committee of the corporation have considered these details, and are of opinion that none of the schemes submitted fully meet their requirements. They recommend that the Parliamentary Committee adhere to their decision to construct a ferro-concrete bridge with improvements on Messrs. Mouchel's design, including a temporary footbridge over the river while the new bridge is being constructed. They add that in due course arrangements should be made with Messrs. Mouchel & Partners for carrying out the scheme under the supervision of the borough engineer, Mr. H. Tremelling, and a specially qualified resident engineer. The matter is still under consideration.

Renfrewshire C.C.—A resolution has been passed to make provision at Spiersbridge for a fire brigade station with the necessary accommodation for the staff, a justice of peace court-house, a small office for the district sanitary inspector in lieu of the one formerly occupied at Pollokshaws, a mortuary and house accommodation for the superintendent, and such other portions of the police force as may be afterwards decided upon, and at Giffnock for two cottages for married constables near the present police station.

HOUSING AND TOWN PLANNING.

Caistor R.D.C. Plans have been approved for the erection of a pair of cottages on the council's land at Grasby, being the first of about sixty which it is intended to erect in the district under the Housing and Town Planning Act.

Chester T.C. A special committee has been appointed to carry out such of the powers and provisions of the Housing of the Working Classes Act, 1890 to 1909, as relate to the housing of the working classes.

Denbigh T.C. The question of providing workmen's dwellings has been referred to the General Purposes Committee.

Falmouth T.C. The borough surveyor, Mr. J. S. Wethey, has now submitted a provisional plan of the proposed estate for the erection of twenty-two workmen's dwellings, showing an increase in the cost, owing to the rise in the price of materials. It was originally considered that the houses could be built at £150 each. The council have authorised the General Purposes Committee to visit Truro, St. Austell and Yeovil for the purpose of inspecting the houses erected in those places. It was stated that the rent proposed was 5s. 3d. per week.

Clitheroe T.C.—The Town Planning Committee and the General Finance Committee have been authorised to select a suitable site and prepare plans and estimates for the erection of about twenty houses suitable for working men's families.

Cwyrfai R.D.C.—It has been agreed to proceed with a scheme for providing dwellings at Clwtybont.

Stafford T.C.—A scheme is to be prepared for the erection of forty working-class dwellings, in addition to the twenty already proposed, at rents of 5s. and 6s. a week, twenty of the houses to be erected in Blakiston-street and twenty in Harrowby-street, on land belonging to the town.

PARKS AND OPEN SPACES.

Oldham T.C. The council have approved the plan of the surveyor, Mr. E. C. Foote, for laying out the land at Snipe Clough, which was gifted to the council as an open space by the Misses Wright. The donors have also contributed £250 towards the cost of the work of laying out.

Edinburgh T.C.—It has been referred to the Parks Committee to consider and report upon the provision of a bowling green upon ground belonging to the corporation in the neighbourhood of the existing bowling green at Portobello.

REFUSE COLLECTION AND DISPOSAL.

Cardiff T.C.—The report of the city engineer, Mr. W. Harpur, with respect to the cleansing and watering of the streets, recites the various activities of the cleansing department for several years back, and makes recommendations for carrying out the work more thoroughly. Mr. Harpur reported that the work could not be done with greater efficiency than at present except by incurring the following expenditures: Twelve additional street sweepers for the main thoroughfares; twelve additional street watervans; twenty additional street hydrants; and the employment of a cleansing detective. These represented a capital charge of £1,084, and an estimated annual charge of £1,642. A return prepared by the city engineer also showed that, taking representative cities and large towns in the country, the cost per mile of scavenging varied from £50 to over £200. Cardiff was the lowest but one on the list, with £74. The chairman of the Health Committee, whose members considered the report last week, said a better way of keeping the streets clean would be to go in for more tar spraying. In any case, he did not think the committee could recommend the extra expenditure suggested by the city engineer, except that involved by the engagement of twelve additional street sweepers. It was agreed to engage the sweepers, at an estimated capital charge of £84, and an estimated annual charge of £814.

Hunstanton U.D.C. It has been decided to provide a new vertical boiler with a steel chimney for the refuse destructor at a cost of £235, and to utilise the present destructor boiler as an additional one for the pumping station.

Tutbury R.D.C.—The surveyor, Mr. H. S. Tebbitt, has recommended a house-scavenging scheme for Stretton, and the council have asked the parish council to give the matter their consideration. Taking the average cost of each house per annum to be 5s., the cost is estimated to be £75 a year.

ROADS AND MATERIALS.

Aberdeen T.C.—It has been agreed to pave Stirling-street with wood, and carry out repairs in several other streets.

Berwickshire C.C.—It has been agreed by the Eastern District Committee to make up the road over Whiteburn Hill from the Weir Burn to the

Duns-road, provided that land and stones are given free, that no fencing is required, and that a sum of £150 is subscribed locally.

Bodmin R.D.C.—Delegates have been appointed to a conference with the St. Columb Rural District Council on the subject of the main roads contracts between the rural councils and the county council, it being considered that these should be made more equitable, or the county council should take over the management of the main roads in the eastern division of the county.

Bourne R.D.C.—In reply to a question at the council meeting last week, the clerk quoted figures showing that the expenditure of the council in highway matters had risen since 1908 by £1,600, the surveyor, Mr. T. Lake, stating that a considerable amount of that sum was in respect of road improvements in the district.

Cardiff T.C.—Plans of three schemes, estimated respectively to cost £2,060, £4,450 and £6,530, for widening Edward-terrace and Pembroke-terrace by covering the feeder and making a bridge, were submitted last week by the city engineer, Mr. W. Harpur, to the Public Works Committee. The main object of the suggested improvement is to provide increased facilities for vehicular traffic to and from the Taff Vale Railway Station. The committee agreed that the question was too large a one to be decided in a hurry, and referred the plans to a sub-committee to consider and report fully upon the advantages offered by the schemes.

Cannock U.D.C.—Another application is to be made to the Road Board for a grant for carrying out the widening of Stafford-road, near the Royal Oak, and for the widening of the Stafford-road near Hatherton Wharf. The estimated cost of the former improvement is £409, and of the latter £1,075. The board is also to be asked to give a grant towards the estimated cost of £934 for the widening of Mill-street, Cannock.

East Ham T.C.—It has been agreed to support a proposal to urge upon the Government the desirability of an authority being constituted to decide what ought to be the main roads of the country, and which of those main roads should be trunk roads; also that the State should contribute towards the cost of the main roads the actual half of the cost of maintenance (as was understood to be intended in 1888); and that, with regard to trunk roads, special additional grants should be made, subject to inspection by the central authority.

Edinburgh T.C.—The Streets and Buildings Committee have sanctioned a road improvement scheme involving a continuation of the widening of Ravelston Dykes from the Caledonian Railway Bridge westwards to a point opposite Murrayfield-avenue. At present the road is 20 ft. wide and it is to be increased to 60 ft.

Kingston (Surrey) T.C.—Woodbine-avenue is to be made up under the Private Street Works Act. £291 is to be contributed towards the cost of laying new wood blocks on the margins of the tramways in Richmond-road, in order to satisfactorily fit in with the new wood paving there. The remaining three-fourths is to be paid by the tramway company.

Plymouth T.C.—The tender of Mr. T. Doney, at £250, has been accepted for making up Compton Park Villas-road, and the tender of Messrs. Pearn & Bros., Limited, at £168, for making up Penrose Villas-road. The Road Board have promised a grant of £2,000 towards the £10,000 necessary to widen Weston Park-road from 15 to 40 ft.

Wincanton R.D.C.—A special committee has submitted a report recommending that, as from March 31st next, the manual labour on both the main and district roads be carried out by direct labour. By including the main and district roads in the direct labour scheme more men, they consider, could be employed in a smaller area, which would compromise by minimising the distance the men would have to travel to their work. The report is to be considered at the next monthly meeting of the council.—The Somerset County Council have proposed a widening improvement at Yenston Bridge between Templecombe and Henstridge, including the rebuilding of the bridge, at an estimated cost of £2,470, exclusive of the cost of land required. This council are considering the matter with a view to ascertain whether financial support can be obtained locally for the scheme.

Woodford U.D.C.—Improvements are to be carried out on Lea Bridge-road, in aid of the cost of which a contribution will be received from the Road Board.

SEWERAGE AND SEWAGE DISPOSAL.

Acton U.D.C.—The plan of the surveyor, Mr. F. Sadler, for the provision of a public lavatory for women, at an estimated cost of £700, has been approved.

Camberwell B.C.—It has been agreed to pay one-fourth of the cost (£2,403) of the underground convenience to be erected at Crystal Palace-parade, the other contributory districts being Lambeth, Croydon, and Penge.—The borough engineer, Mr. W. Oxtoby, has prepared a plan for a public convenience on Goose Green, at an estimated cost of £900.

Norwich T.C.—The city engineer, Mr. A. E. Collins, has received authority to erect a sanitary convenience for each sex at Sewell Park, at an estimated cost of £101.—The tender of Mr. W. J. Hannent, at £267, for the erection of a shelter and lavatory at the cemetery in accordance with the city engineer's specification has been accepted.

Paignton U.D.C.—The tender of Mr. W. Smaridge for a public convenience and shelter at Preston, at £273, has been accepted, subject to the Local Government Board granting the £73 additional to the £200 already sanctioned.

Rochester T.C.—A deputation has been appointed to meet representatives of the Chatham Town Council to discuss the question of a joint drainage scheme with the outfall works at or near Whitewall.

Truro T.C.—The borough surveyor, Mr. F. A. Barnes, has been instructed to report on a further alternative site for a sewage disposal scheme.

Whitby R.D.C.—The clerk has been instructed to obtain information with respect to plans and estimates for a sewerage and sewage disposal scheme for Sleights.

Woolwich B.C.—The tender of Mr. J. W. Ellingham, of Bexley Heath, at £567, has been accepted for the construction of a public convenience. The East Ham Town Council have agreed to contribute one-third of the cost.

WATER, GAS, AND ELECTRICITY.

Banbridge U.D.C.—A memorial to the Board of Trade has been approved for the grant of a Provisional Order in connection with the electric lighting scheme.

Bridlington T.C.—Authority has been given to the Electricity Committee to erect a new steam generating set at the electricity works, at an estimated cost of £5,000, subject to the Local Government Board sanctioning a loan for the purpose.

Chelmsford R.D.C.—An amended scheme has been prepared by Mr. J. Dewhirst, sanitary surveyor, for the supply of water to Broomfield, which is now estimated to cost £5,860.

Ebbw Vale U.D.C.—The council have decided to promote a Parliamentary Bill next Session to construct additional waterworks. Powers are to be asked to borrow £125,500 for the purchase of lands and wayleaves for and for the construction of the waterworks. Out of the sum the council are to pay off £43,224 which they have already expended on the adit into the Llangattock Mountain. The whole sum of £125,500 is to be repaid within sixty years from the date of the borrowing.

Keighley T.C.—In connection with the water supply scheme, the council have accepted the tenders of Messrs. W. Morley & Sons, of Keighley, at £2,359, and Messrs. Guest & Chrimes, of Rotherham, at £376.

Lowestoft T.C.—There was a deficit of £2,384 on the working of the tramway undertaking last year.

Marston Sicca R.D.C.—Messrs. Willcox & Raikes, engineers, have submitted a report with respect to a water supply for Long Marston from the mains of the Evesham and Pebworth Joint Water Committee, the total estimated cost being £690. The matter is under consideration.

Selby U.D.C.—The purchase has been effected for £600 of a tract of high ground near Selby for the protection of the water supply.

Widnes T.C.—Gas and waterworks extensions are to be carried out at a total estimated cost of £36,000.

MISCELLANEOUS.

Hunstanton U.D.C.—With the object of increasing the productive capacity of the gasworks, it has been decided to erect a new exhauster with a capacity of 10,000 cub. ft. per hour, and also a naphthalene extractor, at a total estimated expenditure of £212.—The water pits at the waterworks are also to be altered at a cost of £60.

Okehampton T.C.—It has been decided to provide oilskins for the outdoor employees.

Sunbury U.D.C. The wages of roadmen earning under 23s. per week have been increased by 1s. per week, and the sewermen have received a similar increase.

PERSONAL.

Mr. J. Johnson, surveyor to the Dulverton Rural District Council, has been appointed surveyor to the Keynsham Rural District Council.

Mr. Arthur L. Parker, surveyor to the Oakham Urban District Council, was married last week to Miss Annie E. Shepherd, of Ruskington.

Mr. J. L. West, chief assistant to the Berks county surveyor (Mr. J. F. Hawkins), has been appointed surveyor for the west district under the Essex County Council.

Mr. A. F. Wickenden, A.R.I.B.A., of Ilford, has been selected by the Improvement Committee of the Birkenhead Corporation as assistant to the borough surveyor.

Sir John H. A. Macdonald, K.C.B., member of the Road Board, gave an address before the Edinburgh Philosophical Institution last week on "The Road: What it was, is, and should be."

Messrs. Dodd & Dodd, MM.INST.C.E., civil and consulting engineers, of 37 Waterloo-street, have removed to more spacious offices at County Chambers, Corporation-street, Birmingham.

Mr. Chas. J. Conquest, engineer and surveyor to the Sandgate Urban District Council, is the engineer to the water supply scheme promoted by the council, including the construction of two reservoirs, one to hold 200,000 gallons and the other to hold 150,000 gallons.

Mr. George Smith, chief assistant to Mr. H. C. Fread, A.R.I.B.A., engineer and surveyor to the Urban District Council of Esher and the Dittons, Surrey, was appointed by the Eton Urban District Council as town surveyor at their last meeting. Mr. Smith has passed the examination of the Institution of Municipal and County Engineers, the Surveyors' Institution and the Royal Sanitary Institute.

Mr. J. A. Brodie, city engineer of Liverpool, arrived at Bombay on the 13th inst., en route for Delhi. Mr. Brodie, with his co-members of the Government Commission appointed to lay out Delhi as the new capital of India, will be away for two or three months, by which time the great scheme of town-planning, commenced earlier in the year, will, so far as the preliminary designs are concerned, be completed.

"The Civic Engineer's Who's Who."—The first issue of "The Civic Engineer's Who's Who" (London: St. Bride's Press, Limited, 24 Bride-lane, E.C., 2s. 6d. nett) gives wonderfully complete lists of the engineering officials of England and Wales. For a first issue [illegible].—*Glasgow Herald.*

Colne Corporation Bill.—The Colne Corporation Bill for 1913 deals mainly with the purchase of the undertaking of the Colne and Trawden Light Railways Company. In addition to the purchase of tramways, it is proposed to supply energy by means of the Bill to extend the area of supply of the electricity undertaking of the corporation to the districts of Trawden and Foulridge.

Reconstruction of Chertsey Lock. The Thames Conservancy have adopted a scheme for the reconstruction of Chertsey Lock, among a plan having for its object the widening of the existing lock, the work to be carried out in steel piling, faced with concrete, at an estimated cost, including the cost of [illegible] of £9,250. The new sluice at Hampton Wick is also to be extended at a cost of £150.

WATER-STERILISING PLANTS WANTED.

Mr. R. O. Wynne-Roberts, M.INST.C.E., of Regina, Sask., Canada, is, as we stated last week, desirous of installing a water-sterilising plant which must be simple, self-contained and reliable. The city can generate electricity with two 80-horse power oil engines, which can be belted to dynamos. Hypochlorite is expensive, costing at least 1d. per lb. Salt can be had at 3½d. per lb., but is of unknown quality. Rock salt can be bought for 1 cent per lb. in bulk. It is desired to treat 2,000,000 gallons per day, and later to increase this to some 4,000,000 gallons. The water is very hard, but clear. We should be glad if firms who handle water-sterilising plants would send particulars of them direct to Mr. Wynne-Roberts, Regina, P.O. Box 65, and we should be obliged if they would at the same time notify us that they have sent such details.

Proposed Liverpool Improvements.—A special meeting of the Liverpool City Council was held on Monday last for the purpose of considering the provisions of an Omnibus Bill to be promoted in the next session of Parliament. The objects of the Bill are described as being to empower the corporation to make new streets, make better provision for the health, local government and finances of the city, to provide for the granting of superannuation allowances to certain officers and servants of the corporation, and other purposes. After a good deal of discussion the meeting was adjourned to January 2nd.

FOR OTHER ADVERTISEMENTS
See End of Paper.

TO CONTRACTORS.

THE COUNCIL OF THE METROPOLITAN BOROUGH OF WANDSWORTH is prepared to receive Tenders for the Making Up and Paving of the following new streets—viz.:—

(*a*) That part of Salterford-road, Streatham, which lies between Southcroft-road and Welham-road.

(*b*) Otterburn-street, Tooting.

The Specifications and Drawings may be seen, and Forms of Tender obtained of the Borough Engineer, Mr. P. Dodd, M.INST.C.E., at the office of the New Streets Department, No. 56 East-hill, Wandsworth, S.W., between the hours of 10 and 4 (Saturdays 10 and 12), upon payment of a deposit of Five Guineas in each case.

Tenders, enclosed in Separate Sealed Envelopes, and endorsed "Tender for Paving ——," must be delivered at the Council House, East-hill, Wandsworth, S.W., and may be placed by the person tendering in the box provided for the purpose not later than four o'clock in the afternoon of Monday, the 20th January next.

Persons tendering must, in the case of all workmen employed by them in and about the execution of the contract, pay wages at not less and observe hours of labour not greater than the rates and hours recognised by the Associations of Employers and Employees and in practice obtained in the district where the work is to be executed.

No Tender will be received unless it be made upon one of the forms provided for the purpose. The council does not pledge itself to accept the lowest or any Tender. If required, the Contractor must provide two sureties for the due execution of the Contract.

D. A. NICHOLL,
Town Clerk.

Council House, Wandsworth, S.W.
December 23, 1912.

CAMBRIDGESHIRE COUNTY COUNCIL.
TENDERS FOR ROAD MATERIAL.

The above Council invite Tenders for the Supply of Broken Granite, Basalt, Slag and Tarred Macadam for use on the Main Roads during the year ending March 31, 1914.

Particulars and Forms of Tender may be obtained from this Office, where Tenders are to be delivered on or before Wednesday, January 1, 1913.

J. E. BLACKWALL,
County Surveyor.

County Surveyor's Office,
54 Hills-road,
Cambridge.

Road Drainage and Foundations.

[Extracts from an informal discussion at a meeting of the American Society of Civil Engineers, held in January last, with Notes and Comments by Reginald Ryves, M.Cons.E., Assoc.M.Inst.C.E.]

The subject under informal discussion at a meeting of the American Society of Civil Engineers held last January was "Road Construction and Maintenance," the following notes and comments relating to Part I., "Drainage and Foundations." The full report will be found in vol. lxxv., 1912, of the "Transactions" of the society.

For the present purposes the references made can be conveniently grouped under three heads, but it must be borne in mind that this grouping and the selection of only the most important of the remarks or opinions expressed may not in all cases present the particular speaker's views in true perspective, or do full justice to his attitude on the subject.

DRAINAGE GENERALLY.

The discussion was opened by Mr. J. Owen with a just and very important observation as to the attitude which ought to be taken up in the matter of drainage generally.

"On the question of drainage it may be recalled that at one of the National Road meetings the Minister or Commissioner of Roads of Ontario laid down three fundamental principles of road construction: First, drainage; second, drainage; and third, drainage. He was asked afterward what he would do if he lived in Arizona, where there is no rainfall. From this it can be reasonably understood that drainage is: First, a matter of climate; second, a matter of topography; and third, a matter of soil. In discussing these subjects it is best to consider the question of drainage *per se*."

Another matter to which the same speaker directed attention is that of the difference between water levels and rates of ground water flow before the road is made, and the levels and rates of flow after the road is made. He pointed out that in many cases "the first rush of water is merely a lowering of the water level to the new grade, and that frequently within a year or two such springs disappear entirely. Consequently the money spent to take care of them was practically wasted. Therefore the topography of a locality where there are springs should be considered, and judgment should be used in determining whether a spring is permanent or whether it is merely due to changing conditions in constructing the road."

This is an important matter. In some cases a whole series of springs may be tapped, or the water level throughout a long stretch of road may be lowered by making one good outlet at a suitable spot, depending upon the lie of the strata. In other cases very small drains, or a drainage course, may seem to be inadequate as a means of dealing with the large volume of water, but may ultimately prove to be of ample dimension and of a suitable character to deal with the rate of flow when accumulations of water in the soil are no longer formed.

Considering the great importance of the type of road referred to, the wide range of soils and climates to which it is suited, and the enormous mileage of efficient and economical roads so constructed, the following passage (Mr. T. S. Oxholm, New York) is a welcome item in the discussion:—

"It has been found in this borough that large sums, formerly spent for unnecessary drainage, could be saved by constructing the road, in most cases, where the conditions appear to be favourable, without any special provisions for drainage other than well-cleared ditches at the sides, having suitable outlets at the foot of grades, and by noting frost heaves or other damaged sections during the winter and spring, and in these places, which are comparatively few, building blind drains of stone from the centre of the road diagonally to the ditches or culverts."

Even when elaborate drainage ensures against failures, it may not be the only way or the most economical way of doing the work. On this point Mr. J. A. Johnston, of the Massachusetts Highway Commission, said: "In beginning its work the commission constructed some rather elaborate systems of trench drains and telford paving for foundations. Where such work was done there were no failures, but the cost was excessive."

In this connection it may be noted that in many parts of the world drought is a far worse enemy than wet.

Other remarks made by Mr. Johnston suggest the consideration that in some cases works of drainage or of foundation are alternatives, and he points out that the effect of a drain may to a large extent be nullified by the puddling of the road surface under traffic.

With respect to drainage through the crust, as distinct from drainage off the surface, it may be pointed out here that a passage quoted from THE SURVEYOR relates to the problems for economical and efficient maintenance of certain classes of roads carrying heavy traffic, the immediate "problem" referred to being a main road problem. The road with a pervious crust on a pervious subsoil, or provided with a good drainage course, and the road which effectually rids itself of water trickling through a pervious crust and off a cambered road bed, the flow being usually aided by a lengthwise slope—such a road is a type of much importance in many climates and under varying conditions. A crust with these characteristics is an element of one of the main types of tertiary or by-roads, and plays a not unimportant part in some secondary road systems.

As regards the manner in which drainage problems may be affected by the construction of really waterproof road crusts, the following passage is of interest:—

"The New York State Highway Department is now working on a scheme whereby a trench will be dug next to the macadam, and nothing will be put in that trench but a series of vertical plates made either from clay of the same kind as the soil pipe, from asphalt and clay mixed, or, in fact, from anything which can resist the disintegration which will take place in the ground. The water will meet that plane, follow it down to the pipe and run off."

This device would not in all cases prevent water from getting under the crust, while in most other cases the provision of a drain along the edge would seem to be sufficient to ensure that no excessive quantity of water would reach the subsoil under the crust. A great many soils are most stable when somewhat damp.

THE NATURE OF FOUNDATIONS.

On the whole, it may be suggested, it has been a weak point in American road-making work during recent years that where foundations of the telford type have been provided there has frequently been some error in construction which has largely reduced the service value of such bottoming. In many cases the wearing crust has been too thin, or, having regard to the circumstances, the total thickness has not been sufficient; or the deposition of the materials has not been such that the bearing area of a wheel-load on the subsoil is great enough to keep down the pressure below a suitable limit. For instance, Mr. T. S. Oxholm, in referring to roads with telford foundations, said: "When repairs were made to these latter roads, it was found that the upper or wearing surface, composed of the smaller sizes of stone, was badly worn where it came in contact with the telford; this appeared to indicate that the wearing surface was being worn, both at the top by vehicles and at the bottom by the impact on the heavy telford stone, thereby causing an increased expense for maintenance."

If a telford pavement is properly made, and the wearing crust above it is of sufficient thickness, no such action should occur, or, if it does occur, the top and bottom wearing should not amount to more than the top wear alone of a crust not subjected to such action. Again, as regards the draining effect of a telford pavement, or a good alternative, it is surely intended to drain sideways as well as downwards, and is designed to deal either with the water near the surface of the subsoil, when that soil is both receptive and retentive of water, or to deal with water in a road crust which is not itself permeable sideways. To serve either of these purposes cross-drains would have to be very close together, or, assuming the soil to be permeable, very deeply laid. These remarks are suggested by several passages which seem to show that the functions of a foundation of the telford type were confused in the minds

of the speakers with the functions of drains proper. Mr. J. Owen said, however, "The telford pavement has, or should have, of the construction a fairly good, a system of drainage of its own. Such a pavement is supposed to be in reality a culvert to the bottom, after which the water has to be carried away to the lowest point."

From other passages, and, indeed, from one's knowledge of the recent history of road making in the United States, it may be gathered that, although full justice has not been done to the telford type of pavement in that country, it has proved very serviceable on a large mileage of roads.

As regards foundations of other types, the following passage (Mr. Owen) deserves attention:—

"In the speaker's district there is plenty of stone, and telford roads are built as cheaply as macadam roads within the same locality; but any frostproof stone can be used in foundations, and the speaker has laid many miles of sandstone foundation and obtained good results from the roads."

Many kinds of sandstone are very useful for foundations, one of the most important features of such stone as regards economical maintenance being that when the wearing crust has worn right down to the sandstone foundation the road still wears smooth and is not likely to become muddy, the sandstone often possessing most of the chief features desirable in a wearing crust, except durability.

As regards the relation between drainage and foundation, attention may be directed to the following passage (Mr. J. A. Johnston):—

"Under most conditions, a 10-ft. foundation of stone, even 6 in. deep, which will seldom cost more than 25 cents per lineal foot of road, is of immeasurably greater benefit than a single drain which will cost more money. To hold up a road surface by strengthening the foundation may not sound as scientific as by the more indirect method of drainage, but it is none the less successful. By a stone foundation is not meant the hit-or-miss dumping of stone into mudholes, nor, at the same time, is it essential to hit each stone on three sides with a hammer and wedge it in places as telford paving. The dirt surface of the roadbed should be smoothed and properly graded to run off the water, the stone should be placed by hand, with the smaller stones on top to close the crevices, and the whole should be well rolled. It is not always necessary to have a great depth of stone; it should be varied according to conditions, being in some places 18 in., and in others only 6 in. It is by no means essential that the foundation should extend the full width of the macadam. On most of the roads in the speaker's division the foundations are only 10 ft. wide, while the macadam is 15 ft. In the case of [illegible] the average width of travel is rarely more than 10 ft., and, though [illegible] the foundation, there have been no breaks and no trouble from this practice."

I may be suggested, however, that in most cases it would be better practice to use the same quantity of material in the shape of a much wider edge of the crust proper, and extending beyond it. On some soils a still better arrangement would be to provide [illegible] 2½ ft. wide and 12 in. deep at the edges, and [illegible] extending beyond the edge of the [illegible] purpose. When "the eye can readily detect the line of the ridge on the inside," there is [illegible] wrong, and such a road in many soils or with certain classes of traffic would have a [illegible] to the surface of the general pavement.

Road engineers generally would attain to a great [illegible] of the subject of foundations if they were [illegible] that it is not the road crust itself which [illegible] a foundation is required to [illegible] load. It is the given pressure allowed on the [illegible] the angle of spread. This angle depends upon the way in which the crust is made, the nature of the materials, the extent to which the stones interlock, and so on; and it depends to a large extent upon whether the crust can be kept within certain limits as regards proportion of moisture. Since the thickness depends upon the spread and the spread depends upon drainage in some cases, it is clear that in those cases thickness depends upon drainage. This is the reason why a foundation course may be required for drainage, in some cases, even when the subsoil is hard and strong. Sometimes, too, a foundation course of material not suitable for the wearing crust, but providing an effective cushion between the crust and the very hard subsoil or rock, is a useful feature. In other cases a single homogeneous crust may serve the whole purpose of spreading the wheel-load to the necessary extent and at the same time perform the other duty of resisting wear and weathering action.

As regards the foundations, then, the three determining factors are: the allowance pressure on the soil, the wheel-load, and the angle of spread. These decide the thickness of the effective load-sustaining crust, whatever it is, or whichever it is. Drainage may be carried out to increase the angle of spread, to reduce the area necessary to sustain the load upon the subsoil, and for the other and distinct purpose of reducing the amount of wear in the upper course of the road crust. Drainage, however, does not always increase the sustaining power of a soil; it reduces that of sand to a very great extent, and in a less degree reduces the sustaining powers of soils which are sandy in character, and some others. In this connection the following passages are to the point. Mr. H. P. Willis said: "The speaker believes that the subsoil must be considered as the real foundation of the road, and that before the road problem is solved everybody will come to this conclusion."

With respect to the rolling of the subsoil Mr. S. Whinery said: "Plastic clays in excavations, for instance, if they are not disturbed, are about as thoroughly compacted by Nature as they can be. Whenever a heavy roller is put on such a surface, and it is rolled too much, a condition of plasticity is produced. The speaker thinks that very frequently clay foundations are over-rolled, and that the remedy is to stop the rolling the moment one notices a tendency of the surface to wave, either behind or before the roller. In his experience in preparing street foundations in excavation, a 4-ton roller has often given very much better results than a 10-ton roller."

If a pastic soil is to act effectively as a support to the crust, without a reduction of effective crust thickness by the penetration of its lower course into the soil, it may be advisable as has often been done in this country and in some European States—to prepare the surface in some such manner as that suggested in the following passage (Mr. W. W. Christy):—

"This tricky condition may be overcome satisfactorily by spreading a layer of sand, cinders, or stone dust, as may be convenient, on top of the sub-grade, to a thickness of from 2 in. to 6 in., and then compacting this layer, with the roller, so as to secure an entirely satisfactory surface on which the macadam can be placed without danger of its being mixed with the sub-grade material and thus losing any portion of its effective depth.

"Still another method, which has been found to be quite successful, is to use for the first course of macadam crusher-run stone containing all the fine material. Such stone, placed on a poor sub-grade previously put in the best possible condition, is then thoroughly harrowed. The effect of the harrowing is to deposit the fine material in the bottom of the stone layer and produce apparently about the same effect as the application of a layer of sand or screenings placed by itself on the sub-grade as previously described."

SURFACE DRAINAGE AND CAMBER.

As regards camber, it is interesting to note that Mr. J. Owen varies the amount of camber not only according to the location and grade, and the character of the traffic, but also according to the amount of the traffic. "On a country highway with a single line of travel," he said, "the best practice has always been to built the crown about 2 in. higher than is ultimately desired, as by work is given to a certain extent, and if allowance is not made for the first settlement, there is a likelihood of a flat surface in the centre where water will collect."

In this country a similar practice seems to have been of doubtful advantage, particularly on roads which are intended to accommodate only a single line of traffic with provision for careful passing. Further, there seems no reason why the middle of such a road crust should be more compressed than the haunches, unless it is thicker; and there seems to be no good reason why it should usually be thicker. When the soil is compressed the compression is usually greatest under the wheel-tracks. The opinion may be offered that it is the one curve or barrelled camber which tends to flatten in the middle, as well as sometimes to become steeper near the edges owing to the rapid flow of the water in this steepest part; the better form from the present point of view is that of two slopes joined by a curve, a form which, under some circumstances, has a tendency to reduction of camber rather than to its increase. To prevent the formation of a flat in the middle of the road the joining curve should be an arc of relatively small radius. Referring to the relation between grade and camber, Mr. Owen said: "As a rule, it must be understood that the steeper the grade the greater the crown. If there is a 10 per cent grade, with an ordinary flat crown, the tendency of the water in a heavy rainfall is to follow the grade rather than the crown, or at least to make a curve in its final discharge; but in such cases it is always better to make a rather higher crown."

This is the usual view. It seems to be overlooked that as long as there is any camber at all there will be at least some tendency for the water to flow to the side; and it is also overlooked that the ordinary camber, without any increase on account of the grade, is usually sufficient to prevent the formation of water courses along the carriageway. As a matter of fact, a smaller camber than that used on level stretches of the same road is usually sufficient for this purpose. Suppose that the camber on a road 24 ft. wide is 1 in 24, and the grade of the road is 1 in 24; the water will tend to run off down the diagonal with a fall of 1 in 17 rather than across or along the road down a slope of 1 in 24. Suppose the grade to be steeper, the water will flow at an angle more acute with the direction of the road, through a distance somewhat greater than 17 ft., and there seems to be no good reason why it should not do so. If on account of rutting there is a strong tendency for water to flow down the road, this will not be counteracted by any possible camber, and other remedies must be sought. Practically, the engineer actually in charge of the road will soon find what camber is needed to prevent the formation of watercourses, or whether on very steep hills any camber at all is worth having. In any case, a sharp camber on steep hills is to be avoided on account of its danger; the creation of a grade steeper than either the longitudinal or the cross-wise slope of the road is a serious matter in some cases. Apart from all this there are roads of such a character that they require little or no camber on fairly steep hills, and there are several classes of road which are better without any camber at all on hills of more than moderate steepness. Generally, with a saving clause as regards certain heavily cambered roads, one feels inclined to support English district and county municipal surveyors in their actual practice in this matter against the theorists who come to conclusions on insufficient premises, and some of whom seem to think that it is a matter of the utmost importance that the water on a hill road should be shed, theoretically, at an angle of exactly 45 deg., although they know perfectly well that this would not be the case in practice.

In the vital matter of the undulation of roads, or the avoiding of dead flats, Mr. Owen made a timely and important observation to the effect that dead flats should always be avoided if possible. He said: "In regard to grades, the speaker has always insisted that a flat road should never be built. In some localities it is almost impossible to accomplish this; but where it is possible—and in ninety-nine cases out of a hundred it can be done—it is better to build the road so as to shed the water longitudinally rather than continuously sideways." And again: "In a long stretch of level country it is sometimes difficult to undulate the road from point to point with a minimum fall of 5/10 in. in 100 ft., but it is better practice than to have a level surface."

But why, it may be asked, should there be any difficulty at all in undulating a new road from culvert to culvert even in a dead flat country?

SOME OTHER POINTS.

In many parts of the United States the depth to which frost penetrates the ground makes it necessary to drain to a much lower level than that needed in this country, in most parts of which, though not everywhere, the effects of frosts upon road surfaces are much more important than their action in heaving up the crust. In this connection the following passages are of interest. Mr. Owen said: "Where the frost is 4 ft. or 5 ft. deep, breaking up the homogeneity of the road and coming out at the surface, with, say, 1 ft. of melted earth on the top and 2 ft. of hard frozen ground below, it makes the most undesirable proposition that can be considered, and these conditions will obtain almost all over the northern part of the United States."

Mr. Johnston said: "It has been the speaker's practice to locate carefully every frost break and soft spot which shows on the road in the spring, and to remedy such places as promptly as possible."

In a passage already quoted, Mr. T. S. Oxholm referred to a similar practice, such places being provided with drains of stone from the centre of the road diagonally to the ditches or culverts.

A reference made to bog roads should not be missed. After describing a method adopted in widening an old road across a bog (a mattress of boughs covered with gravel being put down before the bank was made), Mr. P. D. Sargent said: "In work of this kind it is absolutely necessary that the turf or sod be not cut. If it is, and much of a load is superimposed, settlement will almost certainly occur."

This is in accordance with the best British practice, as recently exemplified in Ireland.

THE COLLECTION OF REFUSE.

AN IMPROVED TYPE OF BIN.

Dealing at the last meeting of the Institute of Sanitary Engineers with the drawbacks common to the bins generally in use in connection with the collection of house refuse, Mr. J. O. Neumann stated that he had recently devised a bin in the endeavour to obviate these difficulties, and to meet the great objection which is always made to the introduction of the duplicate bin system—namely, the cost of transport and storage.

This bin has a separate bottom fitted to the cylindrical part by means of a double bayonet fastening. When the bin is turned upside down in the cart the bottom is removed easily, and the contents, aided by the air, come out easily; it is not necessary to bang the bin about. The cart, which is generally wider at the top than at the bottom, has an iron rod along each side. By means of a ring fixed to the side the bin bottom is slid on the rod on one side of the cart, and a clean one taken from the others and placed on the bin. On return to the yard these—the only parts of the bin which really get foul—can be soused with a hose, and placed on the carts ready for the next collection. By these means cost of carriage and storage is avoided, the bin will be clean instead of foul, the cleansing will be under supervision, the bins will last longer, and no effluvia will escape, because the lid will keep fitting.

The "Lightning" File.—Manufacturers in Sheffield are displaying marked activity and enterprise in producing files of high efficiency, and to an increasing extent users are buying these goods on the basis of the amount of work they do under mechanical [illegible] rather than merely accepting the lowest tender. American competition in this important industry was practically eliminated from the home market several years ago, and Sheffield makers have gone well ahead of their Transatlantic rivals in developing what is known as the "high-speed" file. A report has been issued of a test by the Sheffield Testing Works, Limited, of the high-speed "Lightning" file which has lately been placed on the market by Lockwood Brothers, Limited, of Sheffield. According to this, a 14-in. file tested on both sides, made 120,000 strokes, and in that distance had removed 7880 in. of metal weighing 22 lb. from an inch-square bar. At the conclusion of this severe trial the tool was reported to be "slightly worn." The makers claim the result of the test to represent the highest point of working efficiency ever attained by a file under similar conditions. It may be of interest to state that the Admiralty require the files they buy to make only 20,000 strokes and to remove 6 in. of material. In round figures, the "Lightning" file is capable of doing treble the amount of work that can be got out of an ordinary file, and as the increased price is inconsiderable, it must be highly economical in use.

ROAD IMPROVEMENTS IN AND ADJOINING COUNTY BOROUGHS.

ROAD BOARD CIRCULAR.

The Road Board announce that they are prepared to consider applications from the councils of county boroughs in England and Wales for grants, or short loans for terms not exceeding five years, towards works of road improvements.

In order to assist councils in making their proposals the board think it desirable to give the following indications of their views as to the kind of works to which they will be disposed to give most favourable consideration:—

(1) They do not encourage proposals relating to the widening of streets in fully built areas which are crowded and congested mainly with local traffic, as they do not consider that such works are fairly within the scope of the Road Improvement Fund.

(2) They will give special consideration to proposals for the reconstruction of road crusts, especially in cases where these require immediate reconstruction in consequence of motor traffic. But they are of opinion that grants should not be sought from them for the more expensive forms of road construction for which it is customary to borrow the initial cost on long term loans. The money available for grants can, they suggest, be spent more usefully and more beneficially in the interest of existing ratepayers on reconstruction works for which there is an immediate need, but for which the council cannot get sanction to borrow for a term which would spread the initial cost over a large number of years.

(3) In selecting the roads, the reconstruction of which they will assist, they will give prior consideration to those roads which form part of important through routes, carrying a considerable volume of long-distance traffic, and also those roads which, although not strong enough for the purpose, are now being extensively used by heavy motor vehicles.

(4) They will favourably consider proposals which will facilitate the execution of town planning schemes, so far as these contain provision for the improvement of through road communication.

(5) They will give special consideration to proposals for the acquisition of vacant land required or likely to be required for widenings of important roads in cases where it can be shown that the prospect of building is imminent.

(6) Having regard to the amount for which applications are likely to be made grants will be made for a proportion only of the cost of works proposed, the proportion being fixed by the board after consideration of the circumstances of each case.

(7) The works selected for applications to the board should not include any that have been commenced or for which financial provision has been made.

In connection with works of the character indicated in (4) and (5) it has been intimated to the board that there is considerable difficulty in dealing with such works in the area immediately outside the boundaries of county boroughs. Improvements on approach roads outside borough boundaries are frequently required more in the interests of the borough than in the interests of the adjoining urban or rural district. Consequently, district councils are unwilling to promote or finance such schemes, and there are difficulties in the way of borough councils paying for or contributing to improvements outside their area, however desirable in the interests of the borough traffic such improvements may be. The board are, therefore, prepared to give consideration to joint applications from a county borough, and adjoining authorities, and to apportion their grants so as to enable such cases to be dealt with.

The aggregate amount which the board are prepared to treat as available at the present time for grants or short loans to county borough councils is £[illegible].

The board are unable to assist county borough councils in the selection of the works to be proposed for grants by indicating the amount likely to be granted to each council, as they are not prepared to allocate the total sum on any fixed principle. The grants will be settled after consideration by the board of the applications which may be received. The board regret, however, that it would be impossible for each county borough council to calculate what percentage of the aforementioned sum of £[illegible] could be allocated to them if the allocation were made in the ratio of the population of county boroughs, inasmuch as any council would be unlikely to get more than a share on population basis, except for some work of exceptional public value. The grants which may be made for such special works will necessarily reduce the amount available for other works, and may result in the board being unable to make any grants at the present time to a considerable number of county boroughs.

ROAD BOARD ADMINISTRATION.

In the House of Commons on Friday last Mr. Bridgeman (Oswestry) raised the question of the administration of the Road Board. Mr. Bridgeman contended that the relief to agricultural rates through the operation of the Road Board had not nearly reached the amount which the Chancellor of the Exchequer led them to expect. When the board was established the Chancellor estimated that, including old age pensions, the relief to rates would be 4d. in the £, but his calculation was that the relief given was not more than 2¼d. The Road Board had only expended £250 000 in grants to local authorities, and had piled up an unexpected balance of £1,800,000. The policy of the Road Board in making grants was to require the local authorities to expend money additional to the grants upon road improvement for the benefit of motorists, and this was strongly resented by the local ratepayers.

Mr. Macpherson (Ross and Cromarty) also complained of the refusal of the Road Board to make grants to local authorities to relieve the rates. This was felt to be a great grievance in the poor districts of the Highlands, where the cost of road maintenance had much increased in consequence of motor traffic.

Mr. Masterman (Financial Secretary of the Treasury) said the House deliberately adopted the principle, when the Road Board Act was passed, that the responsibility of the recommendation of grants from the fund should be on the Road Board and not on the Government, and therefore it would be altogether outside the intention of Parliament if he made any kind of representation either to Sir George Gibb or to the board as to the policy of the allocation of these special grants. The bulk of the grants given, or those that were in negotiation, were not so much for improvements in connection with new construction or the widening and improvement of curves and corners as for the improvement of the road crusts. The additional expenditure to which the hon. gentleman had referred was not owing to any exalted standard of efficiency which had been laid down by the Road Board, but was due to the requirements of the traffic which would have had to be met, in any circumstances, by the road authority, even if no Road Board had existed. The Road Board was called into existence to meet the transition from one sort of traffic to another, and a very large proportion of the work would have to be carried out by the local authorities if there had been no Road Board at all. Under these circumstances it was not fair to say that the board was forcing work upon a county that it would not otherwise have undertaken. The total amount received by the board up to the end of last month was £2.748.000. Of that £1,200.000 had been practically allocated in grants; £459.000 had been allocated in loans; and, in addition, the board had intimated its readiness by general circulars to make grants to the aggregate amount of £1,050.000, and was now receiving applications to enable them to settle the details of the work. There were two main reasons why more money had not been spent. The schemes had not gone through with the rapidity that had been expected, and even where they were completed the money was being advanced as the scheme progressed. The second reason was one of some importance. Under the Act the grants through the Development Commissioners and the Road Board were to be used, except in matters of great urgency, to standardise outside employment. They had been passing through a time of an enormous "boom" in trade, and in the last few months there was practically no unemployment. They anticipated the time when unemployment would rise with trade depression, and there would be a demand for this kind of more or less unskilled work which the Road Board and local authorities could furnish. They hoped to be able to accumulate before the bad time came a reserve of something like £1.000.000 with which to [illegible] the outside market. He happened to know that the Departmental Committee on Local and Imperial Taxation was very vitally considering the whole subject especially in connection with the main roads, and he hoped that when their report was published it would be found that very full consideration had been given to the question.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. R. J. THOMAS, M.INST.C.E., County Surveyor, Buckinghamshire.

SOUTH-EASTERN DISTRICT.

A meeting of members of the above district will take place at Sidcup at 2.30 p.m. on Wednesday, January 8th, when the road sections will be inspected.

Mr. Maybury has kindly consented to supply the revised cost of the trial lengths up to December 31st; the meeting will be followed by a dinner at Frascati's Restaurant, Oxford-street, at 6.30 p.m.

SOUTH WALES DISTRICT MEETING.

District Chairman—Mr. W. HARPUR, M.INST.C.E., Cardiff.

A meeting of the institution will be held in the South Wales District at the Guildhall, Swansea, on Saturday, January 11th next.

PROGRAMME.

11.30 a.m.—Meeting of members of South Wales District at the Guildhall, Swansea, for the purpose of electing a district committee.

12 noon.—General meeting at Guildhall, Swansea, where the members will be received by the mayor. Proceed to Castle-street and inspect street widening and construction of tramways by the corporation and erection of new buildings. Thence to Hotel Cameron.

1 p.m.—Luncheon at Hotel Cameron, High-street (tickets 2s. 6d. each).

2 p.m.—Drive by way of High-street, where tramways recently constructed will be inspected, to destructor (tickets 1s. 6d. each). Inspection of the Pentre Valley, Burlais Brook culvert, the destructor and its recent improvements, the slab-making plant and the houses erected by the corporation.

4 p.m.—Return to Hotel Cameron. Light refreshments provided by the borough surveyor. Discussion on paper entitled "Swansea Tramways, Past, Present and Future," by Mr. G. Swarbrick, deputy borough surveyor (member), and the paper entitled "The Development of the Pentre Valley in Relation to the Destructor," by Mr. G. H. Bell, assistant borough surveyor (Assoc. Member).

Papers will be taken as read.

In order that the necessary arrangements may be made, members must give notice of their intention to be present not later than Saturday, January 4th, when copy of the papers will be sent in due course.

H. ALEX. CLARKE,
Hon. District Secretary.

Council Offices,
Briton Ferry,

NORTH-EASTERN DISTRICT.

A meeting of the institution will be held in the North-Eastern District at Newcastle-on-Tyne on May 2nd and 3rd next.

Notice is hereby given that, under the provisions of by-law 14, nominations for the council of 1913-14 must be received by me not later than February 1, 1913.

Each member or Associate member of the institution is entitled to nominate one member or associate member for the council. Nominations must be accompanied by the consent of the nominee.

SOUTHERN DISTRICT MEETING.

A meeting of the Southern District will be held at Southampton on Saturday, February 22nd next.

THOMAS COLE,
11 Victoria-street, S.W. *Secretary.*

The King's Hall, Ilkley.—On Wednesday, the 18th inst., Mr. F. S. Jackson, J.P., chairman of the Ilkley Urban District Council, laid the foundation stone in connection with the erection of the annexe to the King's Hall, Ilkley. Mr. Jackson was presented with a silver trowel by the architect (Mr. Henry West, Ilkley).

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but these responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

SURVEYOR.—December 27th.—Consett Urban District Council. £175—£205.—Mr. H. Jackson, clerk.

SURVEYOR'S ASSISTANT.—December 27th.—Consett Urban District Council. £52—£67.—Mr. H. Jackson, clerk.

TEMPORARY ARCHITECTURAL ASSISTANT.—December 28th.—Dartford Urban District Council. £2 10s. per week.—Mr. T. E. Tiffin, surveyor.

CLERK OF WORKS.—December 28th.—Hyde Town Council.—Mr. T. Brownson, town clerk.

ARCHITECTURAL ASSISTANT.—December 30th.—Corporation of Nelson. £90 per annum.—Mr. J. H. Baldwick, town clerk.

CLERK OF WORKS.—December 30th.—The Rivers Committee of the Manchester Corporation. £3 3s. per week.—Mr. Thomas Hudson, town clerk.

ENGINEER-IN-CHIEF.—December 31st.—Mersey Docks and Harbour Board.—Mr. Alfred Chandler, general manager and secretary.

STEAM-ROLLER DRIVER.—December 31st.—Corporation of King's Lynn. 27s. per week.—Mr. Alfred J. Smith, borough surveyor.

INSPECTOR OF NUISANCES AND SURVEYOR.—December 31st.—Shoreham Urban District Council. £225 per annum.—Mr. H. Brown, clerk.

BOROUGH ENGINEER'S CLERKS.—January 1st.—Hornsey Borough Council. General clerk £70 per annum, and junior clerk £40 per annum.—Borough Engineer and Surveyor, Municipal Offices, Highgate, N.

SECOND ASSISTANT SURVEYOR.—January 3rd.—Cannock Urban District Council. £52 per annum.—Mr. C. A. Loxton, clerk.

BRIDGE AND ROAD SURVEYOR.—January 18th.—Devon County Council. £400 per annum.—Mr. F. Bailey, clerk, The Castle, Exeter.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but these responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

BELFAST.—January 1st.—Designs for 126 houses of two apartments each, and 126 houses of three apartments each, for the corporation. Premiums are offered of £25, £15, and £10.—Mr. R. Meyer, town clerk.

ORSETT (Essex).—January 1st.—For the construction of a sewerage and sewage disposal scheme in the parish of South Ockendon, for the Orsett Rural District Council. Premiums of £50 and £25 are offered.—Mr. James Beck, clerk, 2 Orsett-road, Grays.

SWAFFHAM.—January 25th.—Plans, specifications and estimates for workmen's dwellings, for the rural district council. A premium of £10 is offered to the selected plan.—Mr. Sydney Matthews, clerk.

JAMAICA.—January 31st.—Plans for municipal buildings to cost £9,000. A premium of £100 is offered. Messrs. Young, Limited, 60 Fenchurch-street, London, E.C.

HARROGATE.—February 3rd.—Designs for a council school, for 675 children.—Mr. C. E. Rivers, ASSOC.M. INST.C.E., borough engineer.

DUBLIN.—February 6th.—Designs for municipal buildings for the corporation. The proposed expenditure is £50,000, and the author of the design placed first will be appointed to carry out the scheme on a 5 per cent basis. Premiums of £150 and £100 are offered. The assessor is Mr. Albert E. Murray, F.R.I.B.A. —The Town Clerk.

RANGOON.—March 1st.—Designs for municipal buildings. Premiums are offered of £300, £200, and £100.—The Clerk to the Rangoon Municipality.

WINNIPEG.—March 1st.—Designs for city hall. Limited to British architects in Canada. Premiums are offered of 5,000 dols., 3,000 dols., and 2,000 dols.—The Clerk.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, but *those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

Buildings.

SOUTHAMPTON.—December 30th.—For the reconstruction of Fore Bridge, for the county council. Mr. H. Barber, clerk, The Castle, Winchester.

ALTRINCHAM. December 30th.—For the erection of a shelter and conveniences, for the urban district council.—Mr. H. E. Brown, surveyor.

SOUTHGATE.—December 31st.—For the construction of an open-air swimming bath, for the urban district council.—Mr. C. G. Lawson, surveyor.

EAST HAM.—December 31st—January 21st.—For the erection of a school, for the Education Committee.—Mr. F. R. Thompson, secretary, Town Hall.

EAST RIDING.—January 1st.—For alterations to school, and erection of a school and teacher's house, for the county council.—Mr. J. Bickersteth, clerk, County Hall, Beverley.

HERTS.—January 2nd.—For the erection of a police station, for the Standing Joint Committee.—Mr. U. A. Smith, county surveyor, Hatfield.

NEWRY.—January 3rd.—For additions to the town hall, for the urban district council. Mr. William Cronin, clerk.

CHATHAM.—January 4th.—For the erection of a school, for the Education Committee.—Mr. G. F. Bond, High-street, Rochester.

MANCHESTER.—January 8th.—For reinforced concrete work, for the corporation.—Mr. Thos. Hudson, town clerk.

WEST RIDING.—January 10th.—For the erection of a school, for the Education Committee.—Mr. Francis Alvey Darwin, clerk, County Hall, Wakefield.

CORNWALL.—January 11th.—For building a school at Tintagel, for the Education Committee.—Mr. F. R. Pascoe, secretary, County Hall, Truro.

PEMBROKE.—January 11th.—For the erection of a school, for the Education Committee.—Mr. H. E. H. Jones, clerk, County Education Offices, Haverfordwest.

FLINT.—January 14th.—For the erection of an elementary school, for the county council. Mr. Sam. Evans, county surveyor, County Offices, Mold.

LANCASHIRE.—January 14th.—For the erection of a school, for the Education Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

MANCHESTER.—January 15th.—For the construction of a public library, for the corporation.—Mr. Thos. Hudson, town clerk.

Iron and Steel.

RYE.—January 8th.—For the supply of cast-iron socket pipes and irregulars, for the corporation.—Mr. W. Dawes, town clerk.

SWANSEA.—January 9th.—For the supply of steel work, for the Hafodyrynys Tinplate Co.—Mr. T. Struck, clerk.

CHORLEY.—January 13th.—For the supply of two gas engines and two pumps, loan of portable boiler, and laying cast-iron mains, for the rural district council.—Mr. P. J. Aspden, clerk.

MADRAS.—January 22nd.—For the supply of [illegible] pipes and specials, varying from 4 in. to 24 in. internal diameter, and aggregating a length of about 100 miles, for the corporation.—Messrs. James Mansergh & Son, agents, 5 Victoria-street, Westminster.

ELLESMERE.—January 31st.—For providing and laying 9,000 yards of 4 in. and 3 in. cast-iron mains, sluice valves, fire hydrants and air valves, for the rural district council.—Mr. H. R. Gibbs, clerk.

Roads.

EXMOUTH.—December 28th.—For excavation and filling, making concrete foot paths, foundations, [illegible] and supply of tar-macadam for finishing coat of carriageway, for the urban district council.—Mr. Samuel Hillier, engineer.

WALMER.—December 28th.—For the supply of clean flints, for the urban district council.—Mr. H. W. Barker, surveyor.

DERBYSHIRE.—December 30th.—For the supply of granite, basalt, slag, limestone, tarred macadam, and tarred chippings, for the county council.—Mr. J. W. Horton, county surveyor, St. Mary's Gate, Derby.

SHOREHAM.—December 31st.—For the supply of 20,000 gallons of dehydrated tar or other bituminous material, for the urban district council. Mr. Harold Brown, clerk.

LLANTRISANT AND LLANTWIT FARDRE.—January 1st.—For the completion of the new Ely Valley-road, and branch roads, about 3 miles in length, for the rural district council.—Messrs. Gomer S. Morgan & Thomas Saunders, engineers, School-street, Pontyclun, Glam.

SEVENOAKS.—January 1st.—For the supply of chert, flints and ragstone, granite, quartz, basalt, steam rolling, team labour, cartage and hauling, for the rural district council.—Mr. F. H. Vibert, clerk.

HULL.—January 1st.—For flagging work, for the town council.—Mr. A. E. White, city engineer.

HARWICH.—January 1st.—For the supply of broken granite and granite chippings, for the corporation.—Mr. F. Harold French, borough surveyor.

HOVE.—January 1st.—For laying wood paving, for the corporation.—Mr. H. H. Scott, borough surveyor.

DENBIGH.—January 1st.—For the supply of road stone and tar-macadam, for the county council.—Mr. Ellis W. Jones, county surveyor, Wrexham.

WHITLEY UPPER.—January 1st.—For road rolling and scarifying, for the urban district council.—Mr. Joe Sharp, clerk.

CHESTER-LE-STREET.—January 1st.—For making up three private streets, for the rural district council. Mr. R. V. Dickinson, clerk.

READING.—January 2nd.—For making-up work, for the corporation.—Mr. J. Bowen, borough engineer.

SALE.—January 2nd.—For works of paving and flagging, for the urban district council.—Mr. D. Hallewell, clerk.

RAMSGATE.—January 2nd.—For the extension of Victoria-parade, including sewering, road and footpath making, for the corporation.—Mr. T. G. Taylor, borough engineer.

DORSET.—January 4th.—For steam rolling on 458 miles of main roads for three years, for the county council.—Mr. W. Townshend Fletcher, county surveyor, Dorchester.

DORSET.—January 4th.—For the supply of granites, basalts, quartzites, limestones and tar-macadam, for the county council.—Mr. W. Townshend Fletcher, county surveyor, Dorchester.

NORTH RIDING.—January 4th.—For work of steam rolling and scarifying, for the county council.—Mr. W. G. Bryning, county surveyor, County Hall, Northallerton.

SUNBURY-ON-THAMES.—January 6th.—For the supply of 4000 gallons of refined tar, for the urban district council.—Mr. H. F. Coales, surveyor.

GLANFORD BRIGG.—January 6th.—For the supply of granite and slag, for the rural district council.—Mr. Frank C. Hett, clerk.

EASTHAMPSTEAD.—January 7th.—For the supply of broken or unbroken granite, slag, limestone and flints, for the rural district council.—Mr. C. B. Wilson, clerk.

EAST GRINSTEAD.—January 8th.—For the supply of 20,000 gallons of tar, prepared in accordance with the Road Board's specification for tar No. 1, for the rural district council.—Mr. Francis S. White, clerk.

KESTEVEN.—January 8th.—For steam-rolling work, for the county council.—Mr. W. B. Purser, county surveyor, Grantham.

LLANTRISANT AND LLANTWIT.—January 9th.—For making up private streets, for the rural district council.—Mr. Thomas Saunders, surveyor, School-street, Pontyclun.

MIDHURST.—January 11th.—For the supply of granite and tar-macadam, for the rural district council.—Mr. A. G. Gibbs, surveyor.

ANTRIM.—January 11th.—For tar treatment and steam rolling in certain roads, for the county council.—Mr. Alexander Millar, deputy-secretary, County Courthouse, Belfast.

"The Surveyor" Supplement.

For Architects, Quantity Surveyors, Contractors, and all Users of Reinforced Concrete.

Leigh-on-Sea New Council Offices and Fire Station.

An important event in the annals of the Leigh-on-Sea Urban District Council was celebrated recently, when the new public offices and fire station were formally opened by the chairman of the council, the Rev. R. Stuart King, M.A., J.P., in the presence of a large assembly. Councillor S. F. Johnson, chairman of the Highways Committee, opened the proceedings, and in doing so alluded to the rapid development of the town as sufficient justification for the erection of the new buildings, and referred to the possibilities upon that historic past that they built up their hopes for the future. From a village they had developed to town life, and they commenced in the new buildings with a feeling of hope that they were going on to greater things. In conclusion, he congratulated the surveyor to the council, Mr. J. W. Liversedge, on the design, and Mr. Davey, the contractor, on the manner in which he had executed the commission.

The Mayor of Southend (Mr. Charlton Hubbard, J.P.), Mr. James Tabor, J.P. (High Sheriff of Essex),

Frost Phot. LEIGH-ON-SEA COUNCIL OFFICES AND FIRE STATION. *A. J. Pudgett, Leigh-on-Sea*

Mr. John W. Liversedge, Assoc.M.Inst.C.E. Engineer and Surveyor to the Urban District Council, Architect.

Leigh had at rivalling Southend as a health resort. In the latter connection he spoke of a suggestion for the linking of Canvey Island with the mainland at Leigh by means of a promenade pier, and giving an approach to the sea at all states of the tide.

A description of the new buildings was given by the architect, Mr. John W. Liversedge, A.M.Inst.C.E., borough surveyor to the council.

Mr. F. P. Wheatley Down, clerk to the council, handed a silver key to the chairman of the council, who then formally opened the offices. Speaking subsequently in the council chamber, he observed that Leigh was one of the oldest places in Essex, and was mentioned in the Domesday Book, adding that it was Alderman John Burrows, and Mr. F. W. Senior, J.P., each made a few remarks appropriate to the occasion, after which tea was provided at the rectory. The guests included the Mayor and Mayoress of Southend, the High Sheriff (Mr. James Tabor), the town clerk of Southend (Mr. H. Worwood), the borough engineer of Southend (Mr. E. J. Elford), members of council, council officials, and others.

The following is a description of the new council offices and fire station.

COUNCIL OFFICES.

The buildings are centrally situated on the west side of Elm-road, and adjoin the new post office,

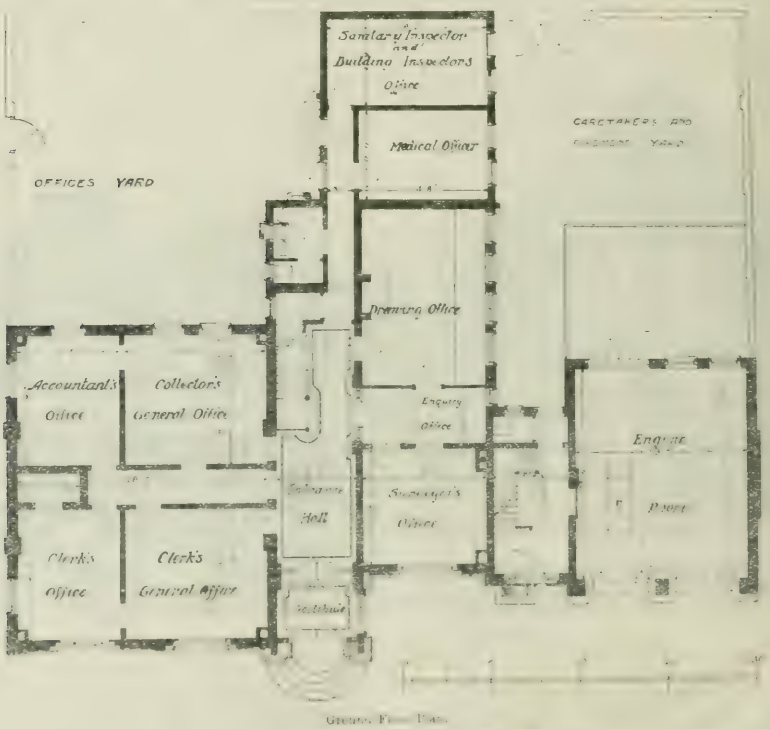
The site was purchased in 1906, has a frontage of 95 ft., with a depth of 250 ft., one-half of the area being used for the offices, and the remaining portion at the rear as the council's depot and town yard.

FAÇADE.

The main façade is constructed with best quality red facing bricks with Bath stone dressings in the free Renaissance style. The main entrance has been

leading to the entrance hall. The outer and inner doors are in polished teak, the outer being solid, moulded and panelled, the upper portion of the inner door being fitted with polished plate glass, with lead lights on each side and over transom. The vestibule floor is laid with mosaic tiling, and the hall with Minton tiles. The walls of the hall have a 6-ft. dado, with glazed wall tiling and suitable plinth and capping. Immediately on the left on entering is the

Front Elevation.



Ground Floor Plan.

Lighting, Central Heating and Fire Station.

The fire station is attached to the offices, but a little lighter treatment has been given to this portion of the design. The building is well set back from the road and approached by a semi-circular drive, with front areas fenced, kerbed and turfed.

The offices are approached by a flight of steps leading to the entrance with double folding doors

with a central corridor leading to the clerk's private and the surveyor's office, on the right is the surveyor's department, this including the surveyor's private office, an enquiry and clerks' office, and drawing office. Immediately in front is the staircase leading to the council chamber, and a corridor leading to the medical officer of health's office, the sanitary in-

telephone box. There are three departmental stores and strong room in the basement.

FIRST FLOOR.

This is approached by the main staircase leading from the entrance hall, lavatory and cloak accommodation being provided at the half-space landing. The staircase is lighted from a central dome and a side window fitted with leaded lights. Glazed tiled pump ventilator. The chamber has been fittingly furnished, with floors laid with cork lino. A raised dais accommodates the chairman and officials, and a central table of horse-shoe pattern is provided for eighteen councillors, this being fitted with a separate desk for each councillor. The whole of the fittings are in oak, with leather dressings and upholstering.

The committee-room is 23 ft. 6 in. by 13 ft., and is

Section.

First Floor Plan.

LEIGH-ON-SEA COUNCIL OFFICES AND FIRE STATION.

dadoes are carried forward along the staircase. The council chamber, 34 ft. by 18 ft., leading from the landing at the head of the stairs, has a semi-circular ribbed roof, with panelled and moulded ceiling. All windows are of the iron casement type, fitted with leaded lights of special design.

The [illegible] simple but effective. Ventilation [illegible] special inlets and a central outlet air suitably furnished. The caretaker's quarters lead from the first-floor landing, and include living-room, scullery and bathroom, with two bed-rooms on the second floor over the firemen's club-room.

FIRE STATION.

The fire station is approached from the main street through [illegible] oak double-leading doors [illegible]

with patent automatic spring-opening gearing. The station is 23 ft. 8 in. by 19 ft. 6 in., and has dado in glazed bricks and Fletton facings above. The floors are laid in wood blocks, with granite runners for the wheels. A sunk pit is provided for cleaning purposes. Provision is made for a steam fire engine and horsed escape, with the usual fittings. Over the fire station is arranged the firemen's club-room, with accommodation for a billiard table. The caretaker's and firemen's entrance is on one side, the stairs giving approach to the basement. The first and second floors are arranged around a well, which is designed for use as a hose-drying tower. Suitable hoisting tackle is provided in the roof, and there is a ferro-concrete tank in the basement for washing purposes. The heating arrangements are in the basement. A yard is provided at the rear for practice purposes and escape drill.

GENERALLY.

The building is heated with hot water throughout on the low-pressure system, sectionalised by valves capable of dealing with the various parts of the building. Radiators are provided with suitable regulators. The floors to the ground floor of offices are pitch-pine wood block on concrete, all other wood floors being pitch-pine narrow widths. Kentobin patent flooring is used for lavatories. Sirapite has been used for the plastering, and Westmorland green slates for roofs.

The contract for the erection of the buildings has been carried out in a satisfactory manner by Mr. F. Davey, contractor, Southend, and Mr. E. T. Bradshaw has acted as clerk of works.

The following firms have supplied special goods under the contract: Sanitary fittings, Messrs. Doulton & Co., London; iron casements, Messrs. Crittal, Braintree; tiling, Messrs. Carter & Co., Poole; patent flooring, Messrs. G. Kent & Co., London; heating, Messrs. Hayward Brothers & Eckstein, London; lighting, Messrs. Hulett & Co., London; locks and fittings, Mr. J. Gibbons, Wolverhampton; ventilation, Messrs. Ewart & Son, London; decorative glazing, Messrs. J. Hall & Sons, London; furnishing, Messrs. Hampton & Sons, London.

The contract for the building, exclusive of the cost of land and furnishing, is £4,570, or 9¾d. per cubic foot.

MUNICIPAL ICE MAKING AT BOLTON.

INAUGURATION OF NEW PLANT.

A constant supply of good, hard, crystal ice at a low price has long been recognised as a necessity in all large industrial centres, and the Corporation of Bolton was among the first public bodies in the early days of refrigeration to establish an ice and cold storage plant. This was placed in the basement of the market hall in the centre of the town, and was readily accessible to the various tradesmen. They installed two machines, each having a total producing capacity of 10 tons of ice per twenty-four hours, but one of these was used only for cooling a number of rooms for storing perishable goods of all varieties. The machine in use for ice-making was greatly appreciated, and the demand increased until the plant was insufficient to meet the present requirements. It was therefore decided to extend the plant and bring it thoroughly up-to-date. During recent years scientific research and new methods of working metals have enabled manufacturers vastly to improve the design of these plants, both as regards reliability and efficiency of operation, and a sub-committee was therefore appointed to inspect the latest installations to ensure that the new plant should be of the latest design. It was finally decided to replace one of the old machines with a new machine capable of producing 30 tons of ice in twenty-four hours, partly because the old machine was in need of a thorough overhaul, but chiefly because the large machine would reduce the operating cost to a minimum. After careful consideration the Markets Committee recommended modern cell ice-tanks to produce the ice in blocks of the best quality, and a refrigerating plant on the carbonic anhydride (CO_2) system, so that the plant should be similar in design to the new Longsight and Ashton plants, and thus become a good reserve. Until recently the only available under the market hall for the machinery purposes which required a plant working on the ammonia system, but recently the other types on the market. It was also felt that it would be necessary to use gas which was preferable to ammonia, as the plant is situated under the market hall.

The new plant was inaugurated, which was performed on Thursday of last week by the Mayor of Bolton (Dr. James Young, J.P.)—has been supplied by the Haslam Foundry and Engineering Company, Limited, of Derby.

THE REFRIGERATING PROCESS.

The ice tanks consist of wooden tanks well insulated with slab cork to reduce the heat losses, and are fitted with hollow galvanised wrought-iron slabs, through which is circulated cold brine supplied by the refrigerating machine. The water for making the ice is first cooled to a low temperature in a "fore" cooler, and then run into the spaces between the slabs and frozen into solid blocks of ice. During the process the water is continually agitated by a plunger moving up and down in a compartment at one side of the tanks, to liberate the globules of air and ensure the ice being transparent. The town's water is used for ice-making. Any impurities are separated from the water when it freezes, and, owing to the action of the plunger, are carried into a space at the bottom of the tank, and then run off before the tank is refilled. By this means the ice produced is quite clear and pure. After the water is frozen solid the cold brine is shut off and warm brine is circulated through the cells to liberate the ice, and the blocks are then withdrawn, an electric traveller being provided to save labour. The blocks weigh 5 cwts. each, but a special ice saw is supplied, by means of which the ice can be cut into blocks weighing 1, 2, 3 or 4 cwts. each. The heat eliminated from the water is carried away by the cold brine which returns to the refrigerating plant, where it is again cooled to a low temperature. The cold is produced by the evaporation of liquid CO_2, the vapour being compressed and again liquefied under a high pressure in wrought-iron pipes cooled by well water circulated over the outside, the liquid CO_2 then passing into the refrigerator coils, where it again evaporates at a temperature far below freezing point. The plant works on the closed principle, and the same CO_2 is re-used continually.

The whole of the coils in the plant are made in continuous lengths and are welded up by electricity. The connections and compressors are made from solid steel ingots to avoid the possibility of any leakage, and all parts subject to the pressure of the CO_2 are tested to 3,000 lb. to the square inch (four times the working pressure) by water, and afterwards by means of compressed air, before leaving the makers' works. The plant is arranged so that any portion can be shut off if necessary. The CO_2 compressor and the pumps for circulating the cold and warm brine are driven by independent electric motors so that the plant can be worked to the best advantage. The whole plant is designed to reduce the working expenses to the lowest possible figure consistent with the production of good, clear ice. Crossover connections are also supplied so that the plant can be worked in conjunction with the existing plant, and either machine can be used for ice-making or for cooling the cold stores as required in order to avoid the possibility of any stoppage and also to enable the machines to be overhauled when required.

The whole of the new installation has been erected and completed at a cost of about £7,700.

The erection and insulation of the ice tanks, &c., has been carried out by Messrs. R. C. Eskrigge & Sons, of Seaforth, Liverpool, and the motors and crane have been supplied and fitted up by Messrs. Newton Bros., of Derby, under the direction of Messrs. the Haslam Foundry and Engineering Company, Limited. The electric wiring and lighting has been supplied and fitted by the Bolton Corporation, electric fittings department.

The whole of the works have been carried out from the specifications and under the superintendence of Mr. E. L. Morgan, Assoc.M.Inst.C.E., borough engineer, and Mr. Robert Pike, superintendent of markets and cold stores.

Thrift and Footpaths. *Engineering and Contracting* (Chicago) reports the case of a certain Arkansas city which wished to extend a cement footpath, and, having no funds for the purpose, sold advertising space on each square of the footway. The city secured a list of the names of the town and county officials, the various industries, the population and other data, and the remainder of the squares were sold to local merchants. The advertising was done by forming letters in the top coat of the cement before it finally set. We can probably safely quote the report without risk of the proceeding being emulated in this country.

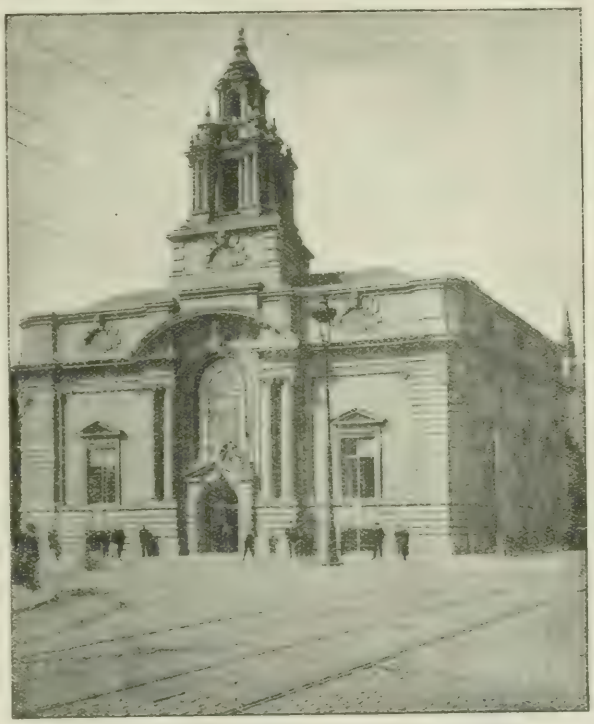
"The Surveyor" Supplement.

FOR ARCHITECTS, QUANTITY SURVEYORS, CONTRACTORS, AND ALL USERS OF REINFORCED CONCRETE.

Dundee's New Central Reading Rooms.

Mr. James Thomson, the city engineer, is the architect of the new central reading rooms which have recently been erected in Dundee in connection with a scheme of library extension.

The structure, of which, by the courtesy of Dr. Millar, the chief librarian, we are enabled to give an illustration, may be characterised as an adaptation of free English Renaissance, and the interior is commanding in its aspect and beautiful in its details.



CENTRAL READING ROOMS, DUNDEE.

An ample staircase leads from the corridor to the first floor, on which there are three rooms. As first designed, the news-room was on the north side of the building; but as it was soon found that the light there was not altogether satisfactory, the flat was re-arranged, and the news-room, fitted with ample reading-desks, is now placed in the central apartment, amply lighted by the dome above. The room on the south is devoted to magazines. The north room is partly occupied by ladies and juveniles. A separate entrance for juveniles is provided. By having a half-sunk storey excellent storage accommodation has been obtained for newspaper-files, magazines and pictures. For the convenience and safe handling of the last-named a swing-window and grating have been placed on the street level, thus obviating any unnecessary carrying and risk, and the floor has been fitted with convenient picture-racks, which permit of classification of the pictures. The heating chamber is also placed here, and an efficient system of heating is carried through the building.

At the first landing the stair divides into two portions, north and south, meeting at the east beneath a large staircase window, and thence rising to the west main landing. The central room, which is lighted from the dome, is devoted exclusively to pictures of old Dundee and portraits of eminent Dundonians. There are two sculpture galleries on this floor, one to the north being set apart for classical work, while the southern gallery is reserved for Celtic, Italian, French, and German sculpture, of which characteristic examples are displayed. Especially noteworthy is the fine series of casts of the principal sculptured stones of Scotland. The Parthenon Frieze in the classical gallery is set out in (as near as possible) its actual position on the great temple at Athens, and a fine papier-maché reproduction indicates the successive order of each plaque. Full-sized fragments of figures from the wonderful group above the main entrance to the temple are shown in their actual position, and set out upon a platform. Examples of classical sculpture, from the primitive "Charioteer" to the Venus di Milo, are arranged in such manner that the gradual development of the sculptor's art may be easily studied.

New pedestals of stained and polished wood have been provided. A very striking effect has been obtained by covering the walls of the sculpture galleries with a delicately-tinted cloth, which throws the figures into bold relief. The system of electric lighting introduced consists of inverted arc-lamps, which diffuse the light

without casting heavy shadows. The sculpture was never properly seen in its former position in the Central Museum; but these galleries have been specially constructed to display the casts to the best advantage, and the result is eminently satisfactory.

ACCOMMODATION SUBWAYS FOR PIPES AND WIRES.

The most extensive placing of underground structures in galleries is, of course, to be found in Paris and London, the sewers being used in Paris, while in London the county council has constructed pipe galleries under a number of new streets. The trouble in America has not been due to a lack of study of the subject; for the best-designed galleries actually planned anywhere appear to have been those proposed by the late Rapid Transit Commission for the subway in Lower Broadway, New York. These galleries, it may be remembered, had seven separate divisions, with the electric ducts of the street railway company in the centre, chambers for pipes on each side of the street, and separate ducts for high and low tension conductors, also on each side, with separate manholes for each class of wires, and distribution passages from manholes along in front of buildings. Long openings for handling pipes and ventilation were also provided, and it was a great setback to the progress of street engineering (says *Scientific American*) when the idea of building the galleries had to be abandoned. Various types of galleries, based on the New York type, were suggested for Boston, when the Washington-street subway was proposed, but nothing resulted beyond the plans.

The chief reason for the failure to build the Lower Broadway galleries was said at the time to be a difference of opinion as to what city department was to have charge of the galleries, and unfortunately the completion of the subway could not be delayed for the settling of the question. In Boston there were several objectors. The municipal engineers consulted wanted their pipes above the subway, while the railway company objected to any construction which would lower the station platforms a foot more than was absolutely necessary. The city engineer, moreover, objected to any placing of pipes (water, sewer or gas) in an open gallery, no matter how well designed, on the ground that the character of municipal employees had so deteriorated that it was unsafe to place the maintenance in their hands of pipes in a common gallery.

"While," remarks our contemporary, "it is well to err on the side of safety before making radical changes, there appears to be ample testimony that the placing of pipes in galleries would make for greater safety instead of greater danger. In the London galleries large gas mains are found close to electric light cables, and yet no explosions have occurred, whereas gas mains buried under streets have caused constant explosions in different cities."

Royal Institute of British Architects.—Mr. Reginald Blomfield, A.R.A., the president, will deliver the opening address of the session at a meeting to be held on Monday, November 4th, at 8.30 p.m.

Hospital Accommodation at Stafford.—The Stafford Rural District Council have decided to call upon Stafford Corporation to extend at once the isolation hospital in accordance with the agreement entered into in 1903 by the two. The application arose out of a case of enteric fever which could not be received into the hospital from the rural district because there was no room for it, notwithstanding that the rural district council have agreed to pay £300 a year for the use of the hospital.

New Secondary School for Clitheroe.—Lord Derby on Saturday laid the foundation-stone of a new secondary school which is being built at Clitheroe by the Lancashire County Council and the local authorities, at a cost of about £20,000. The building is designed to [illegible] school, the sexes will be in separate wings for teaching purposes, but will have the common use of the assembly hall, science, and other [illegible]. The building, which will also be used for evening classes, will accommodate 128 boys and 120 girls. The contract has been let to Messrs. J. Bleazard & Sons, Clitheroe, to the design by Mr. H. Littler, county architect. It is being erected on an ideal site, in the centre of the town, hitherto occupied by the old Clitheroe Royal Grammar School, which was founded in 1554.

SOUTH FIFE DEVELOPMENT.

NORTH QUEENSFERRY AND BRUCEHAVEN TOWN PLANNING SCHEMES.

The preliminary statutory conference of owners in connection with the North Queensferry and Bruchaven town planning schemes was held in Dunfermline on the 13th inst.

These two schemes, promoted by the Fife County Council, are the first brought forward by Mr. J. E. Wilkes, Assoc.M.Inst.C.E., who is designing the naval port of Rosyth, and who also has charge of the four town planning schemes in the vicinity of this new naval base.

Lord Bruce, chairman of the Fife County Council Town Planning Committee, said that although by law they were not required to put forward detailed plans at the first owners' conference, he had previously felt, when being at such conferences in the capacity of a landowner, that it was rather foolish to invite those most interested to give sanction to the planning of a mere area without showing them something of the actual scheme; hitherto he had been told that the preparation of such schemes as he had desired would occupy too much time, but owing to the manner in which the present schemes had been handled he was enabled to submit to them not only the altitude surveys, but definite proposals. North Queensferry, being a hilly district, had to be planned to a large extent as the levels demanded, but the residential part had been so arranged as to command beautiful views of the Forth. On the east side two esplanades had been located, a lower one just above the level of the sands of Port Laing, which at the present time was the Admiralty hydroplane station; this esplanade was arranged to lead by inverse curves to two pavilions, each located at the end of a straight length. This should be one of the most beautiful of promenades, as it commanded very delightful views of the Forth towards the open sea. At the top of the cliffs another promenade had been arranged, and it was hoped that shortly the intervening space would resemble the Leas at Folkestone. Houses for workpeople had been arranged near the works area, which was alongside Inverkeithing Bay and the railway. The town centre had been arranged between the residential and the workpeople's areas, so that people from both would have equal facilities for reaching public buildings and the locality for shopping.

As the district would depend largely for its population on the naval base, it was proposed to construct a new approach road from the west gate of the Admiralty's territory. This road would entail the erection of a steel bridge of 100 ft. span and 50 ft. in width; also for some length the road would have to be carried between rather high retaining walls. It was understood that the Burgh of Inverkeithing had expressed willingness to share the costs of this scheme, as it would be of great benefit to them.

The Bruchaven scheme lay to the west of the new naval base, and had been laid out almost entirely for residential purposes. An esplanade had been planned on the foreshore, which would require a considerable amount of reclamation. It was also proposed to dredge a channel to the east of the present pier, and to construct a considerable length of quay wall. This esplanade was necessitated by the fact that the new road from Dunfermline would open directly out on to it; thus people coming by tramway from the inland and mining districts would obtain not only a pleasant impression of the new town, but also of the old-world village of Limekilns to the west. As in the North Queensferry scheme, the heart of the new town was arranged to come within easy reach of the working class and of those who could afford to live in the better type of house. Sites had been reserved for churches. With regard to details, the roads would be of either tarred stone or radial sett paving. Sewers and water mains would be kept out of the streets and behind the houses, the ensuing not only economy in construction, but the avoidance of breaking up the roadway. Not a single sewer manhole cover would be located in the carriageway as these had proved dangerous to traffic and difficult to maintain in satisfactory condition. The tramways were to be constructed on a ballast foundation, and laid on pressed-steel sleepers, and would be separated from the roadway by a grass verge, in which a line of trees would be planted.

No opposition was offered.

New Fire Station for Hackney. A new fire station is to be built at Hackney at a cost of £11,549.

TOWN PLANNING PROGRESS.

THE BLUNDERS OF THE PAST.

Sir George McCrae, Vice-President of the Local Government Board for Scotland, who was delegated by the Government to represent Scotland at the International Congress on Hygiene and Demography at Washington, read a paper at the congress on "Modern Town Planning." Town planning, he said, to be of real scientific value, must not only regulate the development of future communities; it must also, so far as possible, retrieve the blunders of the past. The latter was generally a most expensive business. Still, it must be faced. But hitherto there had been no scientific and considered line of advance. It was not too much to say that it was costing Britain millions of pounds sterling to clear away slum areas for the improvement of the conditions under which the poorer classes live, due to the defective town planning of the past, and yet in many cases they had missed the opportunity afforded them when new developments took place. They had, unfortunately, not appreciated the inestimable advantage of being able to deal with the problem on virgin soil, unhampered with the complications of vested interests, unless, perhaps, in respect of land.

THE PRICE OF LAND.

The two great barriers to progress were—first, the prohibitive price of land, with the attendant expensive forms of procedure necessary for its acquisition for public purposes; and, secondly, the hard-and-fast line of demarcation between town and county areas of administration. Under the Town Planning Act of 1909 a new departure of great importance was made, the far-reaching importance of which few even in this country yet appreciated. The inevitable effect of the Act would be a reduction in the price of land for working-class houses. Nowhere had they more striking examples of the need for cheaper land than in his own city of Edinburgh. The poorer classes not only paid comparatively more than the richer classes; they did actually pay more for the same area of land on which they live. This they did in increased rents far above the competitive rent, apart from the monopoly value of the land they occupied. Ground rent in Scotland was in the form of an annual rent charge, called a feu. In Edinburgh land restricted for the sake of amenity for the erection of villas for the richer classes could be got at a land rent of from £20 to £40 per annum. But for the same land, if available for the building of working-class tenement houses, the ground rent was as much as £250 per annum, simply because under the old laws people could build so many houses to the acre. Little surprise need be felt when he said that in the centre of Edinburgh city there were districts as many as 200 persons to the acre, with a correspondingly high death-rate.

THE ROSYTH SCHEME.

The progress under the Act had been most gratifying. The most interesting scheme of all was one at present being considered by the Scottish Board. Unique in its features, it was perhaps the greatest opportunity ever presented in an old country of town planning on absolutely free conditions and on virgin soil. The great North Sea naval base at Rosyth was nearing completion, and there a new town would arise numbering, to begin with, a population of 30,000 within the next two years. This would gradually increase. The Admiralty had requested the Scottish Local Government Board to supervise the creation of this new community, and this interesting experience was being watched with close attention by town planners everywhere as an experiment big with results for the future of the movement. When he said that the scheme under consideration embraced an area of 6,000 acres, an idea would be had of the future magnitude of this new area. The scheme was being prepared by the city of Dunfermline, and was to be submitted for approval or amendment to the Local Government Board for Scotland. Although the Act had only been in operation for little over two years in Scotland, no less than twenty-three schemes were in various stages of progress. In England the success had been equally marked. But the progress of town planning in Britain was not to be judged merely by the number of schemes coming officially before the Local Government Boards for approval. The very fact that the central authority had power under the Act to compel a local authority to make a scheme had had the effect of raising the standard of building and roadway conditions all round.

REINFORCED CONCRETE.

ATTITUDE OF THE LOCAL GOVERNMENT BOARD.

The following letter from Mr. Lucien Serraillier, Queen Anne's Chambers, Westminster, appears in the *Times Engineering Supplement* of Wednesday last:

"The action of the Local Government Board in restricting the application of reinforced concrete by a discrimination (to the detriment of this mode of construction as compared with the older forms of construction) in the periods they allow for the repayment of municipal and local loans has been the cause on many occasions of protests from those who are suffering from this attitude. It is a common occurrence for reinforced concrete schemes to be turned down in favour of brick, steel frame, or even timber construction, because the Local Government Board will allow only ten or fifteen years for the repayment of the loan for reinforced concrete schemes, as compared with the usual term of thirty years for the other forms of construction.

"The President of the Local Government Board is, of course, entirely guided in these matters by his technical advisers, and apparently those gentlemen still consider that reinforced concrete is in an experimental stage, notwithstanding the vast amount of work which has been done in America and France, and the increasing amount of work which is being done in this country. The result of this attitude is that when, as is generally the case, the reinforced concrete scheme is cheaper than the alternative schemes, it has to be abandoned owing to the greater cost of procuring the money, and the taxpayer does not get the benefit of the cheaper construction.

"I will not dwell upon the wisdom of the policy of long terms for the repayment of local loans, and the equity of throwing this financial burden upon a future generation. It savours of the policy of the British railways, which have generally paid for improvements out of capital instead of out of revenue.

"There is a large consensus of opinion in favour of short-term loans, and there is no doubt that if reinforced concrete were considered by the Local Government Board to be worthy of the same financial treatment as other forms of construction, its cheaper cost would in many cases benefit the taxpayer immediately. The attitude of the Local Government Board is utterly illogical, since one of the properties of reinforced concrete is that its strength increases with age, as against other forms of construction which deteriorate with age. It also is based on certain failures which have occurred in reinforced concrete, and probably on ignorance of their true causes.

"A reinforced concrete failure is at once advertised, but there are plenty of instances of failures in other forms of construction which, like the birth of Jeames Yellowplush, are 'wropped in mistry'! Failures in reinforced concrete are usually due to the premature removal of the falsework or to bad construction, and one of the features of reinforced concrete which the technical advisers of the Local Government Board apparently do not realise is that if a reinforced concrete building is going to fail it will fail at once. In that case it seems illogical—does it not?—to give it even a ten-year loan, for it is perfectly certain that if it will stand for two years it will stand for ever, which is more than can be said of a timber or a steel frame building.

"I do not think there is any single example extant of a reinforced concrete structure having failed after it had been up two years. Can this be said of any other form of construction? It is a remarkable fact that the Admiralty, the War Office, the Office of Works, and other Government departments are all using reinforced concrete, and that the only department which has no need of structures is the one that is arresting the development of this form of construction. Certain regulations for standardising and safeguarding the construction of reinforced concrete structures have been drafted by the London County Council in conjunction with the representative technical bodies. These regulations are now pigeon-holed at the Local Government Board. When shall we get them?

"I trust that these remarks may produce some correspondence on the subject, and that some joint action may be taken by those interested in the reinforced concrete industry, and also by the ratepayers, to make another attempt to induce the President of the Local Government Board to adopt a more conciliatory attitude towards reinforced concrete schemes."

REINFORCED CONCRETE RESERVOIR AT EAST COWES.

The October issue of *Concrete and Constructional Engineering* contains an interesting description of a reinforced-concrete reservoir which has lately been completed for the East Cowes Urban District Council.

Some months ago the council instructed their water engineer and surveyor (Mr. Albert E. Barton, M.I.MUN.E.) to prepare plans for a brick reservoir capable of holding 1,000,000 gallons. Upon the completion of these plans it was found that the cost was prohibitive, and on the recommendation of Mr. Barton the council decided to construct it in reinforced concrete, the result being that the cost worked out at considerably less than half the cost of the brick-built reservoir.

Tenders were advertised for, several well-known reinforced-concrete engineering firms submitted designs, and the council, after careful consideration, adopted the "Kahn" Trussed Bar System, submitted by the Trussed Concrete Steel Company, Limited, Caxton House, Westminster.

The internal dimensions of the reservoir are 100 ft. by 100 ft., with a clear height of 17 ft. between floor and roof slab; the overflow provides for a maximum depth of 16 ft., the total capacity being 1,000 000 gallons. The reservoir is divided into two parts, having a division wall in the centre, which can be worked independently of each other.

The floor slab consists of 6-in. concrete interlaced with ⅜-in. rib bars, spaced in both directions at 14-in. centres. The wall slabs between vertical buttresses or piers have horizontal reinforcing bars spaced 4 in. to 12 in. apart at varying heights from the bottom proportionate to the pressure; the vertical bars are placed in the centre of the bay, the panels and piers are flush on the inner side. The centre division wall has the panel in the centre of piers; the thickness of the slab is from 5 in. at the floor level to 4 in. at the top.

The roof slab is 3 in. thick, with ⅜-in. cup bar, 10½-in. centres, the maximum size of slab clear of beams being 5 ft. by 16 ft. 8 in.; 12 in. of surface soil is placed on the top, with the usual ventilators for each bay.

The east and west outer walls consist of seven 26-in. by 12-in. vertical buttresses reinforced with "Kahn" trussed and cup bars opposite the cross line of columns, and twelve 24-in. by 9-in. intermediate buttresses, all standing upon a continuous beam 24 in. by 10 in., into which the roof beam and slab tie bars are hooked. The remaining outer walls are constructed in a similar manner with nineteen 24-in. by 9-in. buttresses and 4-in. to 5-in. wall slabs between; no cross beam at head is required.

The dividing wall is formed of five 27-in. by 12-in. and twelve 25-in. by 12-in. vertical buttresses of similar construction to the last, with 5-in. to 4-in. slab spanning between these buttresses.

The materials used consist of "Needles" shingle and sea sand mixed with best Portland cement, the principal portions being five parts shingle (¾ mesh) and clean, sharp sea sand to one part of Portland cement. The internal walls are coated with 1 in. of cement rendering gauged three sand and one cement, and mixed with "Ceresit" waterproofing composition; the rendering is done in three coats and finished with plain floated surface.

Messrs. W. H. Brading & Son, East Cowes, were the contractors.

Public Libraries for Bethnal Green.—It was decided at the last meeting of Bethnal Green Borough Council to adopt the Public Libraries Act, and a special committee was instructed to report upon the establishment of public libraries in the borough.

Hackney Branch Libraries.—The foundation-stone of the second of the three branch libraries being provided at Hackney, through the munificence of Mr. Andrew Carnegie, was laid on Saturday afternoon at Brooksby's-walk, Homerton, by Councillor D. W. Marpole, chairman of the Public Libraries Committee. The site was purchased by the borough council for the sum of £1,300, and the library, which is intended to serve the eastern division of Hackney, is estimated to cost £5,280. The first of the branch libraries, situated in Woodland-road, Dalston, will be opened by the mayor (Councillor W. Hammer, J.P.) to-morrow (Saturday), and the plans of the third building, to be erected in Northwold-road, Upper Clapton, have just been approved by Mr. Carnegie.

ROOFING MATERIALS.

BRITISH FIRE-PREVENTION COMMITTEE'S TESTS.

The British Fire-Prevention Committee last week conducted a further series of fire tests in respect to roofing materials, the coverings under investigation being corrugated sheets of asbestos-cement made in Canada, and produced in such a manner that they can be applied in the same way as the well-known corrugated-iron sheets, while having great advantages as to non-conductivity against heat and fire.

It will be realised that these tests were of particular importance to Indian and Colonial authorities, as the difficulty of finding suitable materials to meet the climatic conditions has always been great.

Mr. Edwin O. Sachs, F.R.S.ED. (chairman of the executive), Major O'Meara, C.M.G. (General Post Office), Mr. Horace S. Folker, F.A.I. (hon. treasurer), Mr. Percy Collins, F.S.S., and other members of council, received the members and visitors attending at the committee's Regent's Park Testing Station, and the operations were conducted by a sub-committee under the direction of Mr. C. T. Cuss and Mr. Ellis Marsland (district surveyor).

The roofing material under test was tested at different angles, fire being applied in different forms, such as bonfires, fire brands, and so on, and certain of the roofs were also subjected to water from a steam fire engine when they were in a heated condition.

The visitors, as usual, comprised representatives of the principal Government departments concerned, including the War Office, H.M. Office of Works, Home Office and Admiralty, but on this occasion also the representatives of the various Colonial Government agencies were present, and there was also a considerable attendance of insurance surveyors, engineers of railway companies, and fire brigade officers.

Waterproofing of Buildings.—"Pudlo," the widely used waterproofing material, has been specified for the whole of the cement work in connection with a new library at Huthwaite.

Housing in Scotland.—A Royal Commission has been appointed to inquire into the housing of the industrial population of Scotland, rural and urban (with special reference in the rural districts to the housing of miners and agricultural labourers), and to report what legislative or administrative action is, in their opinion, desirable to remedy existing defects.

A Sanatorium for Lincoln.—The Lincoln City Council have decided that the memorial to the late Mr. John Dawber, who left a large sum of money to the city for charitable purposes, shall take the form of a sanatorium. A sum of £7,500 had been set apart for the memorial, and it is expected that a Treasury grant of £2,777 will be obtainable, so that the council will have an available fund of £10,277.

Business Announcement.—Messrs. Herbert Morris, Limited, Empress Works, Loughborough, announce that the increasing volume of business reaching them from the Yorkshire ground has made it necessary for them to open offices in Leeds. These, we are given to understand, are situated on the ground floor of Standard Buildings, City-square; telephone, 2968 Central; telegrams, "Comorris, Leeds." The new branch will be under the management of the firm's Yorkshire representative, Mr. O. J. Wendlandt, and its opening has followed rapidly on the opening of an office at 30 George-square, Glasgow, as the centre of Messrs. Morris's Scottish business, which is under the management of Mr. A. Hatfield Acres.

Sheffield Society of Architects and Surveyors.—In his inaugural address to the members of the body on the 10th inst., Mr. J. B. Mitchell-Withers, the president, put forward the suggestion that it would tend to the benefit of the architectural profession as a whole of it were possible to have more intercommunication between the provincial societies and to obtain a greater and more permanent representation on the council of the Royal Institute. Some of their younger members were arranging this session to hold lectures of their own, and his hope was that the scheme would be well supported. The remarkable scarcity of young men entering the profession was the subject of comment by a subsequent speaker. In regard to this the president observed that it must be remembered that a great deal of important work was now undertaken by public bodies, though, he believed, at much greater cost than formerly.

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